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Danny Goodman
With a foreword by Brendan Eich, creator of JavaScript

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About the Author

Danny Goodman is the author of numerous critically acclaimed and best-selling books, including *The Complete HyperCard Handbook*, *Danny Goodman's AppleScript Handbook*, and *Dynamic HTML: The Definitive Reference*. He is a renowned authority and expert teacher of computer scripting languages and is widely known for his "JavaScript Apostle" articles at Netscape's *ViewSource* online developer newsletter. His writing style and pedagogy continue to earn praise from readers and teachers around the world. To help keep his finger on the pulse of real-world programming challenges, Goodman frequently lends his touch as consulting programmer and designer to leading-edge World Wide Web and intranet sites from his home base in the San Francisco area.

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Foreword

As JavaScript's creator, I would like to say a few words about where JavaScript has been, where it is going, and how the book you're holding will help you to make the most of the language.

JavaScript was born out of a desire to let HTML authors write scripts directly in their documents. This may seem obvious now, but in the spring of 1995 it was novel and more than a little at odds with both the conventional wisdom (that HTML should describe static document structure only) and the Next Big Thing (Java applets, which were hyped as the one true way to enliven and extend Web pages). Once I got past these contentions, JavaScript quickly shaped up along the following lines:

✦ **"Java-lite" syntax.** Although the "natural language" syntax of HyperTalk was fresh in my mind after a friend lent me *The Complete HyperCard Handbook* by some fellow named Goodman, the Next Big Thing weighed heavier, especially in light of another goal: scripting Java applets. If the scripting language resembled Java, then those programmers who made the jump from JavaScript to Java would welcome similarities in syntax. But insisting on Java's class and type declarations, or on a semicolon after each statement when a line ending would do, was out of the question — scripting for most people is about writing short snippets of code, quickly and without fuss.

✦ **Events for HTML elements.** Buttons should have `onClick` event handlers. Documents load and unload from windows, so windows should have onLoad and onUnload handlers. Users and scripts submit forms: thus the onSubmit handler. Although not initially as flexible as HyperCard's messages (whose handlers inspired the onEvent naming convention), JavaScript events let HTML authors take control of user interaction from remote servers and respond quickly to user gestures and browser actions. With the adoption of the W3C DOM Level 2 event handling recommendations, JavaScript in modern browsers has fully flexible control over events.

✦ **Objects without classes.** The Self programming language proved the notion of prototype-based inheritance. For JavaScript, I wanted a single prototype per object (for simplicity and efficiency), based by default on the function called using the new operator (for consonance with Java). To avoid distinguishing constructors from methods from functions, all functions receive the object naming them as the property that was called, in the `this` parameter. Although prototypes didn't appear until Navigator 3, they were prefigured in Version 2 by quoted text being treated as an object (the String object prototype, to which users could attach methods).

✦ **Generated HTML.** Embedding JavaScript in HTML gave rise to a thought: Let the script speak HTML, as if the emitted text and markup were loaded in place of the script itself. The possibilities went beyond automating current or last-modified dates, to computing whole trees of tables where all the repeated structure was rolled up in a scripted loop, while the varying contents to be tabulated came in minimal fashion from JavaScript objects forming a catalog or mini-database.

At first, I thought JavaScript would most often find use in validating input to HTML forms. But before long, I was surprised to see how many Web designers devised compelling applications by way of script-generated HTML and JavaScript objects. It became clear from user demonstration and feedback that Web designers sought to build significant applications quickly and effectively with just a few images, HTML, and JavaScript. Eventually they demanded that the browser support what is now known as "Dynamic HTML" (one fun link: `http://www.javascript-games.org/`).

As legions of Web authors embraced the authoring power of JavaScript, they, in turn, demonstrated the crucial advantages of a scripting environment over old-school application development. Not only were the HTML and JavaScript languages comparatively easy to use, but development did not require the programming expertise needed to light all pixels and handle all events as in a big, traditional application.

The primacy of JavaScript on the Web today vindicates our early belief in the value of a scripting language for HTML authors. By keeping the "pixel-lighting" bar low, HTML with images has made Web designers out of millions of people. By keeping the "event-handling" bar low, JavaScript has helped many thousands of those designers become programmers. Perhaps the ultimate example of Web development's convergence with application development is the Mozilla browser, wherein all of the user-interface and even some custom widgets and modular components are implemented entirely using JavaScript, Cascading Style Sheets (CSS), custom XML-based markup languages, and images.

JavaScript is also a general language, useful apart from HTML and XML. It has been embedded in servers, authoring tools, browser plug-ins, and other kinds of browsers (for such things as 3D graphical worlds). Its international standard, ECMA-262 (ISO 16262), has advanced to a Third Edition. But compared with languages such as Perl and even Java, it is still relatively young. Work toward a Fourth Edition of the language, supporting optional types, classes, and versioning facilities, progresses within the ECMA technical committee (see the "JS2" proposal to the ECMA technical committee documented at `http://www.mozilla.org/js/language/js20/`).

It is clear to me that JavaScript would not have survived without a creative, loyal, and patient community of developers; I owe them each a huge debt of thanks. Those developers who took up the beta releases of Navigator 2 and disseminated vital workarounds and feature requests by e-mail and net-news are the language's godparents. Developer support and feedback continue to make JavaScript the eclectic, rambunctious success it is.

The book in your hands compiles thousands of those "developer miles" with the insight of an expert guide and teacher. Danny didn't know at the time how much inspiration I found in his HyperCard book, but it was on my desk throughout the development of JavaScript in 1995. His energy, compassion, and clear prose helped me keep the goal of "a language for all" in mind. It is enormously gratifying to write the foreword to the Gold edition of this book, which has earned so many "satisfied reader miles."

I highly recommend Danny Goodman's *JavaScript Bible* to anyone who wants to learn JavaScript, and especially to those HTML authors who've so far written only a few scripts or programs — you're in for a lifetime of fun on the "scripting road" with a trusty guide at your side.

— *Brendan Eich*
The Mozilla Organization (http://www.mozilla.org)

Preface

For nearly 20 years, I have written the books I wished had already been written to help me learn or use a new technology. Whenever possible, I like to get in at the very beginning of a new authoring or programming environment, feel the growing pains, and share with readers the solutions to my struggles. This Gold edition of the *JavaScript Bible* represents knowledge and experience accumulated over five years of daily work in JavaScript and a constant monitoring of newsgroups for questions, problems, and challenges facing scripters at all levels. My goal is to help you avoid the same frustration and head scratching I and others have experienced through multiple generations of scriptable browsers.

While previous editions of this book focused on the then-predominant Netscape Navigator browser, the swing of the browser market share pendulum currently favors Microsoft Internet Explorer. At the same time, Netscape has accomplished the admirable task of reinventing its own browser in light of rapidly advancing industry standards. As a result of both of these trends, this massively revised and expanded Gold edition treats both brands of browsers as equals as far as scripters are concerned. You hear my praise and dismay at various scripting features of both browser families. But empowering you to design and write good scripts is my passion, regardless of browser. Therefore, the book contains details about proprietary and standard implementations to equip you to choose the development path that best fits your content's audience. If you detect any bias of mine throughout this book, it is a desire, where possible, to write scripts that work on as many browsers as possible.

Organization and Features of This Edition

Because of the greatly expanded range of vocabularies that scripts may use in the latest browser versions, the biggest change to the structure of the book is in the reference portion. In this edition, you find a greater distinction between the document object model and core JavaScript language reference sections. This new division should help those readers who are primarily interested in only the JavaScript language (for use in other applications) find what they need more quickly. Here are some details about the book's structure.

Part I

Part I of the book begins with a chapter that shows how JavaScript compares with Java and discusses its role within the rest of the World Wide Web. The Web browser and scripting world have undergone significant changes since JavaScript first arrived on the scene. That's why Chapter 2 is devoted to addressing challenges facing scripters who must develop applications for both single- and cross-platform browser audiences amid rapidly changing standards efforts. Chapter 3 provides the first foray into JavaScript, where you get to write your first practical script.

Part II

All of Part II is handed over to a tutorial for newcomers to JavaScript. Nine lessons provide you with a gradual path through browser internals, basic programming skills, and genuine JavaScript scripting. With only a couple of clearly labeled items, the lessons cover scripting topics that apply to all scriptable browsers. Exercises follow at the end of each lesson to help reinforce what you just learned and challenge you to use your new knowledge (you'll find answers to the exercises in Appendix C). The goal of the tutorial is to equip you with sufficient experience to start scripting simple pages right away while making it easier for you to understand the in-depth discussions and examples in the rest of the book. By the end of the final lesson, you'll know how to script multiple frame environments and even create the mouse-rollover image swapping effect that is popular in a lot of Web pages these days.

On the CD-ROM

You can find all of the Part II chapters on the CD-ROM that accompanies this book.

Part III

Part III, the largest section of the book, provides in-depth coverage of the document object models as implemented in browsers from the earliest days to today. In all reference chapters, a compatibility chart indicates the browser version that supports each object and object feature. One chapter in particular, Chapter 15, contains reference material that is shared by most of the remaining chapters of Part III. To help you refer back to Chapter 15 from other chapters, a dark tab along the outside edge of the page shows you at a glance where the chapter is located. Additional navigation aids include guide words at the bottoms of most pages to indicate which object and object feature is covered on the page.

Part IV

Reference information for the core JavaScript language fills Part IV. As with reference chapters of Part III, the JavaScript chapters display browser compatibility charts for every JavaScript language term. Guide words at the bottoms of pages help you find a particular term quickly.

Part V

In Part V, I get down to the business of deploying JavaScript. Here are the practical aspects of JavaScript, such as Chapter 43's coverage of client-side form data validation and Chapter 44's coverage of blending Java applets and plug-ins into pages.

Debugging scripts is the focus of Chapter 45, with tips on understanding error messages, building your own debugging tools. Chapter 46 goes into great detail about security issues for JavaScript-enabled applications. Dynamic HTML in a cross-browser environment is the subject of Chapter 47, while Chapter 48 introduces you to Microsoft's behaviors mechanism for Windows.

The remaining nine chapters consist of full-fledged applications of JavaScript. These applications are designed not necessarily as plug-and-play modules you can put into your pages right away. Instead, their goal is to demonstrate many of the concepts described earlier in the book by way of real-world examples. New for this edition are some examples based on XML data islands in Internet Explorer for Windows.

Part VI

Finally, several appendixes at the end of the book provide helpful reference information. These resources include a JavaScript and Browser Objects Quick Reference in Appendix A, a list of JavaScript reserved words in Appendix B, answers to Part II's tutorial exercises in Appendix C, and Internet resources in Appendix D. In Appendix E, you also find information on using the CD-ROM that comes with this book.

CD-ROM

The accompanying CD-ROM contains over 300 ready-to-run HTML documents that serve as examples of most of the document object model and JavaScript vocabulary words in Parts III and IV. You can run these examples with your JavaScript-enabled browser, but be sure to use the `index.html` page in the listings folder as a gateway to running the listings. This page shows you the browsers that are compatible with each example listing. I could have provided you with humorous little sample code fragments out of context, but I think that seeing full-fledged HTML documents (simple though they may be) for employing these concepts is important. I intentionally omitted the script listings from the tutorial part (Part II) of this book to encourage you to type the scripts. I believe you learn a lot, even by aping listings from the book, as you get used to the rhythms of typing scripts in documents. You also find listings from Parts I and V on the CD-ROM.

The CD-ROM holds another valuable resource: dozens and dozens of Example sections for Parts III and IV, which are compiled in Appendix F. Many of these sections reveal detailed descriptions of HTML listings that illustrate a particular object model or language feature. Even more Example sections invite you to try out an object model or language feature with the help of an interactive workbench, called The Evaluator — a *JavaScript Bible* exclusive! You see instant results and quickly learn how the feature works.

The Quick Reference from Appendix A is in .pdf format on the CD-ROM for you to print out and assemble as a handy reference, if desired. Adobe Acrobat Reader is also included on the CD-ROM so that you can read this .pdf file. Finally, the text of the book is in a .pdf file format on the CD-ROM for easy searching.

Prerequisites to Learning JavaScript

Although this book doesn't demand that you have a great deal of programming experience behind you, the more Web pages you've created with HTML, the easier you will find it to understand how JavaScript interacts with the familiar elements you normally place in your pages. Occasionally, you will need to modify HTML tags to take advantage of scripting. If you are familiar with those tags already, the JavaScript enhancements will be simple to digest.

Forms and their elements (text fields, buttons, and selection lists) play an especially important role in much of typical JavaScript work. You should be familiar with these elements and their HTML attributes. Fortunately, you won't need to know about server scripting or passing information from a form to a server. The focus here is on client-side scripting, which operates independently of the server after the JavaScript-enhanced HTML page is fully loaded into the browser.

The basic vocabulary of the current HTML standard should be part of your working knowledge. When we get to using frames, for instance, the focus is on how to script these elements, not on designing pages with them. Microsoft, Netscape, and other online sources provide more detailed explanations of frames.

If you've never programmed before

To someone who learned HTML from a slim guidebook a few years ago, the size of this book must be daunting. JavaScript may not be the easiest language in the world to learn, but believe me, it's a far cry from having to learn a full programming language, such as Java or C. Unlike developing a full-fledged monolithic application (such as the productivity programs you buy in the stores), JavaScript lets you experiment by writing small snippets of program code to accomplish big things. The JavaScript interpreter built into every scriptable browser does a great deal of the technical work for you.

Programming, at its most basic level, consists of nothing more than writing a series of instructions for the computer to follow. We humans follow instructions all the time, even if we don't realize it. Traveling to a friend's house is a sequence of small instructions: Go three blocks that way; turn left here; turn right there. Amid these instructions are some decisions that we have to make: If the stoplight is red, then stop; if the light is green, then go; if the light is yellow, then floor it. Occasionally, we must repeat some operations several times (kind of like having to go around the block until a parking space opens up). A computer program not only contains the main sequence of steps, but it also anticipates what decisions or repetitions may be needed to accomplish the program's goal (such as how to handle the various states of a stoplight or what to do if someone just stole the parking spot you were aiming for).

The initial hurdle of learning to program is becoming comfortable with the way a programming language wants its words and numbers organized in these instructions. Such rules are called syntax, the same as in a living language. Because computers generally are dumb electronic hulks, they aren't very forgiving if you don't communicate with them in the specific language they understand. When speaking to another human, you can flub a sentence's syntax and still have a good chance of the other person's understanding you fully. Not so with computer programming languages. If the syntax isn't perfect (or at least within the language's range of knowledge that it can correct), the computer has the brazenness to tell you that you have made a syntax error.

The best thing you can do is to just chalk up the syntax errors you receive as learning experiences. Even experienced programmers get them. Every syntax error you get — and every resolution of that error made by rewriting the wayward statement — adds to your knowledge of the language.

If you've done a little programming before

Programming experience in a procedural language, such as BASIC or Pascal, may almost be a hindrance rather than a help to learning JavaScript. Although you may have an appreciation for precision in syntax, the overall concept of how a program fits into the world is probably radically different from how JavaScript works. Part of this has to do with the typical tasks a script performs (carrying out a very specific task in response to user action within a Web page), but a large part also has to do with the nature of object-oriented programming.

In a typical procedural program, the programmer is responsible for everything that appears on the screen and everything that happens under the hood. When the program first runs, a great deal of code is dedicated to setting up the visual environment. Perhaps the screen contains several text entry fields or clickable buttons. To determine which button a user clicks, the program examines the coordinates of the click and compares those coordinates against a list of all button coordinates on the screen. Program execution then branches out to perform the instructions reserved for clicking in that space.

Object-oriented programming is almost the inverse of that process. A button is considered an object — something tangible. An object has properties, such as its label, size, alignment, and so on. An object may also contain a script. At the same time, the system software and browser, working together, can send a message to an object — depending on what the user does — to trigger the script. For example, if a user clicks in a text entry field, the system/browser tells the field that somebody has clicked there (that is, has set the focus to that field), giving the field the task of deciding what to do about it. That's where the script comes in. The script is connected to the field, and it contains the instructions that the field carries out after the user activates it. Another set of instructions may control what happens when the user types an entry and tabs or clicks out of the field, thereby changing the content of the field.

Some of the scripts you write may seem to be procedural in construction: They contain a simple list of instructions that are carried out in order. But when dealing with data from form elements, these instructions work with the object-based nature of JavaScript. The form is an object; each radio button or text field is an object as well. The script then acts on the properties of those objects to get some work done.

Making the transition from procedural to object-oriented programming may be the most difficult challenge for you. When I was first introduced to object-oriented programming a number of years ago, I didn't get it at first. But when the concept clicked — a long, pensive walk helped — so many light bulbs went on inside my head that I thought I might glow in the dark. From then on, object orientation seemed to be the only sensible way to program.

If you've programmed in C before

By borrowing syntax from Java (which, in turn, is derived from C and C++), JavaScript shares many syntactical characteristics with C. Programmers familiar with C will feel right at home. Operator symbols, conditional structures, and repeat loops follow very much in the C tradition. You will be less concerned about data types in JavaScript than you are in C. In JavaScript, a variable is not restricted to any particular data type.

With so much of JavaScript's syntax familiar to you, you will be able to concentrate on document object model concepts, which may be entirely new to you. You will still need a good grounding in HTML (especially form elements) to put your expertise to work in JavaScript.

If you've programmed in Java before

Despite the similarity in their names, the two languages share only surface aspects: loop and conditional constructions, C-like "dot" object references, curly braces for grouping statements, several keywords, and a few other attributes. Variable declarations, however, are quite different, because JavaScript is a loosely typed language. A variable can contain an integer value in one statement and a string in the next (though I'm not saying that this is good style). What Java refers to as methods, JavaScript calls methods (when associated with a predefined object) or functions (for scripter-defined actions). JavaScript methods and functions may return values of any type without having to state the data type ahead of time.

Perhaps the most important aspects of Java to suppress when writing JavaScript are the object-oriented notions of classes, inheritance, instantiation, and message passing. These aspects are simply non-issues when scripting. At the same time, however, JavaScript's designers knew that you'd have some hard-to-break habits. For example, although JavaScript does not require a semicolon at the end of each statement line, if you type one in your JavaScript source code, the JavaScript interpreter won't balk.

If you've written scripts (or macros) before

Experience with writing scripts in other authoring tools or macros in productivity programs is helpful for grasping a number of JavaScript's concepts. Perhaps the most important concept is the idea of combining a handful of statements to perform a specific task on some data. For example, you can write a macro in Microsoft Excel that performs a data transformation on daily figures that come in from a corporate financial report on another computer. The macro is built into the Macro menu, and you run it by choosing that menu item whenever a new set of figures arrives.

More sophisticated scripting, such as that found in Toolbook or HyperCard, prepares you for the object orientation of JavaScript. In those environments, screen objects contain scripts that are executed when a user interacts with those objects. A great deal of the scripting you will do in JavaScript matches that pattern exactly. In fact, those environments resemble the scriptable browser environment in another way: They provide a finite set of predefined objects that have fixed sets of properties and behaviors. This predictability makes learning the entire environment and planning an application easier to accomplish.

Formatting and Naming Conventions

The script listings and words in this book are presented in a `monospace font` to set them apart from the rest of the text. Because of restrictions in page width, lines of script listings may, from time to time, break unnaturally. In such cases, the remainder of the script appears in the following line, flush with the left margin of the listing, just as they would appear in a text editor with word wrapping turned on. If these line breaks cause you problems when you type a script listing into a document yourself, I encourage you to access the corresponding listing on the CD-ROM to see how it should look when you type it.

As soon as you reach Part III of this book, you won't likely go for more than a page before reading about an object model or language feature that requires a specific minimum version of one browser or another. To make it easier to spot in the text when a particular browser and browser version is required, most browser references consist of a two-letter abbreviation and a version number. For example, IE5 means Internet Explorer 5 for any operating system; NN6 means Netscape Navigator 6 for any operating system. If a feature is introduced with a particular version of browser and is supported in subsequent versions, a plus symbol (+) follows the number. For example, a feature marked IE4+ indicates that Internet Explorer 4 is required at a minimum, but the feature is also available in IE5, IE5.5, and so on. Occasionally, a feature or some highlighted behavior applies to only one operating system. For example, a feature marked IE4+/Windows works only on Windows versions of Internet Explorer 4 or later. As points of reference, the first scriptable browsers were NN2, IE3/Windows, and IE3.01/Macintosh. Moreover, IE3 for Windows can be equipped with one of two versions of the JScript .dll file. A reference to the earlier version is cited as IE3/J1, while the later version is cited as IE3/J2. You will see this notation primarily in the compatibility charts throughout the reference chapters.

Note, Tip, and Caution icons occasionally appear in the book to flag important points.

On the CD-ROM icons point you to useful examples and code listings found on this book's companion CD-ROM.

Acknowledgments

Before closing, I would like to acknowledge the contributions of many folks who helped make this edition possible: Eric Krock, Tom Pixley, Vidur Apparao, and especially the ever-patient, all-knowing Brendan Eich (Mozilla); Martin Honnen (Netscape DevEdge Champion); Tantek Celik (Microsoft's Macintosh development group); Brenda McLaughlin, Walt Bruce, Michael Roney, Debra Williams Cauley, Neil Romanosky, Eric Newman, Cordelia Heaney, Jerelind Charles, and Victoria Lee O'Malley (Hungry Minds, Inc.); technical reviewer David Wall; "cookie man" Bill Dortch (hIdaho Design); Red and his friends (Mars, Incorporated); and fellow scripters and newsgroup kibitzers, who unwittingly advised me as to where scripters were having trouble with the language. Above all, I want to thank the many readers of the first three editions of this book (with both titles, *Danny Goodman's JavaScript Handbook* and *JavaScript Bible*) for investing in this ongoing effort. I wish I had the space here to acknowledge by name so many who have sent e-mail notes and suggestions: Your input has been most welcome and greatly appreciated. Now it's time to get down to the fun of learning JavaScript. Enjoy!

Contents at a Glance

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P A R T

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In This Part

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CHAPTER 1

JavaScript's Role in the World Wide Web and Beyond

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In This Chapter

How JavaScript blends with other Web-authoring technologies

The history of JavaScript

What kinds of jobs you should and should not entrust to JavaScript

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Many of the technologies that make the World Wide Web possible have far exceeded their original visions. Envisioned at the outset as a medium for publishing static text and image content across a network, the Web is forever being probed, pushed, and pulled by content authors. By taking for granted so much of the "dirty work" of establishing the connection and conveying the bits between server and client computers, content developers and programmers dream of using that connection to generate new user experiences and operating system-independent applications. A developer community essentially taking ownership of a technology and molding it to do new and exciting things is not new. It's the enormous popularity of the Web and the accessibility of the technologies to everyday folks who have intriguing ideas that has led to an unprecedented explosion in turning the World Wide Web from a bland publishing medium into a highly interactive, operating system-agnostic authoring platform.

The JavaScript language is a Web-enhancing technology. When employed on the client computer, the language can help turn a static page of content into an engaging, interactive, and intelligent experience. Applications can be as subtle as welcoming a site's visitor with the greeting "Good morning!" when it is morning in the client computer's time zone — even though it is dinnertime where the server is located. Or applications can be much more obvious, such as delivering the content of a slide show in one-page download while JavaScript controls the sequence of hiding, showing, and "flying slide" transitions while navigating through the presentation.

Of course, JavaScript is not the only technology that can give life to drab Web content. Therefore, it is important to understand where JavaScript fits within the array of standards, tools, and other technologies at your disposal. The alternative technologies described in this chapter are HTML, server programs, plug-ins, and Java applets. In most cases, JavaScript can work side by side with these other technologies, even though the hype around some make them sound like one-stop shopping places for all your interactive needs. That's rarely the case. Finally, you learn about the origins of JavaScript and what role it plays in today's advanced Web browsers.

Competition on the Web

Web page publishers revel in logging as many visits to their sites as possible. Regardless of the questionable accuracy of Web page *hit* counts, a site consistently logging 10,000 dubious hits per week is clearly far more popular than one with 1,000 dubious hits per week. Even if the precise number is unknown, relative popularity is a valuable measure.

Encouraging people to visit a site frequently is the Holy Grail of Web publishing. Competition for viewers is enormous. Not only is the Web like a ten million-channel television, but the Web competes for viewers' attention with all kinds of computer-generated information. That includes anything that appears onscreen as interactive multimedia.

Users of entertainment programs, multimedia encyclopedias, and other colorful, engaging, and mouse finger-numbing actions are accustomed to high-quality presentations. Frequently, these programs sport first-rate graphics, animation, live-action video, and synchronized sound. In contrast, the lowest common denominator Web page has little in the way of razzle-dazzle. Even with the help of recent advances in Dynamic HTML and style sheets, the layout of pictures and text is highly constrained compared with the kinds of desktop publishing documents you see all the time. Regardless of the quality of its content, a vanilla HTML document is flat. At best, interaction is limited to whatever navigation the author offers in the way of hypertext links or forms whose filled-in content magically disappears into the Web site's server.

With so many ways to spice up Web sites and pages, you can count on competitors for your site's visitors to do their darndest to make their sites more engaging than yours. Unless you are the sole purveyor of information that is in high demand, you continually must devise ways to keep your visitors coming back and entice new ones. If you design an intranet, your competition is the drive for improved productivity by the colleagues who use the internal Web sites for getting their jobs done.

These are all excellent reasons why you should care about using one or more Web technologies to raise your pages above the noise. Let's look at the major technologies you should know about.

Hypertext Markup Language (HTML)

As an outgrowth of *SGML (Standard Generalized Markup Language)*, *HTML* is generally viewed as nothing more than a document formatting, or *tagging,* language. The tags (inside <> delimiter characters) instruct a viewer program (the *browser* or, more generically, the *client*) how to display chunks of text or images.

Relegating HTML to the category of a tagging language does disservice not only to the effort that goes into fashioning a first-rate Web page, but also to the way users interact with the pages. To my way of thinking, any collection of commands and other syntax that directs the way users interact with digital information is *programming*. With HTML, a Web page author controls the user experience with the content just as the engineers who program Microsoft Excel craft the way users interact with spreadsheet content and functions.

Recent enhancements to the published standards for HTML (HTML 4.0 and later) endeavor to define more narrowly the purpose of HTML to assign context to content, leaving the appearance to a separate standard for style sheets. In other words, it's not HTML's role to signify that some text is italic, but rather to signify *why* it is italic. (For example, you tag a chunk of text that conveys emphasis regardless of how the style sheet or browser sets the appearance of that emphasized text.)

The most interactivity that HTML lets authors play with is associated with fill-in-the-blank forms. Browsers display text boxes, radio buttons, checkboxes, and select lists in response to HTML tags for those types of form controls. But that's as far as HTML goes. Any processing of the choices or information entered into the form by the user is the job of other technologies, such as programs on the server or client-side scripts.

CGI Scripting

One way to enhance the interaction between user and content is to have the page communicate with the Web server that houses the Web pages. Popular Web search sites, such as Yahoo!, Google, and Lycos, enable users to type search criteria and click a button or two to specify the way the search engine should treat the query. E-commerce sites enable you to gather products in a virtual shopping cart and then click a button to submit an order for processing. When you click the Submit or Search buttons, your browser sends your entries from a form to the server. On the server, a program known as a *CGI (Common Gateway Interface)* script formats the data you enter and sends this information to a database or other program running on the server. The CGI script then sends the results to your browser, sometimes in the form of a new page or as information occupying other fields in the form.

Writing customized CGI scripts typically requires considerable programming skill. Most CGI scripts are written in languages such as Perl, Java, and C or C++. Very few servers are equipped to run server scripts written in JavaScript.

Whatever language you use, the job definitely requires the Web page author to be in control of the server, including whatever *back-end* programs (such as databases) are needed to supply results or massage the information coming from the user. Even with the new, server-based Web site design tools available, CGI scripting often is not a task that a content-oriented HTML author can do without handing it off to a more experienced programmer.

As interesting and useful as CGI scripting is, it burdens the server with the job of processing queries. A busy server may process hundreds of CGI scripts at a time, while the client computers — the personal computers running the browsers — sit idle as the browser's logo icon dances its little animation. This wastes desktop processing horsepower, especially if the process running on the server doesn't need to access big databases or other external computers. That's why some people regard browsing a basic Web page as little more than using a dumb terminal to access some server content.

Of Helpers and Plug-ins

In the early days of the World Wide Web, a browser needed to present only a few kinds of data before a user's eyes. The power to render text (tagged with HTML) and images (in popular formats such as GIF and JPEG) was built into browsers intended for desktop operating systems. Not to be limited by those data types, developers worked hard to extend browsers so that data in other formats could be rendered on the client computer. It was unlikely, however, that a browser would ever be built that could download and render, say, any of several sound file formats.

One way to solve the problem was to allow the browser, upon recognizing an incoming file of a particular type, to launch a separate application on the client machine to render the content. As long as this helper application was installed on the client computer (and the association with the helper program set in the browser's preferences), the browser would launch the program and send the incoming file to that program. Thus, you might have one helper application for a MIDI sound file and another for a WAV sound file.

Beginning with Netscape Navigator 2, software *plug-ins* for browsers enabled developers to extend the capabilities of the browser without having to modify the browser. Unlike a helper application, a plug-in can enable external content to blend into the document seamlessly.

The most common plug-ins are those that facilitate the playback of audio and video from the server. Audio may include music tracks that play in the background while visiting a page or live (streaming) audio, similar to a radio station. Video and animation can operate in a space on the page when played through a plug-in that knows how to process such data.

Today's browsers tend to ship with plug-ins that decode the most common sound file types. Developers of plug-ins for Internet Explorer for the Windows operating system commonly implement plug-ins as ActiveX controls — a distinction that is important to the underpinnings of the operating system, but not to the user.

Plug-ins and helpers are valuable for more than just audio and video playback. A popular helper application is the *Adobe Acrobat Reader*, which displays Acrobat files that are formatted just as if they were being printed. But for interactivity, developers today frequently rely on Macromedia Corporation's *Flash* plug-in. Created using the Macromedia Flash authoring environment, a Flash document can have active clickable areas and draggable elements. Some authors even simulate artistic video games and animated stories in Flash. A browser equipped with the Flash plug-in displays the content in a rectangular area embedded within the browser page.

One potential downside for authoring interactive content in Flash or similar environments is that if the user does not have the plug-in installed, it can take some time to download the plug-in (if the user even wants to bother). Moreover, once the plug-in is installed, highly graphic and interactive content can take longer to download to the client (especially on a dial-up connection) than some users are willing to wait. This is one of those situations in which you must balance your creative palette with the user's desire for your interactive content.

Java Applets

When the interaction between user and Web page exceeds the capabilities of HTML, experienced programmers may prefer to "roll their own" programs to handle the special needs not available in existing plug-ins. The Java programming language fills this need. Developed by Sun Microsystems, this language enables programmers to write small applications (*applets*) that download to the browser as separate files. An applet runs as the user needs it and then is automatically discarded from memory when the user moves elsewhere in the Web.

Animation, including animated text whose content can change over time, is a popular application of the Java applet in an HTML page. Because applets can also communicate with the Internet as they run (it is a very network-centric programming language), they are also used for real-time, data-streaming applications that display up-to-the-minute news, stock market, and sports data as this information comes across the wires. Standard HTML content can surround all of this activity as the Web page designer sees fit.

To play a Java applet, a browser company must license the technology from Sun and build it into its browser (or link up with a Java engine that is part of the operating system). Netscape was the first third-party browser supplier to license and produce a browser capable of running Java applets (Navigator 2 under Windows 95 and UNIX). Today, both Netscape Navigator and Microsoft Internet Explorer (IE) can load and run Java applets on almost every operating system platform supported by the browser.

Despite a flash of popularity in the early Java days, Java is used less and less for browser applets. It is quite popular, however, on the server, where it is used frequently to create small server application modules called *servlets*. On the client, Java applets suffer the same problem as some plug-ins: the delay required to download the file. Also, not every browser is equipped with the desired Java component, causing potential compatibility conflicts.

JavaScript: A Language for All

The Java language is derived from C and C++, but it is a distinct language. Its main audience is the experienced programmer. That leaves out many Web page authors. I was dismayed at this situation when I first read about Java's specifications. I would have preferred a language that casual programmers and scripters who were comfortable with authoring tools such as Apple's once-formidable HyperCard and Microsoft's Visual Basic could adopt quickly. As these accessible development platforms have shown, nonprofessional authors can dream up many creative applications, often for very specific tasks that no professional programmer would have the inclination to work on. Personal needs often drive development in the classroom, office, den, or garage. But Java was not going to be that kind of inclusive language.

My spirits lifted several months later, in November 1995, when I heard of a scripting language project brewing at Netscape. Initially born under the name LiveScript, this language was developed in parallel with Netscape's Web server software. The language was to serve two purposes with the same syntax. One purpose was as a scripting language that Web server administrators could use to manage the server and connect its pages to other services, such as back-end databases and search engines for users looking up information. Extending the "Live" brand name further, Netscape assigned the name LiveWire to the database connectivity usage of JavaScript on the server.

On the client side — in HTML documents — authors could employ scripts written in this new language to enhance Web pages in a number of ways. For example, an author could use LiveScript to make sure that the information a user enters into a form is of the proper type. Instead of forcing the server or database to do the data validation (requiring data exchanges between the client browser and the server), the user's computer handles all the calculation work — putting some of that otherwise wasted horsepower to work. In essence, LiveScript could provide HTML-level interaction for the user.

As the intensity of industry interest in Java grew, Netscape saw another opportunity for LiveScript: as a way for HTML documents (and their users) to communicate with Java applets. For example, a user might make some preference selections from checkboxes and pop-up selection lists located at the top of a Web page. Scrolling down to the next screenful, the user sees text in the Java applet scrolling banner on the page that is customized to the settings made above. In this case, the LiveScript script sends the text that is to appear in the scrolling banner to the applet (and perhaps a new color to use for the banner's background and text). While this is happening, the server doesn't have to worry a bit about it, and the user hasn't had to wait for communication between the browser and the server. As great an idea as this was initially, this connectivity feature didn't make it into Navigator 2 when JavaScript first became available.

LiveScript becomes JavaScript

In early December 1995, just prior to the formal release of Navigator 2, Netscape and Sun jointly announced that the scripting language thereafter would be known as JavaScript. Though Netscape had several good marketing reasons for adopting this name, the changeover may have contributed more confusion to both the Java and HTML scripting worlds than anyone expected.

Before the announcement, the language was already related to Java in some ways. Many of the basic syntax elements of the scripting language were reminiscent of the C and C++ style of Java. For client-side scripting, the language was intended for very different purposes than Java — essentially to function as a programming language integrated into HTML documents rather than as a language for writing applets that occupy a fixed rectangular area on the page (and that are oblivious to anything else on the page). Instead of Java's full-blown programming language vocabulary (and conceptually more difficult to learn object-oriented approach), JavaScript had a small vocabulary and a more easily digestible programming model.

The true difficulty, it turned out, was making the distinction between Java and JavaScript clear to the world. Many computer journalists made major blunders when they said or implied that JavaScript provided a simpler way of building Java applets. To this day, many programmers believe JavaScript is synonymous with the Java language: They post Java queries to JavaScript-specific Internet newsgroups and mailing lists.

The fact remains today that Java and JavaScript are more different than they are similar. The two languages employ entirely different interpreter engines to execute their lines of code. Whereas JavaScript support shipped in every platform-specific version of Navigator 2 in February 1996, Java was not available for Windows 3.1 users until late in the life of Navigator 3. (Many squirrelly technical issues make it difficult for this modern language to work in an "ancient" MS-DOS operating system.)

The Microsoft world

Although the JavaScript language originated at Netscape, Microsoft acknowledged the potential power and popularity of the language by implementing it (under the JScript name) in Internet Explorer 3. Even if Microsoft would rather that the world use the VBScript (Visual Basic Script) language that it provides in the Windows versions of IE, the fact that JavaScript is available on more browsers and operating systems makes it the client-side scripter's choice for anyone who must design for a broad range of users.

In keeping with the competitive nature of the Web browser market, Netscape and Microsoft continue to attract developers to their camps with different philosophies. As this book is written, Netscape is waving the banner of support for published Web standards; Microsoft, on the other hand, provides only partial standards support but many proprietary extensions that are useful, especially when the clients are running Win32 operating systems exclusively. If you develop pages for an audience that uses both browser brands and multiple operating systems, this creates challenges. I address these issues in the next chapter and in several technical sections in Parts III and IV.

JavaScript: The Right Tool for the Right Job

Knowing how to match an authoring tool to a solution-building task is an important part of being a well-rounded Web page author. A Web page designer who ignores JavaScript is akin to a plumber who bruises his knuckles by using pliers instead of the wrench at the bottom of the toolbox.

By the same token, JavaScript won't fulfill every dream. The more you understand about JavaScript's intentions and limitations, the more likely you will be to turn to it immediately when it is the proper tool. In particular, look to JavaScript for the following kinds of solutions:

✦ Getting your Web page to respond or react directly to user interaction with form elements (input fields, text areas, buttons, radio buttons, checkboxes, selection lists) and hypertext links — a class of application I call the *serverless CGI*

✦ Distributing small collections of database-like information and providing a friendly interface to that data

✦ Controlling multiple-frame navigation, plug-ins, or Java applets based on user choices in the HTML document

✦ Preprocessing data on the client before submission to a server

✦ Changing content and styles in modern browsers dynamically and instantly in response to user interaction

At the same time, understanding what JavaScript is *not* capable of doing is vital. Scripters waste many hours looking for ways of carrying out tasks for which JavaScript was not designed. Most of the limitations are designed to protect visitors from invasions of privacy or unauthorized access to their desktop computers. Therefore, unless a visitor uses a modern browser and explicitly gives you permission to access protected parts of his or her computer, JavaScript cannot surreptitiously perform any of the following actions:

- Setting or retrieving the browser's preferences settings, main window appearance features, action buttons, and printing
- Launching an application on the client computer
- Reading or writing files or directories on the client or server computer
- Capturing live data streams from the server for retransmission
- Sending secret e-mails from Web site visitors to you

Web site authors are constantly seeking tools that will make their sites engaging (if not "cool") with the least amount of effort. This is particularly true when the task is in the hands of people more comfortable with writing, graphic design, and page layout than with hard-core programming. Not every Webmaster has legions of experienced programmers on hand to whip up some special, custom enhancement for the site. Nor does every Web author have control over the Web server that physically houses the collection of HTML and graphics files. JavaScript brings programming power within reach of anyone familiar with HTML, even when the server is a black box at the other end of a telephone line.

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CHAPTER 2

Authoring Challenges Amid the Browser Wars

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In This Chapter

How leapfrogging browser developments hurt Web developers

Separating the core JavaScript language from document objects

The importance of developing a cross-browser strategy

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If you are starting to learn JavaScript at this point in the brief history of scriptable browsers, you have both a distinct advantage and disadvantage. The advantage is that you have the wonderful capabilities of the latest browser offerings from Netscape and Microsoft at your bidding. The disadvantage is that you have not experienced the painful history of authoring for older browser versions that were buggy and at times incompatible with one another due to a lack of standards. You have yet to learn the anguish of carefully devising a scripted application for the browser version you use only to have site visitors sending you voluminous e-mail messages about how the page triggers all kinds of script errors when run on a different browser brand, generation, or operating system platform.

Welcome to the real world of scripting Web pages in JavaScript. Several dynamics are at work to help make an author's life difficult if the audience for the application uses more than a single type of browser. This chapter introduces you to these challenges before you type your first word of JavaScript code. My fear is that the subjects I raise may dissuade you from progressing further into JavaScript and its powers. But as a developer myself — and as someone who has been using JavaScript since the earliest days of its public prerelease availability — I dare not sugarcoat the issues facing scripters today. Instead, I want to make sure you have an appreciation of what lies ahead to assist you in learning the language. I believe if you understand the big picture of the browser-scripting world as it stands at the start of the year 2001, you will find it easier to target JavaScript usage in your Web application development.

Leapfrog

Browser compatibility has been an issue for authors since the earliest days of rushing to the Web — long before JavaScript. Despite the fact that browser developers and other interested parties voiced their opinions during formative stages of standards development, HTML authors could not produce a document that appeared the same pixel by pixel on all client machines. It may have been one thing to establish a set of standard tags for defining heading levels and line breaks, but it was rare for the actual rendering of content inside those tags to look identical on different brands of browsers.

Then, as the competitive world heated up — and Web browser development transformed itself from a volunteer undertaking into profit-seeking businesses — creative people defined new features and new tags that helped authors develop more flexible and interesting looking pages. As happens a lot in any computer-related industry, the pace of commercial development easily outpaced the studied processing of standards. A browser maker would build a new HTML feature into a browser and only then propose that feature to the relevant standards body. Web authors were using these features (sometimes for prerelease browser versions) before the proposals were published for review.

When the deployment of content depends almost entirely on an interpretive engine on the client computer receiving the data — the HTML engine in a browser, for example — authors face an immediate problem. Unlike a standalone computer program that can extend and even invent functionality across a wide range and have it run on everyone's computer (at least for a given operating system), Web content providers must rely on the functionality built into the browser. This led to questions such as, "If not all browsers coming to my site support a particular HTML feature, then should I apply newfangled HTML features for visitors only at the bleeding edge?" and "If I do deploy the new features, what do I do for those with older browsers?"

Authors who developed pages in the earliest days of the Web wrestled with these questions for many HTML features that we today take for granted. Tables and frames come to mind. Eventually, the standards caught up with the proposed HTML extensions — but not without a lot of author anguish along the way.

The same game continues today. But the field of players has shrunk to two primary players: Netscape and Microsoft. The independent Opera browser runs a distant third in the browser race. For all of these companies, the stakes are higher than ever before — market share, investor return on investment, and so on. Pick a business buzzword, and you'll find a reason behind the competition. What had begun years ago as a friendly game of leapfrog (long before Microsoft even acknowledged the Web) has become an out-and-out war.

Duck and Cover

Sometimes it is difficult to tell from week to week where the battles are being fought. Marketing messages from the combatants turn on a dime. You can't tell if the message is proactive to stress a genuinely new corporate strategy or reactive to match the opponent's latest salvo. The combatants keep touting to each other: "Anything you can do, we can do better!" Or, in a more recent salvo: "We support Web standards!" and "We integrate seamlessly with the operating system!"

If it were a case of Netscape and Microsoft pitching their server and browser software to customers for the creation of monolithic intranets, I could understand and appreciate such efforts. The battle lines would be clearly drawn, and potential customers would base their decisions on unemotional criteria — how well the solution fits the customer's information distribution and connectivity goals. In fact, if you develop for an organization-wide intranet, whose browser choice is dictated by management, you are in luck because authoring for a single browser brand and version is a piece of cake. But you are not in the majority.

As happens in war, civilian casualties mount when the big guns start shooting. The battle lines have shifted dramatically in only a few years. The huge market share territory once under Netscape's command now lies in Microsoft hands (no doubt aided by the millions of America Online users who receive IE as part of the AOL software). While a fair amount of authoring common ground exists between the latest versions of the two browsers, the newest features cause the biggest problems for authors wishing to deploy on both browsers. Trying to determine where the common denominator is may be the toughest part of the authoring job.

Compatibility Issues Today

Allow me to describe the current status of compatibility between Netscape Navigator and Internet Explorer. The discussion in the next few sections intentionally does not get into specific scripting technology very deeply — some of you may know very little about programming. In many chapters throughout Parts III and IV, I offer scripting suggestions to accommodate both browsers.

Separating language from objects

Although early JavaScript authors initially treated client-side scripting as one environment that permitted the programming of page elements, the scene has changed as the browsers have matured. Today, a clear distinction exists between specifications for the core JavaScript language and for the elements you script in a document (for example, buttons and fields in a form).

On one level, this separation is a good thing. It means that one specification exists for basic programming concepts and syntax that enables you to apply the same language to environments that may not even exist today. You can think of the core language as basic wiring. Once you know how electric wires work, you can connect them to all kinds of electrical devices, including some that may not be invented yet. Similarly, JavaScript today is used to wire together page elements in an HTML document. Tomorrow, operating systems could use the core language to enable users to wire together desktop applications that need to exchange information automatically.

At the ends of today's JavaScript wires are the elements on the page. In programming jargon, these items are known as *document objects*. By keeping the specifications for document objects separate from the wires that connect them, you can use other kinds of wires (other languages) to connect them. It's like designing telephones that can work with any kind of wire, including a type of wire that hasn't been invented yet. Today the devices can work with copper wire or fiber optic cable. You get a good picture of this separation in Internet Explorer, whose set of document objects can be scripted with JavaScript or VBScript. They're the same objects, just different wiring.

The separation of core language from document objects enables each concept to have its own standards effort and development pace. But even with recommended standards for each factor, each browser maker is free to extend the standards. Furthermore, authors may have to expend more effort to devise one version of a page or script that plays on both browsers unless the script adheres to a common denominator (or uses some other branching techniques to let each browser run its own way).

Core language standard

Keeping track of JavaScript language versions requires study of history and politics. History covers the three versions developed by Netscape; politics covers Microsoft's versions and the joint standards effort. The first version of JavaScript (in Navigator 2) was Version 1.0, although that numbering was not part of the language usage. JavaScript was JavaScript. Version numbering became an issue when Navigator 3 was released. The version of JavaScript associated with that Navigator version was JavaScript 1.1. As you will learn later in this book, the version number is sometimes necessary in an attribute of the HTML tags that surround a script. The Navigator 4.*x* generation increased the language version one more notch with JavaScript 1.2.

Microsoft's scripting effort contributes confusion for scripting newcomers. The first version of Internet Explorer to include scripting was Internet Explorer 3. The timing of Internet Explorer 3 was roughly coincidental to Navigator 3. But as scripters soon discovered, Microsoft's scripting effort was one generation behind. Microsoft did not license the JavaScript name. As a result, the company called its language JScript. Even so, the HTML tag attribute that requires naming the language of the script inside the tags could be either JScript or JavaScript for Internet Explorer. Internet Explorer 3 could understand a JavaScript script written for Navigator 2.

During this period of dominance by Navigator 3 and Internet Explorer 3, scripting newcomers were often confused because they expected the scripting languages to be the same. Unfortunately for the scripters, there were language features in JavaScript 1.1 that were not available in the older JavaScript version in Internet Explorer 3. Microsoft improved JavaScript in IE3 with an upgrade to the .dll file that gives IE its JavaScript syntax. However, it's hard to know which .dll is installed in any given visitor's IE3. The situation smoothed out for Internet Explorer 4. Its core language was essentially up to the level of JavaScript 1.2 in Navigator 4. Microsoft still officially called the language JScript. Almost all language features that were new in Navigator 4 (including the script tag attribute identifying JavaScript 1.2) were understood when you loaded the scripts into Internet Explorer 4.

While all of this jockeying for JavaScript versions was happening, Netscape, Microsoft, and other concerned parties met to establish a core language standard. The standards body is a Switzerland-based organization originally called the European Computer Manufacturer's Association and now known simply as ECMA (commonly pronounced ECK-ma). In mid-1997, the first formal language specification was agreed on and published (ECMA-262). Due to licensing issues with the JavaScript name, the body created a new name for the language: ECMAScript.

With only minor and esoteric differences, this first version of ECMAScript was essentially the same as JavaScript 1.1 found in Navigator 3. Both Navigator 4 and Internet Explorer 4 supported the ECMAScript standard. Moreover, as happens so often when commerce meets standards bodies, both browsers went beyond the ECMAScript standard. Fortunately, the common denominator of this extended core language is broad, lessening authoring headaches on this front.

IE5 advances to JavaScript version 1.3, while NN6 has the luxury of implementing JavaScript 1.5. In the meantime, the ECMA standard has evolved to a new release that incorporates features found in JavaScript 1.3 and 1.5.

While the core language tends to exhibit the most compatibility between IE and NN, authors must pay attention to which language features are available in the browsers visiting scripted pages. Older browser versions are not equipped to handle newer JavaScript features. But you can sometimes script around these incompatibilities (as described throughout the language reference in Part IV).

Document object model

If NN and IE are close in core JavaScript language compatibility, nothing could be further from the truth when it comes to the document objects. Internet Explorer 3 based its document object model (DOM) on that of Netscape Navigator 2, the same browser level it used as a model for the core language. When Netscape added a couple of new objects to the model in Navigator 3, the addition caused further headaches for neophyte scripters who expected those objects to appear in Internet Explorer 3. Probably the most commonly missed object in Internet Explorer 3 was the image object, which lets scripts swap the image when a user rolls the cursor atop a graphic — *mouse rollovers*, they're commonly called.

In the Level 4 browsers, however, Internet Explorer's document object model jumped way ahead of the object model Netscape implemented in Navigator 4. The two most revolutionary aspects of IE4 were the ability to script virtually every element in an HTML document and the instant reflow of a page when the content changed. This opened the way for HTML content to be genuinely dynamic without requiring the browser to fetch a rearranged page from the server. NN4 implemented only a small portion of this dynamism, without exposing all elements to scripts or reflowing the page. Inline content could not change as it could in IE4. Suffice it to say IE4 was an enviable implementation.

At the same time, a DOM standard was being negotiated under the auspices of the World Wide Web Consortium (W3C). The hope among scripters was that once a standard was in place, it would be easier to develop dynamic content for all browsers that supported the standard.

Netscape took this wish to heart and designed an almost entirely new browser: Navigator 6. It incorporates all of the W3C DOM Level 1 and a good chunk of Level 2. Even though Microsoft participated in the W3C DOM standards development, IE5 implements only some of the W3C DOM standard — in some cases, just enough to allow cross-browser scripting that adheres to the standard. Of course, the standard is not perfect either, and it brings to the DOM several brand-new concepts for scripters. When you take these issues into account, and add to the mix the number of older browsers still in use, scripting HTML objects is touchy business. It requires a good knowledge of compatibility, as described in the object discussions throughout this book.

Cascading Style Sheets

Navigator 4 and Internet Explorer 4 were the first browsers to claim compatibility with a W3C recommendation called *Cascading Style Sheets Level 1 (CSS1)*. This specification customized content in an organized fashion throughout a document (and thus minimized the HTML in each tag); it was also an effort to extend the Web's tradition of publishing static content. As implementations go, NN4 had a lot of rough edges, especially when trying to mix style sheets and tables. But IE4 was no angel, either, especially when comparing the results of style sheet assignments as rendered in the Windows and Macintosh versions of the browser.

CSS Level 2 adds more style functionality to the standard, and both IE5 and NN6 support a good deal of Level 2. Rendering of styled content is more harmonious between both browsers, largely thanks to more stringent guidelines about how styles should render.

JavaScript plays a role in style sheets in IE4+ and NN6 because those browsers' object models permit dynamic modification to styles associated with any content on the page. Style sheet information is part of the object model and is therefore accessible and modifiable from JavaScript.

Dynamic HTML

Perhaps the biggest improvements to the inner workings of the Level 4 browsers from both Netscape and Microsoft revolve around a concept called *Dynamic HTML (DHTML)*. The ultimate goal of DHTML is to enable scripts in documents to control the content, content position, and content appearance in response to user actions. To that end, the W3C organization developed another standard for the precise positioning of HTML elements on a page as an extension of the CSS standards effort. The CSS-Positioning recommendation was later blended into the CSS standard, and both are now part of CSS Level 2. With positioning, you can define an exact location on the page where an element should appear, whether the item should be visible, and what stacking order it should take among all the items that might overlap it.

IE4+ adheres to the positioning standard syntax and makes positionable items subject to script control. Navigator 4 followed the standard from a conceptual point of view, but it implemented an alternative methodology involving an entirely new, and eventually unsanctioned, tag for layers. Such positionable items were scriptable in Navigator 4 as well, although a lot of the script syntax differed from that used in Internet Explorer 4. Fortunately for DHTML authors, NN6, by its adherence to the CSS standard, is more syntactically in line with DHTML style properties employed in IE4+. Cross-browser scripting can be challenging, yet it is certainly possible if you understand the limitations imposed by following a common denominator.

Developing a Scripting Strategy

Browsers representing the latest generation contain a hodgepodge of standards and proprietary extensions. Even if you try to script to a common denominator among today's browsers, your code probably won't take into account the earlier versions of both the JavaScript core language and the browser document object models.

The true challenge for authors these days is determining the audience for which scripted pages are intended. You will learn techniques in Chapter 13 that enable you to redirect users to different paths in your Web site based on their browser capabilities. In Chapter 14, you will discover the alternatives you can take depending on the object model version(s) and specific features you need to support. Each new browser generation not only brings with it new and exciting features you are probably eager to employ in your pages, it also adds to the fragmentation of the audience visiting a publicly accessible page. With each new browser upgrade, fewer existing users are willing to download megabytes of browser merely to have the latest and greatest browser version. For many pioneers — and certainly for most nontechie users — there is an increasingly smaller imperative to upgrade browsers, unless that browser comes via a new computer or operating system upgrade.

As you work your way through this book, know that the common denominator you choose depends on where you draw the line for browser support. Even if you wish to adhere to the absolutely lowest common denominator of scripting, I've got you covered: The Part II tutorial focuses on language and object aspects that are compatible with every version of JavaScript and every document object model.

At the same time, I think it is important for you to understand that the cool application you see running on your latest, greatest browser may not translate to Internet Explorer 3 or Navigator 2. Therefore, when you see a technique that you'd like to emulate, be realistic in your expectations of adapting that trick for your widest audience. Only a good working knowledge of each language term's compatibility and an examination of the cool source code will reveal how well it will work for your visitors.

✦ ✦ ✦

CHAPTER 3

Your First JavaScript Script

✦ ✦ ✦ ✦

In This Chapter

How to choose basic JavaScript authoring tools

How to set up your authoring environment

How to enter a simple script to a Web page

✦ ✦ ✦ ✦

In this chapter, you set up a productive script-writing and previewing environment on your computer, and then you write a simple script whose results you can see in your JavaScript-compatible browser.

Because of differences in the way various personal computing operating systems behave, I present details of environments for two popular variants: Win32 operating systems (Windows 95/98/NT/2000/ME) and the MacOS. For the most part, your JavaScript authoring experience is the same regardless of the operating system platform you use — including Linux or UNIX. Although there may be slight differences in font designs depending on your browser and operating system, the information remains the same. Most illustrations of browser output in this book are made from the Win32 version of Internet Explorer 5.*x*. If you run another browser or version, don't fret if every pixel doesn't match with the illustrations in this book.

The Software Tools

The best way to learn JavaScript is to type the HTML and scripting code into documents in a text editor. Your choice of editor is up to you, although I provide you with some guidelines for choosing a text editor in the next section.

Choosing a text editor

For the purposes of learning JavaScript in this book, avoid WYSIWYG (What You See Is What You Get) Web page authoring tools, such as FrontPage and DreamWeaver, for now. These tools certainly will come in handy afterward when you can productively use those facilities for molding the bulk of your content and layout. But the examples in this book focus more on script content (which you must type in anyway), so there isn't much HTML that you have to type. Files for all complete Web page listings (except for the tutorial chapters) also appear on the companion CD-ROM.

An important factor to consider in your choice of editor is how easy it is to save standard text files with an .html filename extension. In the case of Windows, any program that not only saves the file as text by default but also enables you to set the extension to .htm or .html prevents a great deal of problems. If you use Microsoft Word, for example, the program tries to save files as binary Word files — something that no Web browser can load. To save the file initially as a text or .html extension file requires mucking around in the Save As dialog box. This requirement is truly a nuisance.

Nothing's wrong with using bare-essentials text editors. In Windows, that includes the WordPad program or a more fully featured product such as the shareware editor called TextPad. For the MacOS, SimpleText is also fine — although the lack of a search-and-replace function may get in the way when you start managing your Web site pages. A favorite among Mac HTML authors and scripters is BBEdit (Bare Bones Software), which includes a number of useful aids for scripters, such as optional line numbers (which help in debugging JavaScript).

Choosing a browser

The other component that is required for learning JavaScript is the browser. You don't have to be connected to the Internet to test your scripts in the browser. You can perform all testing offline. This means you can learn JavaScript and create cool, scripted Web pages with a laptop computer — even on a boat in the middle of an ocean.

The browser brand and version you use is up to you. Until you reach Chapter 12, virtually everything you script will run in every scriptable browser. For page development, however, you want a more modern browser, such as IE5.*x* or NN6. And to derive the most benefit from the examples scattered throughout this book, you should have the latest versions of IE and NN available for your primary operating system.

Note

Many example listings in this book demonstrate language or document object model (DOM) features that work on only specific browsers and versions. Check the compatibility listing for that language or DOM feature to make sure you use the right browser to load the page.

Setting Up Your Authoring Environment

To make the job of testing your scripts easier, make sure that you have enough free memory in your computer to let both your text editor and browser run simultaneously. You need to be able to switch quickly between editor and browser as you experiment and repair any errors that may creep into your code. The typical workflow entails the following steps:

1. Enter HTML and script code into the source document in the text editor.
2. Save the latest version to disk.
3. Switch to the browser.

4. Do one of the following: If this is a new document, open the file via the browser's Open menu. If the document is already loaded, reload the file into the browser.

Steps 2 through 4 are the key ones you will follow frequently. I call this three-step sequence the save-switch-reload sequence. You will perform this sequence so often as you script that the physical act quickly will become second nature to you. How you arrange your application windows and effect the save-switch-reload sequence varies according to your operating system.

Windows

You don't have to have either the editor or browser window maximized (at full screen) to take advantage of them. In fact, you may find them easier to work with if you adjust the size and location of each window so both windows are as large as possible while still enabling you to click a sliver of the other's window. Or, you can leave the taskbar visible so you can click the desired program's button to switch to its window (Figure 3-1). A monitor that displays more than 640 × 480 pixels certainly helps in offering more screen real estate for the windows and the taskbar.

In practice, however, the Windows Alt+Tab task-switching keyboard shortcut makes the job of the save-switch-reload steps outlined earlier a snap. If you run Windows and also use a Windows-compatible text editor (which more than likely has a Ctrl+S file-saving keyboard shortcut), you can effect the save-switch-reload sequence from the keyboard all with the left hand: Ctrl+S (save the source file); Alt+Tab (switch to the browser); Ctrl+R (reload the saved source file).

As long as you keep switching between the browser and text editor via Alt+Tab task switching, either program is always just an Alt+Tab away.

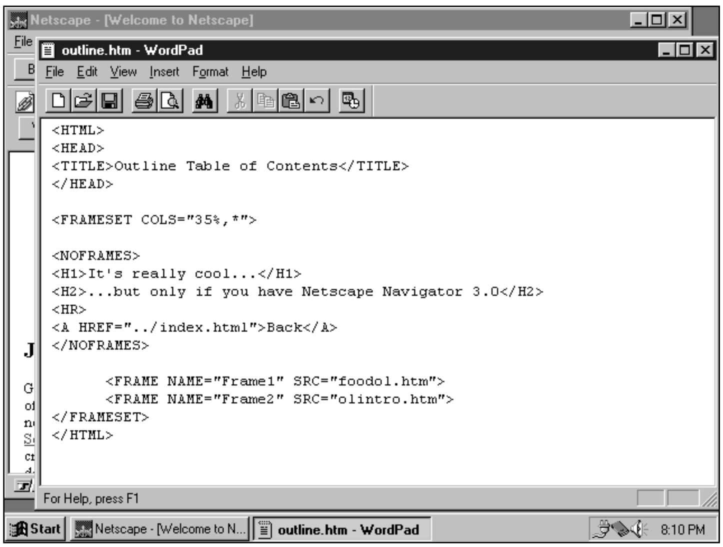

Figure 3-1: Editor and browser window arrangement in Windows 98

MacOS

If you expand the windows of your text editor and browser to full screen, you have to use the rather inconvenient Application menu (right-hand icon of the menu bar) to switch between the programs. A better method is to adjust the size and location of the windows of both programs so they overlap, while allowing a portion of the inactive window to remain visible (Figure 3-2). That way, all you have to do is click anywhere on the inactive window to bring its program to the front.

With this arrangement, the save-switch-reload sequence is a two-handed affair:

1. Press ⌘-S (save the source file).
2. Click in the browser window.
3. Press ⌘-R (reload the saved source file).

To return to editing the source file, click any exposed part of the text editor's window.

A useful utility called *Program Switcher* (`http://www.kamprath.net/claireware`) puts the Alt+Tab program switching functionality on the Mac keyboard. It is more convenient than using the Application menu.

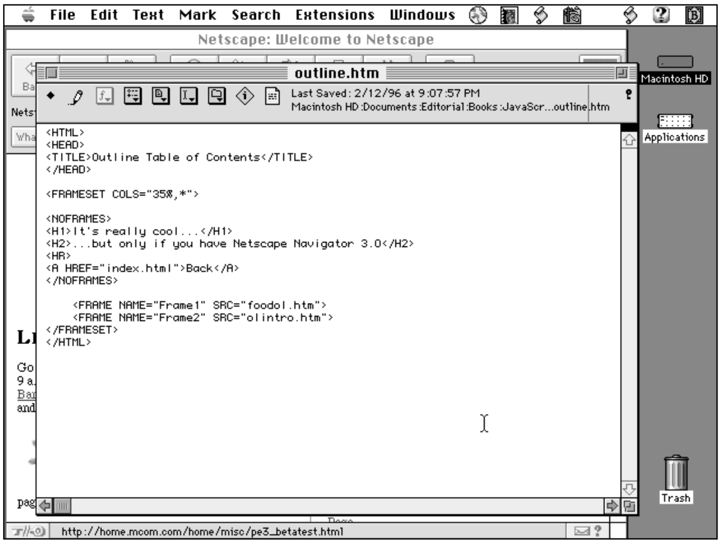

Figure 3-2: Editor and browser window arrangement on the Macintosh screen

Reloading issues

For the most part, a simple page reload is enough to let you test a revised version of a script right away. But sometimes the browser's cache (with its default settings) can preserve parts of the previous page's attributes when you reload, even though you have changed the source code. To perform a more thorough reload, hold down the Shift key while clicking the browser's Reload/Refresh button. Alternatively, you can turn off the browser's cache in the preferences area, but that setting may negatively affect the overall performance of the browser during your regular Web surfing.

What Your First Script Will Do

For the sake of simplicity, the kind of script you look at in the next section is the kind that runs automatically when the browser loads the HTML page. Although all scripting and browsing work done here is offline, the behavior of the page is identical if you place the source file on a server and someone accesses it via the Web.

Figure 3-3 shows the page as it appears in the browser after you're finished. (The exact wording differs slightly if you run your browser on an operating system platform other than Win32 or if you use a browser other than Internet Explorer.) The part of the page that is defined in regular HTML contains nothing more than an <H1>-level header with a horizontal rule under it. If someone does not use a JavaScript-equipped browser, all he or she sees is the header and horizontal rule (unless that person has a truly outmoded browser, in which case some of the script words appear in the page).

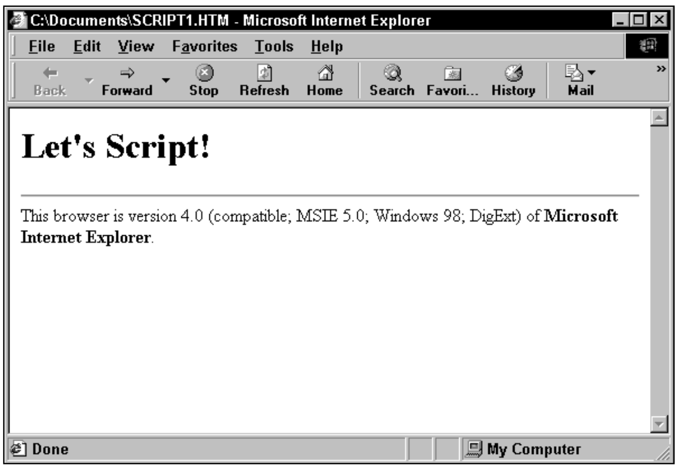

Figure 3-3: The finished page of your first JavaScript script

Below the rule, the script displays plain body text that combines static text with information about the browser you use to load the document. The script writes a stream of HTML information to the browser, including a tag to render a portion of the information in boldface. Even though two lines of code are writing information to the page, the result is rendered as one line — just as it is when all the text is hard-coded in HTML.

Entering Your First Script

It's time to start creating your first JavaScript script. Launch your text editor and browser. If your browser offers to dial your Internet service provider (ISP) or begins dialing automatically, cancel or quit the dialing operation. If the browser's Stop button is active, click it to halt any network searching it may try to do. You may receive a dialog box message indicating that the URL for your browser's home page (usually the home page of the browser's publisher — unless you've changed the settings) is unavailable. That's fine. You want the browser open, but you shouldn't be connected to your ISP. If you're automatically connected via a local area network in your office or school, that's also fine. However, you don't need the network connection for now. Next, follow these steps to enter and preview your first JavaScript script:

1. Activate your text editor and create a new, blank document.
2. Type the script into the window exactly as shown in Listing 3-1.

Listing 3-1: **Source Code for script1.htm**

```
<HTML>
<HEAD>
<TITLE>My First Script</TITLE>
</HEAD>

<BODY>
<H1>Let's Script...</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers
document.write("This browser is version " + navigator.appVersion)
document.write(" of <B>" + navigator.appName + "</B>.")
// end script hiding -->
</SCRIPT>
</BODY>
</HTML>
```

3. Save the document with the name `script1.htm`. (This is the lowest common denominator filenaming convention for Windows 3.1 — feel free to use an .html extension if your operating system allows it.)
4. Switch to your browser.

5. Choose Open (or Open File on some browsers) from the File menu and select `script1.htm`. (On some browsers, you have to click a Browse button to reach the File dialog box.)

If you typed all lines as directed, the document in the browser window should look like the one in Figure 3-3 (with minor differences for your computer's operating system and browser version). If the browser indicates that a mistake exists somewhere as the document loads, don't do anything about it for now. (Click the OK button if you see a script error dialog box.) Let's first examine the details of the entire document so you understand some of the finer points of what the script is doing.

Examining the Script

You do not need to memorize any of the commands or syntax discussed in this section. Instead, relax and watch how the lines of the script become what you see in the browser. In Listing 3-1, all of the lines up to the `<SCRIPT>` tag are very standard HTML. Your JavaScript-enhanced HTML documents should contain the same style of opening tags you normally use.

The <SCRIPT> tag

Any time you include JavaScript verbiage in an HTML document, you must enclose those lines inside a `<SCRIPT>...</SCRIPT>` tag pair. These tags alert the browser program to begin interpreting all the text between these tags as a script. Because other scripting languages (such as Microsoft's VBScript) can take advantage of these script tags, you must specify the precise name of the language in which the enclosed code is written. Therefore, when the browser receives this signal that your script uses the JavaScript language, it employs its built-in JavaScript interpreter to handle the code. You can find parallels to this setup in real life: If you have a French interpreter at your side, you need to know that the person with whom you're conversing also knows French. If you encounter someone from Russia, the French interpreter can't help you. Similarly, if your browser has only a JavaScript interpreter inside, it can't understand code written in VBScript.

Now is a good time to instill an aspect of JavaScript that will be important to you throughout all your scripting ventures: JavaScript is case-sensitive. Therefore, you must enter any item in your script that uses a JavaScript word with the correct uppercase and lowercase letters. Your HTML tags (including the `<SCRIPT>` tag) can be in the case of your choice, but everything in JavaScript is case-sensitive. When a line of JavaScript doesn't work, look for the wrong case first. Always compare your typed code against the listings printed in this book and against the various vocabulary entries discussed throughout it.

A script for all browsers

The next line after the `<SCRIPT>` tag in Listing 3-1 appears to be the beginning of an HTML comment tag. It is, but the JavaScript interpreter treats comment tags in a special way. Although JavaScript dutifully ignores a line that begins with an HTML comment start tag, it treats the next line as a full-fledged script line. In other words, the browser begins interpreting the next line after a comment start tag. If you want to put a comment inside JavaScript code, the comment must start with a double slash (`//`). Such a comment may go near the end of a line (such as after a JavaScript statement that is to be interpreted by the browser) or on its own line. In fact, the latter case appears near the end of the script. The comment line starts with two slashes.

Step back for a moment and notice that the entire script (including comments) is contained inside a standard HTML comment tag (`<!--comment-->`). The value of this containment is not clear until you see what happens to your scripted HTML document in a non-JavaScript-compatible browser. Such a browser blows past the `<SCRIPT>` tag as being an advanced tag it doesn't understand. But it treats a line of script as regular text to be displayed in the page. If you enclose script lines between HTML comment tags, most older browsers don't display the script lines. Still, some old browsers can get tripped up and present some ugliness because they interpret any > symbol (not the whole `-->` symbol) as an end-of-comment character. Figure 3-4 shows the results of your first script when viewed in a now obsolete version of the America Online Web browser (version 2.5 for Windows).

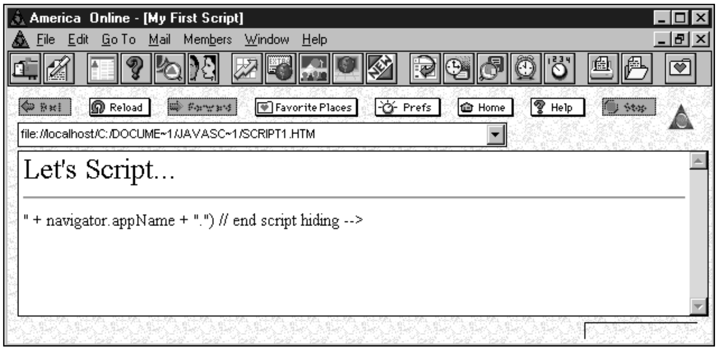

Figure 3-4: If you enclose script lines between HTML comments, the entire script is ignored by most, but not all, non-JavaScript browsers. Here, an old America Online browser shows part of the script anyway.

Remember, too, that some users don't have access to modern browsers or graphical browsers. (They use the Lynx text-oriented UNIX Web reader software or Lynx-like browsers in handheld computers.) By embracing your script lines within these comments, your Web pages don't look completely broken in relatively modern, non-JavaScript browsers.

Note Notice that the comment lines that shield older browsers from your scripts go inside the `<SCRIPT>...</SCRIPT>` tags. Do not put these comment lines above the `<SCRIPT>` tag or below the `</SCRIPT>` tag and expect them to work.

One more issue about the script-hiding comment lines in this book. To save space on the page, most examples do not have comment lines inserted in them. But as you can see in the full-fledged application examples from Chapters 49 through 57, the comment lines are where they should be. For any pages you produce for public consumption, always encase your script lines inside these comments.

Displaying some text

Both script lines in Listing 3-1 use one of the possible actions a script can ask a document to perform (`document.write()`, meaning display text in the current document). You learn more about the `document` object in Chapter 18.

Whenever you ask an object (a document in this case) to perform a task for you, the name of the task is always followed by a set of parentheses. In some cases — the `write()` task, for example — JavaScript needs to know what information it should act on. That information (called a *parameter*) goes inside parentheses after the name of the task. Thus, if you want to write the name of the first U.S. president to a document, the command to do so is

```
document.write("George Washington")
```

The line of text that the script writes starts with some static text (`"This browser is version"`) and adds some evaluated text (the version of the browser) to it. The writing continues with more static text that includes an HTML tag (`" of <B>"`), more evaluated text (the name of the browser application), and an HTML closing tag and the sentence's period (`"</B>."`). JavaScript uses the plus symbol (+) to join (*concatenate*) text components into a larger, single string of text characters to be written by the document. Neither JavaScript nor the + symbol knows anything about words and spaces, so the script is responsible for making sure that the proper spaces are passed along as part of the parameters. Notice, therefore, that an extra space exists after the word "version" in the first `document.write()` parameter, and extra spaces exist on both sides of "of" in the second `document.write()` parameter.

To fetch the information about the browser version and name for your parameters, you call upon JavaScript to extract the corresponding properties from the `navigator` object. You extract a property by appending the property name to the object name (`navigator` in this case) and separating the two names with a period. If you're searching for some English to mentally assign to this scheme as you read it, start from the right side and call the right item a property "of" the left side: the `appVersion` property of the `navigator` object. This dot syntax looks a great deal like the `document.write()` task, but a property name does not have parentheses after it. In any case, the reference to the property in the script tells JavaScript to insert the value of that property in the spot where the call is made. For your first attempt at the script, JavaScript substitutes the internal information about the browser as part of the text string that gets written to the document.

Have Some Fun

If you encounter an error in your first attempt at loading this document into your browser, go back to the text editor and check the lines of the script section against Listing 3-1, looking carefully at each line in light of the explanations. There may be a single character out of place, a lowercase letter where an uppercase one belongs, or a quote or parenthesis missing. Make necessary repairs, switch to your browser, and click Reload.

To see how dynamic the script in `script1.htm` is, go back into the text editor and replace the word “browser” with “client software.” Save, switch, and reload to see how the script changes the text in the document. Feel free to substitute other text for the quoted text in the `document.write()` statement. Or, add more text with additional `document.write()` statements. The parameters to `document.write()` are HTML text, so you can even write `"<BR>"` to make a line break. Always be sure to save, switch, and reload to see the results of your handiwork.

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P A R T

II

JavaScript Tutorial—Summary

The JavaScript tutorial is intended for the newcomer who has little or no programming experience. But even experienced programmers who have not worked in an object-based environment will find many of the tutorial chapters helpful in grasping basic concepts about the ways scripts interact with HTML elements on a page. In fact, an experienced programmer may have to "unlearn" some concepts while making the transition to a looser, interpreted environment in contrast to the rigorous discipline required in other environments.

That's not to say that JavaScript is anything less than "real" programming. As several chapters in this tutorial prove, the JavaScript language provides the same fundamental programming facilities that exist in most heavy-duty languages. At the same time, however, the language is simplified and forgiving in an attempt to attract a wider audience than may gravitate to languages such as C, C++, or Java.

A significant challenge in molding a tutorial about client-side JavaScript is accommodating the wide range of document object models that are spread among numerous browser brands, operating systems, and versions. Despite the large number of object model permutations implemented in the browsers that visit a public Web site, the earliest object model, as implemented in the first scriptable browsers, serves as a convenient and easily digestible common denominator for learning the basics. Therefore, the tutorial focuses most of its energy on the first-generation object model. Everything you learn from the tutorial is immediately applicable to the latest browsers. This knowledge also serves as an excellent foundation for understanding newer object model concepts, whether your development target is just one browser type for a corporate intranet or any browser "out there" surfing the Web. After you have been through the tutorial, Chapter 14's overview of the branches of the object model evolutionary tree becomes crystal clear.

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In This Part

✦ ✦ ✦ ✦

On the CD-ROM

The following sections provide brief summaries of the topics covered in the tutorial chapters found on the CD-ROM in Acrobat format. Each of the chapters ends with exercises, whose answers are also on the CD-ROM in Appendix C.

Chapter 4. Browser and Document Objects

One of the best ways to understand why JavaScript is so valuable on the client computer is to see how scripts add life to otherwise flat HTML documents. Popular categories of scripting implementations include interactive user interfaces, instantaneous form validation, small data collection lookups (the data is embedded in the document for JavaScript to search through), multiple frame management, and, in more recent browsers, dynamic designs that allow dragging elements around the page. At the same time, it is important to recognize when JavaScript is not the preferred technology.

This chapter introduces the concept of a document object model (DOM). You can visualize the object model as a kind of road map to the page elements that become objects in the browser's memory as the page loads into the browser. Figure II-1 is a roadmap for a hypothetical Web page that contains one of each kind of element recognized as an object in the lowest common denominator model. The containment notion conveyed by the grey boxes reinforces the way script statements reference objects, starting with the `window` object at the top of the hierarchy. For example, to address a text box, you assemble a reference like this: `window.document.formName.textBoxName`.

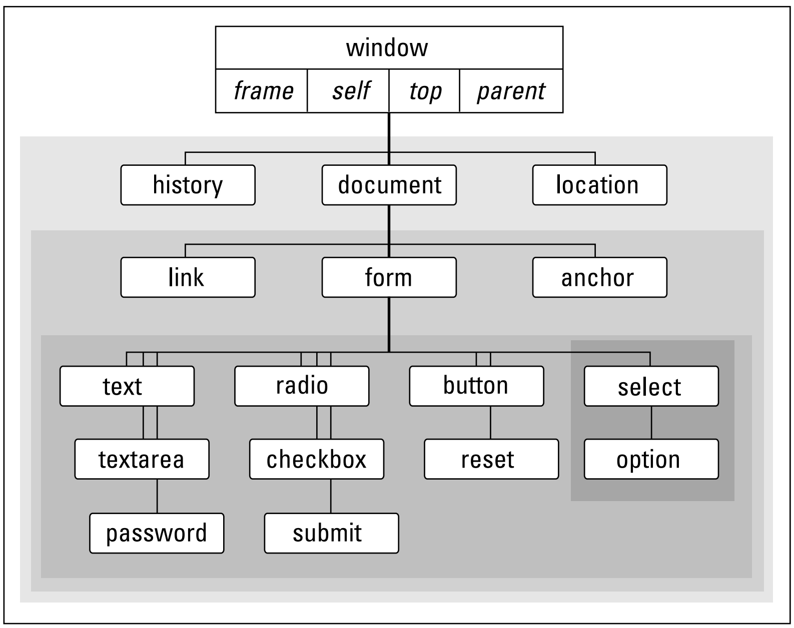


Figure II-1: Map of the lowest common denominator document object model

After a discussion of how "dot syntax" works, the chapter ends with an introduction to the way objects distinguish themselves from each other by way of their properties, methods, and event handlers. An object's properties are like adjectives that describe various characteristics of the object. Methods are like an object's verbs, which provide scripts with ways to ask objects to do something. Event handlers denote the kinds of user and system actions (such as clicking on a button) that trigger script statements to run. Once you know an object's properties, methods, and event handlers, you know everything your scripts can do to make it "dance."

Chapter 5. Scripts and HTML Documents

This chapter helps you begin to see the physical relationships between blocks of scripts and the rest of the tags in an HTML document. By and large, scripts go inside a set of `<SCRIPT>` tags. These tags tell the HTML rendering engines of scriptable browsers to ignore the content between the start and end tags. Such script blocks can occur inside the HEAD or BODY elements, or both, depending on what your scripts have to do in the page. But non-scriptable browsers do not recognize the `<SCRIPT>` tag and try to render the scripts. To avoid this possibility, surround the content of `<SCRIPT>` tags with HTML comment symbols. Scriptable browsers can still run the scripts, but most non-scriptable browsers skip over the commented material.

Script statements — each line of script code is a statement — run either immediately or in deferred mode. An immediate script statement is one that runs while the page loads into the browser. Such a statement might use scripting to generate part of the page's content dynamically (as the script in Chapter 3 does). Most scripts, however, load into the browser's memory and sit quietly until some user or system action triggers those statements.

While you develop scripts — and especially while you learn JavaScript — script errors are bound to occur. It is important to view the messages associated with an error. In this chapter you learn the ways various browsers and browser generations let you view error messages.

Chapter 6. Programming Fundamentals, Part I

For the next two chapters, you momentarily leave the browser world, and dive into vital concepts that the JavaScript language shares with just about every programming language. The terminology may be foreign at first (if you are a non-programmer), but you will use this knowledge virtually every day that you apply JavaScript to your pages.

First is the simple idea that any piece of information — a string of text characters, a number, a special indicator of "true" or "false" — is a *value*. To simplify a script statement's interaction with values, you typically assign each value to a *variable*. In the JavaScript world, a variable is simply a name (identifier) that makes it easy to preserve a value in memory while other statements run.

One of the most important concepts to master is that a script statement usually consists of one or more *expressions* — either a value or combination of values, such as `3 + 4`. Each expression is said to *evaluate* to some value. The expression `3+4` evaluates to `7`; if the value `3` is assigned to a variable named `a`, and `4` is assigned to a variable named `b`, then the expression `a+b` also evaluates to `7`.

To help you experiment with values, expressions, and expression evaluation, Chapter 6 introduces you to a tool called *Evaluator Jr.*, a simplified version of a more powerful authoring and learning tool found in Chapter 13. You can type an expression into one field on Evaluator Jr.'s page, and immediately see the value to which it evaluates.

Every value is of some *type*, such as a number or string of text characters. While so-called data typing is not as rigid in JavaScript as it is in other languages, it is sometimes necessary to convert a value of one type to another. Thus, the chapter demonstrates simple conversions between number and string values. You then meet basic *operators* for simple arithmetic and comparisons.

Chapter 7. Programming Fundamentals, Part II

The tour of programming fundamentals continues with ways to influence the sequence that the browser follows to execute statements in a script. A few approaches to these *control structures* allow a script to follow different paths based on decisions (using the comparison operators shown in Chapter 6) or on criteria for repetition (such as inspecting each character of a text string). You learn about `if` constructions and simple repeat loops.

Next you learn how to gather a related sequence of script statements into a group called a *function*. A function contains the statements of a deferred script. Functions are most commonly invoked by user actions (from object model event handlers), but they are also invoked by statements in other functions. You can also hand off values from one function to another in the form of *parameters* to a function.

To round out the fundamentals discussion, this chapter introduces the very important concept of *arrays*. An array is an organized list of values (visualize a one-column spreadsheet). You can use arrays to keep a set of related values together, very commonly as a way to facilitate looking for a value within a collection (with the help of the repeat loops you learned earlier). Arrays also play a role in related groups of objects in the document object model, as you learn in subsequent chapters.

Chapter 8. Window and Document Objects

Starting with Chapter 8, you come back to the browser objects, and begin to apply your working knowledge of the core JavaScript language to understanding the way scripts work with objects in a document. This chapter focuses on object high up the hierarchy shown earlier in Figure II-1.

At the top of the hierarchy is the `window` object, which represents the window created by the browser program. You can also use scripts to create subwindows. For the tutorial, you learn about setting text in the window's status bar, three types of dialog boxes, and how to trigger scripts when a pages finishes loading all of its content into the window.

The location and history objects are not quite as concrete as the window object. The location object is the more important of the two, because it contains information about the URL (and various pieces of the URL) of the page currently in the window. For privacy and security reasons, scripts have very little access to the browser's history, but the history object provides limited script access to actions that simulate the Back and Forward navigation buttons.

A pivotal object is the document. It is the master container of all content that arrives with the page. Scripts reference elements on the page by way of the document object, such that the term, document, becomes part of the reference to an element. You can use one of the document object's methods to generate content on the page as it loads (as demonstrated in Chapter 3).

Chapter 9. Forms and Form Elements

Most interactive Web pages contain forms, which provide text boxes to fill in, lists to choose from, and buttons to click. The form, itself, is an object. Many of its properties reflect the attributes you typically assign to a form, such as METHOD, ACTION, and TARGET. Thus, scripts can change the values of those attributes based on other user settings in the form.

A form object is also a container. Nested inside are the form controls with which users interact. In this chapter you meet the most common properties and event handlers of text fields, buttons, radio buttons, checkboxes, and SELECT elements. Because form control interaction so often triggers script execution, you learn how to pass information from the form to a function invoked by a control's event handler.

While you're on the subject of forms, you see the basics of client-side validation of data to assure that form settings or text in a desired format get submitted to the server. Client-side validation is much faster and more user-friendly than having the server return the form for the user to complete.

Chapter 10. Strings, Math, and Dates

In Chapter 10, you come back momentarily to the core JavaScript language to learn about a few objects that many of your document object scripts use to manipulate form or other kinds of values. You see more and more how the core JavaScript language and document object models work together to produce your applications.

A string object represents a sequence of text characters. Script statements often need to assemble longer strings out of smaller components. Operators (introduced back in Chapter 6) play a role. But a string object also has several methods available to simplify the copying of sections of a string or finding out if a longer string contains a shorter one (for example, whether a text box for an e-mail address contains an @ character).

The JavaScript Math object is a resource that is always available to any script statement. Use the object's properties to get copies of constant values, such as pi; use its methods for operations such as getting the absolute value of a number or raising a number to a power.

Calculations involving dates and times take advantage of a huge assortment of methods associated with the Date object. With the help of this object, your scripts can grab a snapshot of the date and time of the client's system clock or create a date object for dates in the past or future. Want to display on your page how many shopping days remain until next Christmas? That's one application for `Date` object calculations.

Chapter 11. Scripting Frames and Multiple Windows

One of the strengths of a scriptable browser is that scripts facilitate the management of multiple frames far better than server-based applications. For example, you can script a link in one frame of a three-frame window to change the documents loaded into the other two frames. Or you can use one static frame to preserve accumulated data from pages that come and go from one of the other frames.

The trickiest part of managing frames is knowing how script statements refer to other frames and elements in those other frames. In this chapter you learn the three possible relationships among a parent (that is, the framesetting document) and two or more child frames. Depending on which document contains the script and which document contains the element to reference, the format of the reference needs to be assembled properly.

Some of the same techniques apply to managing multiple windows. Not only are multiple windows more difficult to manage from a user interface point of view, scripting them also presents several challenges. In this lesson you begin to appreciate the issues involved.

Chapter 12. Images and Dynamic HTML

In the final chapter of the tutorial, you travel beyond the confines of the lowest common denominator to embrace concepts that work with a lot of browsers and can greatly improve the user experience on your page.

At the core is the image object. The image object has a split personality. On one side is the object represented in a page by its `<IMG>` tag; on the other side is an image object in memory that allows scripts to preload images invisibly into the browser's memory cache. Through these two mechanisms, scripts can pre-cache an alternate version of, say, an iconic button so that when the user rolls the mouse atop the normal version, a script instantly swaps the visible image with a preloaded one. Here you learn how to implement simple mouse rollovers with pre-cached images.

With even more advanced browsers, particularly those that reflow their content automatically, scripts make pages far more dynamic. Not only can elements be dragged around the page, but table rows can be added or deleted, and entire sections of pages can be inserted or removed. These are just the tip of the iceberg of Dynamic HTML.

✦ ✦ ✦

CHAPTER 4

Browser and Document Objects

In This Chapter

What client-side scripts do

What happens when a document loads

How the browser creates objects

How scripts refer to objects

How to find out what is scriptable in an object

This chapter marks the first of nine tutorial chapters (which compose Part II) tailored to Web authors who have at least basic grounding in HTML concepts. In this chapter, you see several practical applications of JavaScript and begin to see how a JavaScript-enabled browser turns familiar HTML elements into objects that your scripts control. Most of what you learn throughout the tutorial can be applied to all scriptable browsers (back to Navigator 2 and Internet Explorer 3). I clearly label a handful of fancy features that require recent browser versions.

Scripts Run the Show

If you have authored Web pages with HTML, you are familiar with how HTML tags influence the way content is rendered on a page when viewed in the browser. As the page loads, the browser recognizes angle-bracketed tags as formatting instructions. Instructions are read from the top of the document downward, and elements defined in the HTML document appear onscreen in the same order in which they appear in the document's source code. As an author, you do a little work one time and up front — adding the tags to text content — and the browser does a lot more work every time a visitor loads the page into a browser.

Assume for a moment that one of the elements on the page is a text input field inside a form. The user is supposed to enter some text in the text field and then click the Submit button to send that information back to the Web server. If that information must be an Internet e-mail address, how do you ensure the user includes the "@" symbol in the address?

One way is to have a Common Gateway Interface (CGI) program on the server inspect the submitted form data after the user clicks the Submit button and the form information is transferred to the server. If the user omits or forgets the "@" symbol, the CGI program serves the page back to the browser — but this time with an instruction to include the symbol in the address. Nothing is wrong with this exchange, but it means a significant delay for the user to find out that the address does not contain the crucial symbol. Moreover, the Web server has to expend some of its resources to perform the validation and communicate back to the visitor. If the Web site is a busy one, the server may try to perform hundreds of these validations at any given moment, probably slowing the response time to the user even more.

Now imagine that the document containing that text input field has some intelligence built into it that makes sure the text field entry contains the "@" symbol before ever submitting one bit (literally!) of data to the server. That kind of intelligence would have to be embedded in the document in some fashion — downloaded with the page's content so it can stand ready to jump into action when called upon. The browser must know how to run that embedded program. Some user action must start the program, perhaps when the user clicks the Submit button. If the program runs inside the browser and detects a lack of the "@" symbol, an alert message should appear to bring the problem to the user's attention. The same program also should be capable of deciding if the actual submission can proceed or if it should wait until a valid e-mail address is entered into the field.

This kind of pre-submission data entry validation is but one of the practical ways JavaScript adds intelligence to an HTML document. Looking at this example, you might recognize that a script must know how to look into what is typed in a text field; a script must also know how to let a submission continue or how to abort the submission. A browser capable of running JavaScript programs conveniently treats elements such as the text field as *objects*. A JavaScript script controls the action and behavior of objects — most of which you see on the screen in the browser window.

JavaScript in Action

By adding lines of JavaScript code to your HTML documents, you control onscreen objects in whatever way your applications require. To give you an idea of the scope of applications you can create with JavaScript, I show you several applications on the CD-ROM (in the folders for Chapters 49 through 57). I strongly suggest you open the applications and play with them in your browser as they are described in the next several pages.

Interactive user interfaces

HTML hyperlinks do a fine job, but they're not necessarily the most engaging way to present a table of contents for a large site or document. With a bit of JavaScript, you can create an interactive, expandable table of contents listing that displays the hierarchy of a large body of material (see Figure 4-1). Just like the text listings (or *tree views*) in operating system file management windows, the expandable table of contents lets the user see as much or as little as possible while displaying the big picture of the entire data collection.

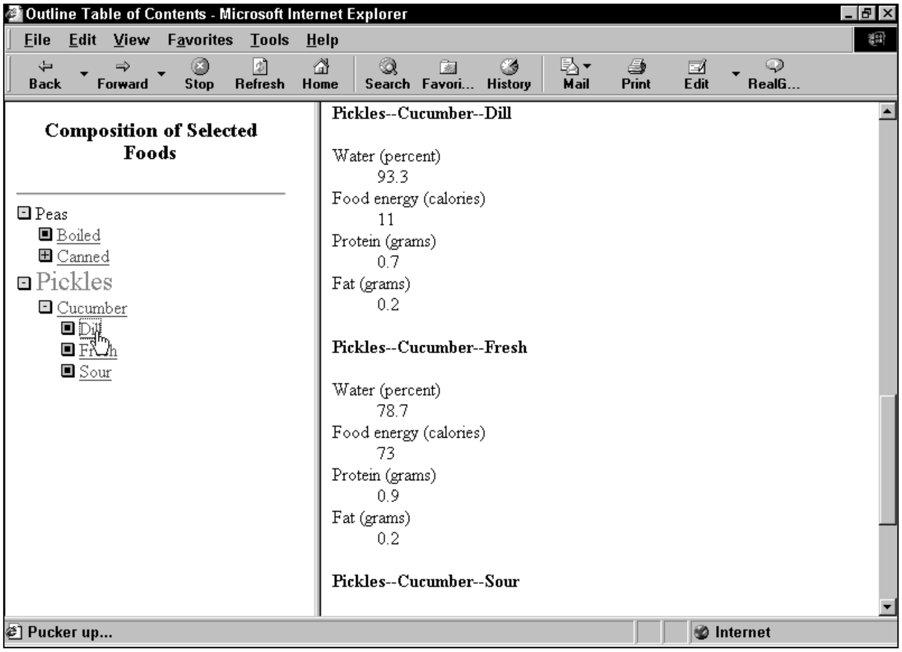


Figure 4-1: An expandable table of contents

Click a gray widget icon to expand the items underneath. An endpoint item has an orange and black widget icon. Items in the outline can be links to other pages or descriptive information. You also maintain the same kind of font control over each entry, as expected from HTML. While such outlines have been created with server CGIs in the past, the response time between clicks is terribly slow. By placing all of the smarts behind the outline inside the page, it downloads once and runs quickly after each click.

As demonstrated in the detailed description of this outline in the application Outline-Style Table of Contents (Chapter 52 on the CD-ROM), you can implement the scriptable workings within straight HTML for Navigator 2 and 3 — although limitations in page rendering require rewriting the page after each click. Internet Explorer 4+ and Navigator 6+ automatically reflow the page in response to changes of content, turning this outliner into a truly dynamic HTML application. Either way you do it, the quick response and action on the screen makes for a more engaging experience for Web surfers who are in a hurry to scout your site.

Small data lookup

A common application on the Web is having a CGI program present a page that visitors use to access large databases on the server. Large data collections are best left on the server where search engines and other technologies are the best fit. But if your page acts as a *front end* to a small data collection lookup, you can consider embedding that data collection in the document (out of view) and letting JavaScript act as the intermediary between user and data.

I do just that in a Social Security prefix lookup system shown in Figure 4-2. I convert a printed table of about 55 entries into a JavaScript list that occupies only a few hundred bytes. When the visitor types the three-character prefix of his or her Social Security number into the field and clicks the Search button, a script behind the scenes compares that number against the 55 or so ranges in the table. When the script finds a match, it displays the corresponding state of registration in a second field.

If the application were stored on the server and the data stored in a server database, each click of the Search button would mean a delay of many seconds as the server processed the request, got the data from the database, and reformulated the page with the result for the user. Built instead as a JavaScript application, once the page downloads the first time, scripts perform all lookups instantaneously.

Forms validation

I've already used data entry form validation as an example of when JavaScript is a good fit. In fact, the data entry field in the Social Security lookup page (see Figure 4-2) includes scripting to check the validity of the entered number. Just as a CGI program for this task has to verify that the entry is a three-digit number, so, too, must the JavaScript program verify the entered value. If a mistake appears in the entry — perhaps a finger slips and hits a letter key — the visitor is advised of the problem and directed to try another entry. The validation script even preselects the text in the entry field for the visitor so that typing a new value replaces the old one.

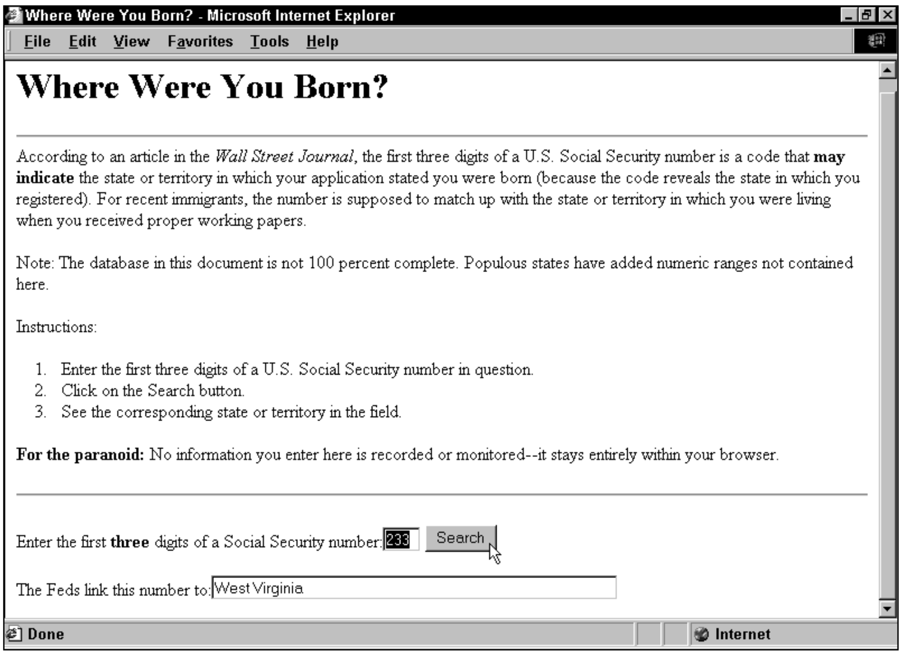


Figure 4-2: Looking up data in a small table

Interactive data

JavaScript opens opportunities for turning static information into interactive information. Figure 4-3 shows a graphical calculator for determining the value of an electrical component (called a *resistor*) whose only markings are colored bars.

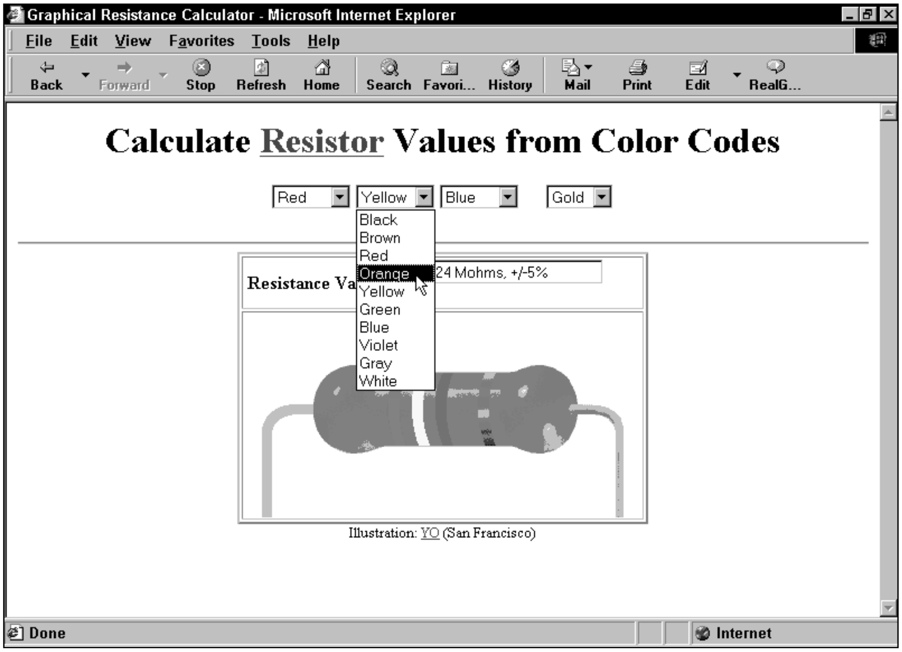


Figure 4-3: An interactive graphical calculator

The image in the bottom half of the page is composed of seven images in vertical slices all bunched up against each other. Four slices display the colored bands, while the remaining three slices contain the ends of the resistor and the spacer between groups of bands. As the visitor selects a color from a pop-up list near the top, the associated image slice changes to the selected color and the resistance value is calculated and displayed.

Again, once the page is loaded, response time is instantaneous. Conversely, a server-based version of this calculator would take many seconds between color changes. Moreover, JavaScript provides the power to preload all possible images into the browser cache while the main page loads. Therefore, with only a slight extra delay to download all images with the page, no further delay occurs when a visitor chooses a new color. Not only is the application practical (for its intended audience), but it's just plain fun to play with.

Multiple frames

While frames are the domain of HTML, they suddenly become more powerful with some JavaScript behind them. The Decision Helper application shown in Figure 4-4 takes this notion to the extreme.

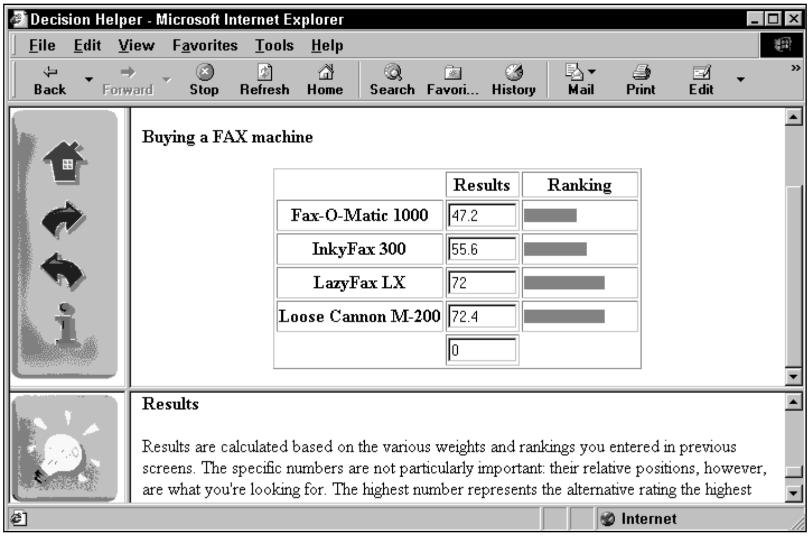


Figure 4-4: The Decision Helper

The Decision Helper is a full-fledged application that includes four input screens and one screen that displays the results of some fairly complex calculations based on the input screens. Results are shown both in numbers and in a bar graph form, as displayed in Figure 4-4.

Interaction among the three frames requires JavaScript. For example, suppose the user clicks one of the directional arrows in the top-left frame. Not only does the top-right frame change to another document, but the instructions document in the bottom frame also shifts to the anchor point that parallels the content of the input screen. Scripting behind the top-right frame documents uses various techniques to preserve entry information as the user navigates through the sequence of input pages. These are the same techniques you might use to build an online product catalog and shopping cart — accumulating the customer's selections from various catalog pages and then bringing them together in the checkout order form.

Certainly you could fashion this application out of a CGI program on the server. But the high level of interaction and calculation required would turn this now speedy application into a glacially slow exchange of information between user and server.

Dynamic HTML

Starting with the version 4 browsers from both Netscape and Microsoft, you can modify more and more content on the page with the help of client-side scripts. In Figure 4-5, for example, scripts in the page control the dragging of map pieces in the puzzle. Highlighted colors change as you click the state maps, instruction panels fly in from the edge of the screen, and another item appears when you place all the states in their proper positions.

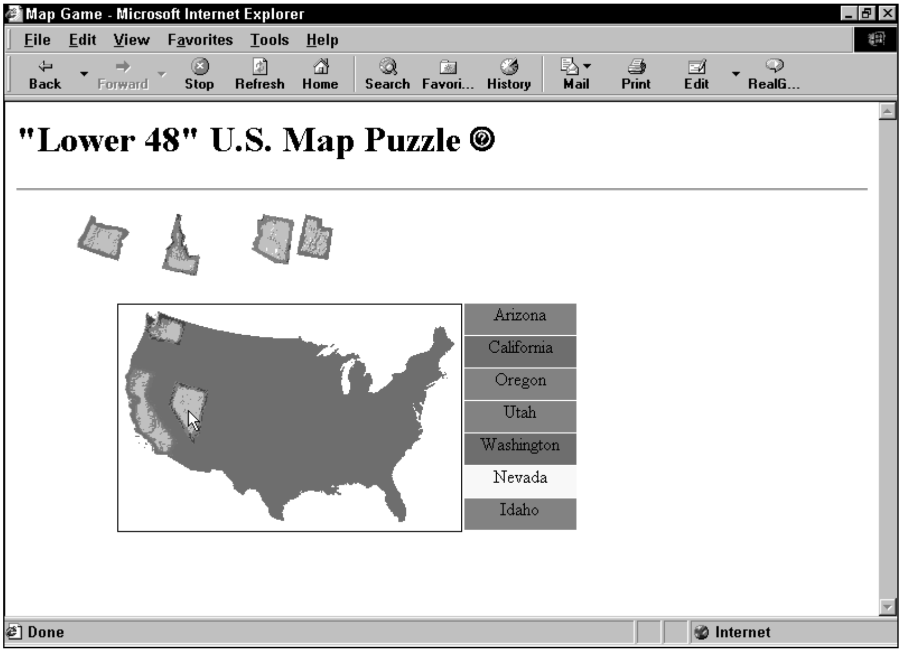


Figure 4-5: A map game in scriptable Dynamic HTML

The browser feature that makes this level of script control possible is *Dynamic HTML (DHTML)*. JavaScript becomes the vital connection between the user and dynamically respositionable elements on the screen. Not even a program on the server could help this application because you need immediate programmatic control in the page to respond to user mouse motion and instantaneous changes to screen elements.

When to use JavaScript

The preceding examples demonstrate a wide range of applications for JavaScript, but by no means do they come close to exhausting JavaScript's possibilities. When faced with a Web application task, I look to client-side JavaScript for help with the following requirements:

✦ **Data entry validation:** If form fields need to be filled out for processing on the server, I let client-side scripts prequalify the data entered by the user.

✦ **Serverless CGIs:** I use this term to describe processes that, were it not for JavaScript, would be programmed as CGIs on the server, yielding slow performance because of the interactivity required between the program and user. This includes tasks such as small data collection lookup, modification of images, and generation of HTML in other frames and windows based on user input.

- **Dynamic HTML interactivity:** It's one thing to use DHTML's capabilities to precisely position elements on the page — you don't need scripting for that. But if you intend to make the content dance on the page, scripting makes that happen.
- **CGI prototyping:** Sometimes you may want a CGI program to be at the root of your application because it reduces the potential incompatibilities among browser brands and versions. It may be easier to create a prototype of the CGI in client-side JavaScript. Use this opportunity to polish the user interface before implementing the application as a CGI.
- **Offloading a busy server:** If you have a highly trafficked Web site, it may be beneficial to convert frequently used CGI processes to client-side JavaScript scripts. Once a page is downloaded, the server is free to serve other visitors. Not only does this lighten server load, but users also experience quicker response to the application embedded in the page.
- **Adding life to otherwise dead pages:** HTML by itself is pretty "flat." Adding a blinking chunk of text doesn't help much; animated GIF images more often distract from, rather than contribute to, the user experience at your site. But if you can dream up ways to add some interactive zip to your page, it may engage the user and encourage a recommendation to friends or repeat visits.
- **Creating "Web pages that think":** If you let your imagination soar, you may develop new, intriguing ways to make your pages appear "smart." For example, in the application Intelligent "Updated" Flags (Chapter 54), you see how (without a server CGI or database) an HTML page can "remember" when a visitor last came to the page. Then any items that have been updated since the last visit — regardless of the number of updates you've done to the page — are flagged for that visitor. That's the kind of subtle, thinking Web page that best displays JavaScript's powers.

The Document Object Model

Before you can truly start scripting, you should have a good feel for the kinds of objects you will be scripting. A scriptable browser does a lot of the work of creating software objects that generally represent the visible objects you see in an HTML page in the browser window. Obvious objects include form controls (text boxes and buttons) and (in recent browsers) images. However, there may be other objects that aren't so obvious by looking at a page, but which make perfect sense when you consider the HTML tags used to generate a page's content — frames of a frameset, for example.

To help scripts control these objects — and to help authors see some method to the madness of potentially dozens of objects on a page — the browser makers define a *document object model (DOM)*. A model is like a prototype or plan for the organization of objects on a page.

Object models implemented in browsers have grown rapidly with each generation of browser. Moreover, Microsoft and Netscape have added their own touches from time to time in a competitive features race. The lack of compatibility among browser versions and brands can drive scripters to distraction, especially if (at the outset) they learn the object model only of the latest version of only one brand — unaware of limits in earlier browsers or those from other makers.

All is not lost, however. This tutorial focuses on the document object model that you can find in every scriptable browser. Figure 4-6 shows a map of the lowest common denominator object model, which is safe to use on all browsers. At this stage of the learning process, it is not important to memorize the model but rather to get a general feel for what's going on.

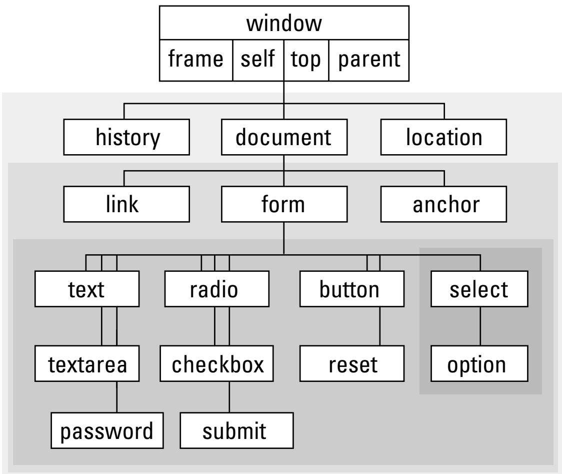


Figure 4-6: Lowest common denominator document object model for all scriptable browsers

One misconception you must avoid at the outset is that the model shown in Figure 4-6 is the model for every document that loads into the browser. On the contrary — it represents an idealized version of a document that includes one of every possible type of object that the browser knows. In a moment, I will show you how the document object model stored in the browser at any given instant reflects the HTML in the document. But for now, I want to impress an important aspect of the structure of the idealized model: its hierarchy.

Proprietary and Standard Object Models

Object model features that are proprietary to one browser version and/or brand are perfectly usable provided you know that your audience uses that brand or version exclusively (for example, in a corporate environment where a browser version might be mandated for all employees). If you develop in this kind of controlled environment, then be assured that browser-specific features are covered in the reference portions of this book.

An industry standards effort (by the W3C) has begun specifying a common set of object model features and syntax that provide more flexibility than the original implementations. The biggest improvement is that every HTML element becomes an object that scripts can manipulate (a feature also found in IE4's object model). This DOM, built upon the original object model you learn in this tutorial, is implemented in varying degrees of completion in IE5+ and NN6+ (the latter offering a much more complete W3C DOM implementation). The scripter's dream is that one day W3C DOM–compatible browsers will be the majority of the installed base, and creating cross-browser, highly dynamic pages will be easier than today. In the meantime, you have lots of fundamentals to learn — knowledge that you'll use for many years to come.

Containment hierarchy

Notice in Figure 4-6 that objects are grouped together in various levels designated by the density of the gray background. Objects are organized in a *hierarchy*, not unlike the hierarchy of a company's organization chart of job positions. At the top is the president. Reporting to the president are several vice presidents. One of the vice presidents manages a sales force that is divided into geographical regions. Each region has a manager who reports to the vice president of sales; each region then has several salespeople. If the president wants to communicate to a salesperson who handles a big account, the protocol dictates that the president should route the message through the hierarchy — to the vice president of sales; to the sales manager; to the salesperson. The hierarchy clearly defines each unit's role and relationship to the other units.

This hierarchical structure applies to the organization of objects in a document. Allow me to highlight the key objects in Figure 4-6 and explain their relationships to others.

✦ **Window object:** At the top of the hierarchy is the window. This object represents the content area of the browser window where HTML documents appear. In a multiple-frame environment, each frame is also a window (but don't concern yourself with this just yet). Because all document action takes place inside the window, it is the outermost element of the object hierarchy. Its physical borders contain the document.

✦ **Document object:** Each HTML document that gets loaded into a window becomes a `document` object. Its position in the object hierarchy is an important one, as you can see in Figure 4-6. The `document` object contains most of the other kinds of objects in the model. This makes perfect sense when you think about it: The document contains the content that you are likely to script.

✦ **Form object:** Users don't see the beginning and ending of forms on a page, only their elements. But a form is a distinct grouping of content inside an HTML document. Everything that is inside the `<FORM>...</FORM>` tag set is part of the form object. A document might have more than one pair of `<FORM>` tags if dictated by the page design. If so, the map of the objects for that particular document has two form objects instead of the one that appears in Figure 4-6.

✦ **Form control elements:** Just as your HTML defines form elements within the confines of the `<FORM>...</FORM>` tag pair, so does a form object contain all the elements defined for that object. Each one of those form elements — text fields, buttons, radio buttons, checkboxes, and the like — is a separate object. Unlike the one-of-everything model shown in Figure 4-6, the precise model for any document depends on the HTML tags in the document.

When a Document Loads

Programming languages, such as JavaScript, are convenient intermediaries between your mental image of how a program works and the true inner workings of the computer. Inside the machine, every word of a program code listing influences the storage and movement of bits (the legendary 1s and 0s of the computer's binary universe) from one RAM storage slot to another. Languages and object models are inside the computer (or, in the case of JavaScript, inside the browser's area of the computer) to make it easier for programmers to visualize how a program works and what its results will be. The relationship reminds me a lot of knowing how to drive an automobile from point A to point B without knowing exactly how an internal combustion engine, steering linkages, and all that other internal "stuff" works. By controlling high-level objects such as the ignition key, gearshift, gas pedal, brake, and steering wheel, I can get the results I need.

Of course, programming is not exactly like driving a car with an automatic transmission. Even scripting requires the equivalent of opening the hood and perhaps knowing how to check the transmission fluid or change the oil. Therefore, now it's time to open the hood and watch what happens to the document object model as a page loads into the browser.

A simple document

Figure 4-7 shows the HTML and corresponding object model for a very simple document. When this page loads, the browser maintains in its memory a map of the objects generated by the HTML tags in the document. The `window` object is always there for every document. Every `window` object also contains an object called the *`location`* object (it stores information about the URL of the document being loaded). I'll skip that object for now, but acknowledge its presence (as a dimmed box in the diagram) because it is part of the model in the browser memory. Finally, because a document has been loaded, the browser generates a `document` object in its current map.

```
<HTML>
<HEAD><TITLE>
Simple Doc
</TITLE></HEAD>
<BODY>
<H1>Howdy</H1>
</BODY>
</HTML>
```

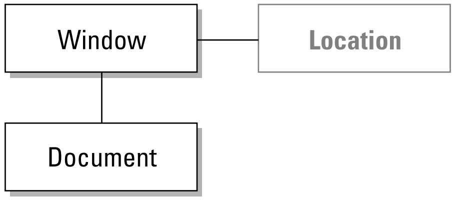


Figure 4-7: A simple document and object map

> **Note** In IE4+ and the W3C DOM, every HTML element (such as the H1 element of Figure 4-7) becomes an object contained by the document. But this tutorial observes the original model, which turns only a handful (albeit an important handful) of HTML elements into scriptable objects.

Add a form

Now, I modify the HTML file to include a blank `<FORM>` tag set and reload the document. Figure 4-8 shows what happens to both the HTML (changes in boldface) and the object map as constructed by the browser. Even though no content appears in the form, the `<FORM>` tags are enough to tell the browser to create that `form` object. Also note that the `form` object is contained by the document in the hierarchy of objects in the current map. This mirrors the structure of the idealized map shown in Figure 4-6.

```
<HTML>
<HEAD><TITLE>
Simple Doc
</TITLE></HEAD>
<BODY>
<H1>Howdy</H1>
<FORM>
</FORM>
</BODY>
</HTML>
```

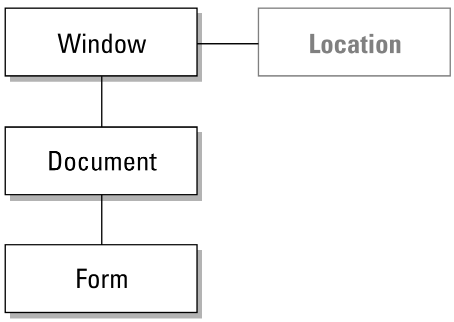


Figure 4-8: Adding a form

Add a text input element

I modify and reload the HTML file again, this time including an `<INPUT>` tag that defines the text field form element shown in Figure 4-9. As mentioned earlier, the containment structure of the HTML (the `<INPUT>` tag goes inside a `<FORM>` tag set) is reflected in the object map for the revised document. Therefore, the window contains a document; the document contains a form; and the form contains a text input element.

```
<HTML>
<HEAD><TITLE>
Simple Doc
</TITLE></HEAD>
<BODY>
<H1>Howdy</H1>
<FORM>
   <INPUT TYPE="text">
</FORM>
</BODY>
</HTML>
```

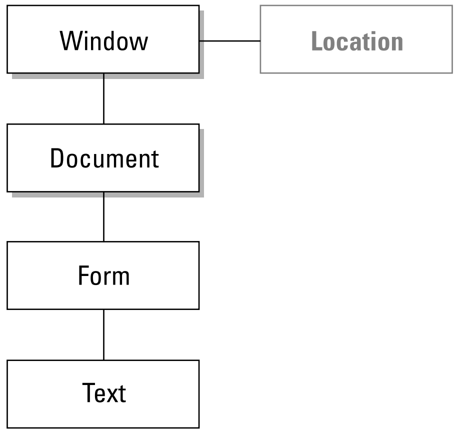


Figure 4-9: Adding a text input element to the form

Add a button element

The last modification I make to the file is to add a button input element to the same form as the one that holds the text input element (see Figure 4-10). Notice that the HTML for the button is contained by the same `<FORM>` tag set as the text field. As a result, the object map hierarchy shows both the text field and button contained by the same `form` object. If the map were a corporate organization chart, the employees represented by the Text and Button boxes would be at the same level reporting to the same boss.

```
<HTML>
<HEAD><TITLE>
Simple Doc
</TITLE></HEAD>
<BODY>
<H1>Howdy</H1>
<FORM>
   <INPUT TYPE="text">
   <INPUT TYPE="button">
</FORM>
</BODY>
</HTML>
```

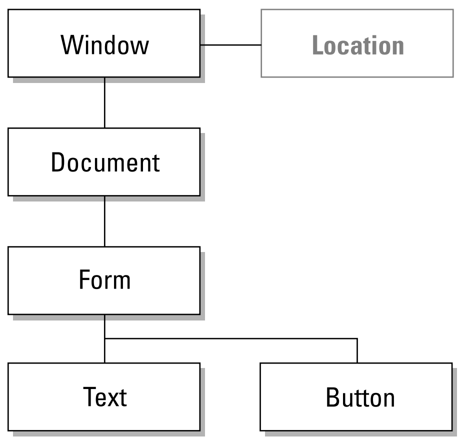


Figure 4-10: Adding a button element to the same form

Now that you see how objects are created in memory in response to HTML tags, the next step is to figure out how scripts can communicate with these objects. After all, scripting is mostly about controlling these objects.

Object References

After a document is loaded into the browser, all of its objects are safely stored in memory in the containment hierarchy structure specified by the browser's document object model. For a script to control one of those objects, there must be a way to communicate with an object and find out something about it such as, "Hey, Mr. Text Field, what did the user type?"

The JavaScript language uses the containment hierarchy structure to let scripts get in touch with any object in a document. For a moment, pretend you are the browser with a document loaded into your memory. You have this road map of objects handy. If a script needs you to locate one of those objects, it would be a big help if the script showed you what route to follow in the map to reach that object. That is precisely what an *object reference* in a script does for the browser.

Object naming

The biggest aid in creating script references to objects is assigning names to every scriptable object in your HTML. Scriptable browsers, such as modern versions of Navigator and Internet Explorer, acknowledge an optional tag attribute called NAME. This attribute enables you to assign a unique name to each object. Here are some examples of NAME attributes added to typical tags:

```
<FORM NAME="dataEntry" METHOD=GET>

<INPUT TYPE="text" NAME="entry">

<FRAME SRC="info.html" NAME="main">
```

The only rules about object names (also called *identifiers*) are that they

- ✦ May not contain spaces
- ✦ Should not contain punctuation except for the underscore character
- ✦ Must be inside quotes when assigned to the NAME attribute
- ✦ Must not start with a numeric character

Think of assigning names the same as sticking nametags on everyone attending a conference meeting. The name of the object, however, is only one part of the actual reference that the browser needs to locate the object. For each object, the reference must include the steps along the object hierarchy from the top down to the object—no matter how many levels of containment are involved. In other words, the browser cannot pick out an object by name only. A reference includes the names of each object along the path from the window to the object. In the JavaScript language, each successive object name along the route is separated from another by a period.

NAME versus ID Attributes

The HTML 4.0 specification introduces a new way to assign an identifier to HTML elements: the `ID` attribute. The `ID` attribute is helpful for some aspects of Cascading Style Sheets (CSS) and Dynamic HTML. Even so, the `NAME` attribute is still required for common denominator elements covered in this tutorial — FRAME, FORM, and INPUT elements, for example. The newest browsers can access an element by name or ID, but authors typically use the `ID` attribute for HTML element objects not shown in Figure 4-6. You can read more about the `ID` attribute (and `id` property) in Chapter 15 after you finish the tutorial.

To demonstrate what real references look like within the context of an object model you've already seen, I retrace the same model steps shown earlier but this time I show the reference to each object as the document acquires more objects.

A simple document

I start with the model whose only objects are the window (and its `location` object) and document from the simple HTML file. Figure 4-11 shows the object map and references for the two main objects. Every document resides in a window, so to reference the `window` object you start with `window`. Also fixed in this reference is the document because there can be only one document per window (or frame). Therefore, a reference to the `document` object is `window.document`.

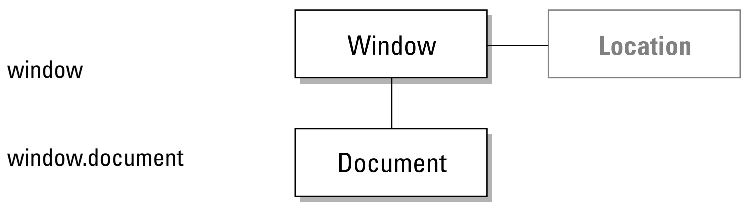


Figure 4-11: References to the window and document

Add a form

Modifying the document to include the empty `<FORM>` tag generates the `form` object in the map. If I do the job right, the `<FORM>` tag also includes a `NAME` attribute. The reference to the form object, as shown in Figure 4-12, starts with the window, wends through the document, and reaches the form, which I call by name: `window.document.`*`formName`* (the italics meaning that in a real script, I would substitute the form's name for *`formName`*).

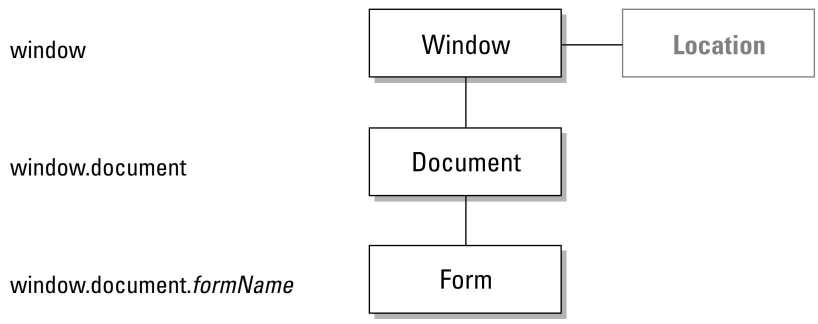


Figure 4-12: Reference to the form object

Add a text input element

As the hierarchy gets deeper, the object reference gets longer. In Figure 4-13, I add a text input object to the form. The reference to this deeply nested object still starts at the window level and works its way down to the name I assigned to the object in its `<INPUT>` tag: `window.document.`*`formName`*`.`*`textName`*.

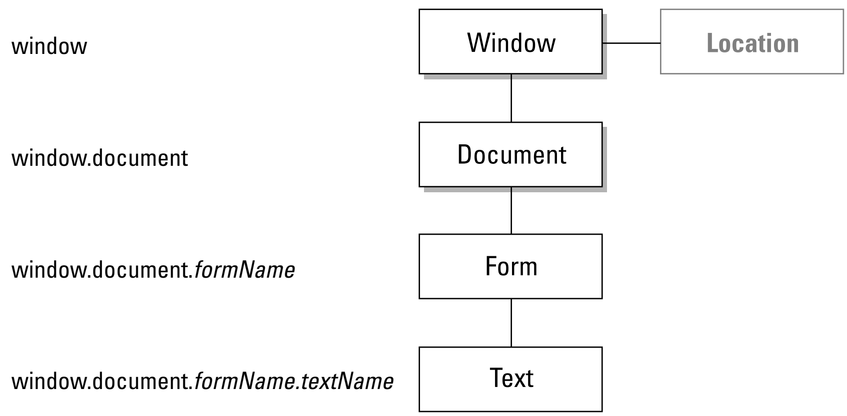


Figure 4-13: Reference to the text field object

Add a button element

When I add a button to the same form as the text object, the reference stays the same length (see Figure 4-14). All that changes is the last part of the reference where the button name goes in place of the text field name: `window.document.`*`formName`*`.`*`buttonName`*.

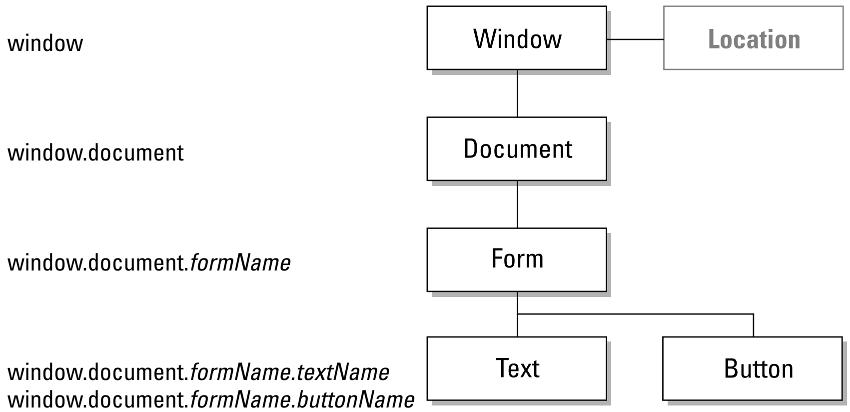


Figure 4-14: Reference to the button object

About the Dot Syntax

JavaScript uses the period to separate components of a hierarchical reference. This convention is adopted from Java, which, in turn, based this formatting on the C language. Every reference typically starts with the most global scope — the window for client-side JavaScript — and narrows focus with each "dot" (.) delimiter.

If you have not programmed before, don't be put off by the dot syntax. You are probably already using it, such as when you access Usenet newsgroups. The methodology for organizing the thousands of newsgroups is to group them in a hierarchy that makes it relatively easy to both find a newsgroup and visualize where the newsgroup you're currently reading is located in the scheme of things.

Newsgroup organization model

Let me briefly dissect a typical newsgroup address to help you understand dot syntax: `rec.sport.skating.inline`. The first entry (at the left edge) defines the basic group — recreation — among all the newsgroup categories. Other group categories, such as `comp` and `alt`, have their own sections and do not overlap with what goes on in the `rec` section. Within the `rec` section are dozens of subsections, one of which is `sport`. That name distinguishes all the sport-related groups from, say, the automobile or music groups within recreational newsgroups.

Like most broad newsgroup categories, `rec.sport` has many subcategories, with each one devoted to a particular sport. In this case, it is skating. Other sport newsgroups include `rec.sport.rugby` and `rec.sport.snowboarding`. Even within the `rec.sport.skating` category, a further subdivision exists to help narrow the subject matter for participants. Therefore, a separate newsgroup just for inline skaters exists, just as a group for roller-skating exists (`rec.sport.skating.roller`). As a narrower definition is needed for a category, a new level is formed by adding a dot and a word to differentiate that subgroup from the thousands of newsgroups on the Net. When you ask your newsgroup software to view messages in the `rec.sport.skating.inline` group, you're giving it a map to follow in the newsgroup hierarchy to go directly to a single newsgroup.

Another benefit of this syntactical method is that names for subcategories can be reused within other categories, if necessary. For example, with this naming scheme, it is possible to have two similarly named subcategories in two separate newsgroup classifications (such as `rec.radio.scanners` and `alt.radio.scanners`). When you ask to visit one, the hierarchical address, starting with the `rec` or `alt` classification, ensures you get to the desired place. Neither collection of messages is automatically connected with the other (although subscribers frequently cross-post to both newsgroups).

For complete newbies to the Net, this dot syntax can be intimidating. Because the system was designed to run on UNIX servers (the UNIX operating system is written in C), the application of a C-like syntax for newsgroup addressing is hardly surprising.

What Defines an Object?

When an HTML tag defines an object in the source code, the browser creates a slot for that object in memory as the page loads. But an object is far more complex internally than, say, a mere number stored in memory. The purpose of an object is to represent some "thing." Because in JavaScript you deal with items that appear in a browser window, an object may be an input text field, a button, or the whole HTML document. Outside of the pared-down world of a JavaScript browser, an object can also represent abstract entities, such as a calendar program's appointment entry or a layer of graphical shapes in a drawing program.

Every object is unique in some way, even if two or more objects look identical to you in the browser. Three very important facets of an object define what it is, what it looks like, how it behaves, and how scripts control it. Those three facets are properties, methods, and event handlers. They play such key roles in your future JavaScript efforts that the Quick Reference in Appendix A summarizes the properties, methods, and event handlers for each object in the object models implemented in various browser generations. You might want to take a quick peek at that road map of the original object model if for no other reason than to gain an appreciation for the size of the scripting vocabulary that this tutorial covers.

Properties

Any physical object you hold in your hand has a collection of characteristics that defines it. A coin, for example, has shape, diameter, thickness, color, weight, embossed images on each side, and any number of other attributes that distinguish it from, say, a feather. Each of those features is called a *property*. Each property has a value of some kind attached to it (even if the value is empty or null). For example, the shape property of a coin might be "circle"—in this case, a text value. In contrast, the denomination property is most likely a numeric value.

You may not have known it, but if you've written HTML for use in a scriptable browser, you have set object properties without writing one iota of JavaScript. Tag attributes are the most common way to set an HTML object's initial properties. The presence of JavaScript often adds optional attributes whose initial values you can set when the document loads. For example, the following HTML tag defines a `button` object that assigns two property values:

```
<INPUT TYPE="button" NAME="clicker" VALUE="Hit Me...">
```

In JavaScript parlance, then, the `name` property holds the word "clicker," while the `value` property is the text that appears on the button label, "Hit Me. . . ." In truth, a button has more properties than just these, but you don't have to set every property for every object. Most properties have default values that are automatically assigned if nothing special is set in the HTML or later from a script.

The contents of some properties can change while a document is loaded and the user interacts with the page. Consider the following text input tag:

```
<INPUT TYPE="text" NAME="entry" VALUE="User Name?">
```

The `name` property of this object is the word "entry." When the page loads, the text of the `VALUE` attribute setting is placed in the text field — the automatic behavior of an HTML text field when the `VALUE` attribute is specified. But if a user enters some other text into the text field, the `value` property changes — not in the HTML, but in the memory copy of the object model that the browser maintains. Therefore, if a script queries the text field about the content of the `value` property, the browser yields the current setting of the property — which isn't the one specified by the HTML if a user changes the text.

To gain access to an object's property, you use the same kind of dot syntax, hierarchical addressing scheme you saw earlier for objects. A property is contained by its object, so the reference to it consists of the reference to the object plus one more extension naming the property. Therefore, for the button and text object tags just shown, references to various properties are

```
document.formName.clicker.name
document.formName.clicker.value
document.formName.entry.value
```

You may wonder what happened to the `window` part of the reference. It turns out that there can be only one document contained in a window, so references to objects inside the document can omit the `window` portion and start the reference with `document`. You cannot omit the `document` object, however, from the reference. In IE4+, you can reference an element object by simply referring to the element's `ID` attribute if one is assigned. Even so, I strongly recommend spelling out references so that your code is easier to read and understand long after you've written it. Notice, too, that the button and text fields both have a property named `value`. These properties represent very different attributes for each object. For the button, the property determines the button label; for the text field, the property reflects the current text in the field. You now see how the (sometimes lengthy) hierarchical referencing scheme helps the browser locate exactly the object and property your script needs. No two items in a document can have identical references even though parts of these references may have the same component names.

Methods

If a property is like a descriptive adjective for an object, then a method is a verb. A *method* is all about action related to the object. A method either does something to the object or with the object that affects other parts of a script or document. They are commands of a sort, but whose behaviors are tied to a particular object.

An object can have any number of methods associated with it (including none at all). To set a method into motion (usually called *invoking a method*), a JavaScript statement must include a reference to it — via its object with a pair of parentheses after the method name — as in the following examples:

```
document.orderForm.submit()
document.orderForm.entry.select()
```

The first is a scripted way of clicking a Submit button to send a form (named `orderForm`) to a server. The second selects the text inside a text field named `entry` (which is contained by a form named `orderForm`).

Sometimes a method requires that you send additional information with it so that it can do its job. Each chunk of information passed with the method is called a *parameter* or *argument* (you can use the terms interchangeably). You saw examples of passing a parameter in your first script in Chapter 3. Two script statements invoked the `write()` method of the `document` object:

```
document.write("This browser is version " + navigator.appVersion)
document.write(" of <B>" + navigator.appName + "</B>.")
```

As the page loaded into the browser, each `document.write()` method sent whatever text was inside the parentheses to the current document. In both cases, the content being sent as a parameter consisted of straight text (inside quotes) and the values of two object properties: the `appVersion` and `appName` properties of the `navigator` object. (The `navigator` object does not appear in the object hierarchy diagram of Figure 4-6 because in early browsers this object exists outside of the document object model.)

Some methods require more than one parameter. If so, the multiple parameters are separated by commas. For example, Version 4 and later browsers support a `window` object method that moves the window to a particular coordinate point on the screen. A coordinate point is defined by two numbers that indicate the number of pixels from the left and top edges of the screen where the top-left corner of the window should be. To move the browser window to a spot 50 pixels from the left and 100 pixels from the top, the method is

```
window.moveTo(50,100)
```

As you learn more about the details of JavaScript and the document objects you can script, pay close attention to the range of methods defined for each object. They reveal a lot about what an object is capable of doing under script control.

Event handlers

One last characteristic of a JavaScript object is the *event handler*. *Events* are actions that take place in a document, usually as the result of user activity. Common examples of user actions that trigger events include clicking a button or typing a character into a text field. Some events, such as the act of loading a document into the browser window or experiencing a network error while an image loads, are not so obvious.

Almost every JavaScript object in a document receives events of one kind or another — summarized for your convenience in the Quick Reference of Appendix A. What determines whether the object does anything in response to the event is an extra attribute you enter into the object's HTML definition. The attribute consists of the event name, an equal sign (just like any HTML attribute), followed by instructions about what to do when the particular event fires. Listing 4-1 shows a very simple document that displays a single button with one event handler defined for it.

Listing 4-1: A Simple Button with an Event Handler

```
<HTML>
<BODY>
<FORM>
<INPUT TYPE="button" VALUE="Click Me" onClick="window.alert ('Ouch!')">
</FORM>
</BODY>
</HTML>
```

The form definition contains what, for the most part, looks like a standard input item. But notice the last attribute, `onClick="window.alert('Ouch!')"`. Button objects, as you see in their complete descriptions in Chapter 24, react to mouse clicks. When a user clicks the button, the browser sends a click event to the button. In this button's definition, the attribute says that whenever the button receives that message, it should invoke one of the `window` object's methods, `alert()`. The `alert()` method displays a simple alert dialog box whose content is whatever text is passed as a parameter to the method. Like most arguments to HTML attributes, the attribute setting to the right of the equal sign goes inside quotes. If additional quotes are necessary, as in the case of the text to be passed along with the event handler, those inner quotes can be single quotes. In actuality, JavaScript doesn't distinguish between single or double quotes but does require that each set be of the same type. Therefore, you can write the attribute this way:

```
onClick='alert("Ouch!")'
```

Exercises

1. Which of the following applications are well suited to client-side JavaScript? Why or why not?

  a. Music jukebox

  b. Web-site visit counter

  c. Chat room

  d. Graphical Fahrenheit-to-Celsius temperature calculator

  e. All of the above

  f. None of the above

2. General Motors has separate divisions for its automobile brands: Chevrolet, Pontiac, Buick, and Cadillac. Each brand has several models of automobile. Following this hierarchy model, write the dot-syntax equivalent reference to the following three vehicle models:

   a. Chevrolet Malibu

   b. Pontiac Firebird

   c. Pontiac GrandAm

3. Which of the following object names are valid in JavaScript? For each one that is invalid, explain why.

   a. `lastName`

   b. `company_name`

   c. `1stLineAddress`

   d. `zip code`

   e. `today's_date`

4. An HTML document contains tags for one link and one form. The form contains tags for three text boxes, one checkbox, a Submit button, and a Reset button. Using the object hierarchy diagram from Figure 4-6 for reference, draw a diagram of the object model that the browser would create in its memory for these objects. Give names to the link, form, text fields, and checkbox, and write the references to each of those objects.

5. Write the HTML tag for a button input element named “Hi,” whose visible label reads “Howdy” and whose `onClick` event handler displays an alert dialog box that says “Hello to you, too!”

✦ ✦ ✦

CHAPTER 5

Scripts and HTML Documents

✦ ✦ ✦ ✦

In This Chapter

Where to place scripts in HTML documents

What a JavaScript statement is

What makes a script run

Viewing script errors

✦ ✦ ✦ ✦

In this chapter's tutorial, you begin to see how scripts are embedded within HTML documents and what comprises a script statement. You also see how script statements can run when the document loads or in response to user action. Finally, you find out where script error information is hiding.

Where Scripts Go in Documents

Chapter 4 did not thoroughly cover what scripts look like or how you add them to an HTML document. That's where this lesson picks up the story.

The <SCRIPT> tag

To assist the browser in recognizing lines of code in an HTML document as belonging to a script, you surround lines of script code with a `<SCRIPT>...</SCRIPT>` tag set. This is common usage in HTML where start and end tags encapsulate content controlled by that tag, whether the tag set is for a form or a paragraph.

Depending on the browser, the `<SCRIPT>` tag has a variety of attributes you can set that govern the script. One attribute shared by scriptable browsers is the `LANGUAGE` attribute. This attribute is essential because each browser brand and version accepts a different set of scripting languages. One setting that all scriptable browsers accept is the JavaScript language, as in

```
<SCRIPT LANGUAGE="JavaScript">
```

Other possibilities include later versions of JavaScript (version numbers are part of the language name), Microsoft's JScript variant, and the separate VBScript language. You don't need to specify any of these other languages unless your script intends to take specific advantage of a particular language version to the exclusion of all others. Until you learn the differences among the language versions, you can safely specify plain JavaScript on all scriptable browsers.

Be sure to include the ending tag for the script. Lines of JavaScript code go between the two tags:

```
<SCRIPT LANGUAGE="JavaScript">
  one or more lines of JavaScript code here
</SCRIPT>
```

If you forget the closing script tag, the script may not run properly and the HTML elsewhere in the page may look strange.

Although you don't work with it in this tutorial, another attribute works with more recent browsers to blend the contents of an external script file into the current document. An `SRC` attribute (similar to the `SRC` attribute of an `<IMG>` tag) points to the file containing the script code. Such files must end with a .js extension. The tag set looks like the following:

```
<SCRIPT LANGUAGE="JavaScript" SRC="myscript.js"></SCRIPT>
```

All script lines are in the external file, so no script lines are included between the start and end script tags in the document.

Tag positions

Where do these tags go within a document? The answer is, anywhere they're needed in the document. Sometimes it makes sense to include the tags nested within the `<HEAD>...</HEAD>` tag set; other times it is essential that you drop the script into a very specific location in the `<BODY>...</BODY>` section.

In the following four listings, I demonstrate — with the help of a skeletal HTML document — some of the possibilities of `<SCRIPT>` tag placement. Later in this lesson, you see why scripts may need to go in different places within a page depending on the scripting requirements.

Listing 5-1 shows the outline of what may be the most common position of a `<SCRIPT>` tag set in a document: in the `<HEAD>` tag section. Typically, the *Head* is a place for tags that influence noncontent settings for the page — so-called HTML "directive" elements, such as `<META>` tags and the document title. It turns out that this is also a convenient place to plant scripts that are called on in response to user action.

A Future Attribute

The HTML 4.0 specification does not endorse the popular `LANGUAGE` attribute for script tags. Instead, it suggests the `TYPE` attribute, which requires a value in the form of a *MIME (Multipurpose Internet Mail Extensions)* type descriptor:

```
TYPE="text/javascript"
```

Only browsers with W3C DOM capabilities (such as IE5+ and NN6+) support the `TYPE` attribute, but the `LANGUAGE` attribute continues to be supported and should be for some time to come. All examples in this book use the compatible `LANGUAGE` attribute.

Listing 5-1: **Scripts in the Head**

```
<HTML>
<HEAD>
<TITLE>A Document</TITLE>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
</HEAD>
<BODY>
</BODY>
</HTML>
```

On the other hand, if you need a script to run as the page loads so that the script generates content in the page, the script goes in the <BODY> portion of the document, as shown in Listing 5-2. If you check the code listing for your first script in Chapter 3, you see that the script tags are in the Body because the script needs to fetch information about the browser and write the results to the page as the page loads.

Listing 5-2: **A Script in the Body**

```
<HTML>
<HEAD>
<TITLE>A Document</TITLE>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
</BODY>
</HTML>
```

It's also good to know that you can place an unlimited number of <SCRIPT> tag sets in a document. For example, Listing 5-3 shows a script in both the Head and Body portions of a document. Perhaps this document needs the Body script to create some dynamic content as the page loads, but the document also contains a button that needs a script to run later. That script is stored in the Head portion.

Listing 5-3: Scripts in the Head and Body

```
<HTML>
<HEAD>
<TITLE>A Document</TITLE>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
</BODY>
</HTML>
```

You also are not limited to one <SCRIPT> tag set in either the Head or Body. You can include as many <SCRIPT> tag sets in a document as are needed to complete your application. In Listing 5-4, for example, two <SCRIPT> tag sets are located in the Body portion, with some other HTML between them.

Listing 5-4: Two Scripts in the Body

```
<HTML>
<HEAD>
<TITLE>A Document</TITLE>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
<MORE HTML>
<SCRIPT LANGUAGE="JavaScript">
    //script statement(s) here
    ...
</SCRIPT>
</BODY>
</HTML>
```

Handling older browsers

Only browsers that include JavaScript in them know to interpret the lines of code between the <SCRIPT>...</SCRIPT> tag pair as script statements and not HTML text for display in the browser. This means that a pre-JavaScript browser not only ignores the tags, but it also treats the JavaScript code as page content. As you saw at the end of Chapter 3 in an illustration of your first script running on an old browser, the results can be disastrous to a page.

You can reduce the risk of old browsers displaying the script lines by playing a trick. The trick is to enclose the script lines between HTML comment symbols, as shown in Listing 5-5. Most nonscriptable browsers completely ignore the content between the <!-- and --> comment tags, whereas scriptable browsers ignore those comment symbols when they appear inside a <SCRIPT> tag set.

Listing 5-5: **Hiding Scripts from Most Old Browsers**

```
<SCRIPT LANGUAGE="JavaScript">
<!--
    //script statement(s) here
    ...
// -->
</SCRIPT>
```

The odd construction right before the ending script tag needs a brief explanation. The two forward slashes are a JavaScript comment symbol. This symbol is necessary because JavaScript otherwise tries to interpret the components of the ending HTML symbol (-->). Therefore, the forward slashes tell JavaScript to skip the line entirely; a nonscriptable browser simply treats those slash characters as part of the entire HTML comment to be ignored.

Despite the fact that this technique is often called *hiding scripts*, it does not disguise the scripts entirely. All client-side JavaScript scripts are part of the HTML document and download to the browser just like all other HTML. Furthermore, you can view them as part of the document's source code. Do not be fooled into thinking that you can hide your scripts entirely from prying eyes.

JavaScript Statements

Virtually every line of code that sits between a <SCRIPT>...</SCRIPT> tag pair is a JavaScript statement. To be compatible with habits of experienced programmers, JavaScript accepts a semicolon at the end of every statement. Fortunately for newcomers, this semicolon is optional. The carriage return at the end of a statement suffices for JavaScript to know the statement has ended.

A statement must be in the script for a purpose. Therefore, every statement does "something" relevant to the script. The kinds of things that statements do are

- ✦ Define or initialize a variable
- ✦ Assign a value to a property or variable
- ✦ Change the value of a property or variable
- ✦ Invoke an object's method
- ✦ Invoke a function routine
- ✦ Make a decision

If you don't yet know what all of these mean, don't worry—you will by the end of this tutorial. The point I want to stress is that each statement contributes to the scripts you write. The only statement that doesn't perform any explicit action is the *comment*. A pair of forward slashes (no space between them) is the most common way to include a comment in a script. You add comments to a script for your benefit. They usually explain in plain language what a statement or group of statements does. The purpose of including comments is to remind you six months from now how your script works.

When Script Statements Execute

Now that you know where scripts go in a document, it's time to look at when they run. Depending on what you need a script to do, you have four choices for determining when a script runs:

- While a document loads
- Immediately after a document loads
- In response to user action
- When called upon by other script statements

The determining factor is how the script statements are positioned in a document.

While a document loads — immediate execution

Your first script in Chapter 3 (reproduced in Listing 5-6) runs while the document loads into the browser. For this application, it is essential that a script inspects some properties of the `navigator` object and includes those property values in the content being rendered for the page as it loads. It makes sense, therefore, to include the `<SCRIPT>` tags and statements in the Body portion of the document. I call the kind of statements that run as the page loads *immediate statements*.

Listing 5-6: HTML Page with Immediate Script Statements

```
<HTML>
<HEAD>
<TITLE>My First Script</TITLE>
</HEAD>

<BODY>
<H1>Let's Script...</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers
document.write("This browser is version " + navigator.appVersion)
document.write(" of <B>" + navigator.appName + "</B>.")
// end script hiding -->
</SCRIPT>
</BODY>
</HTML>
```

Deferred scripts

The other three ways that script statements run are grouped together as what I called *deferred scripts*. To demonstrate these deferred script situations, I must introduce you briefly to a concept covered in more depth in Chapter 7: the function. A *function* defines a block of script statements summoned to run some time after those statements load into the browser. Functions are clearly visible inside a <SCRIPT> tag because each function definition begins with the word function followed by the function name (and parentheses). Once a function is loaded into the browser (commonly in the Head portion so it loads early), it stands ready to run whenever called upon.

One of the times a function is called upon to run is immediately after a page loads. The Window object has an event handler called onLoad. Unlike most event handlers, which are triggered in response to user action (for example, clicking a button), the onLoad event handler fires the instant that all of the page's components (including images, Java applets, and embedded multimedia) are loaded into the browser. The onLoad event handler goes in the <BODY> tag, as shown in Listing 5-7. Recall from Chapter 4 (Listing 4-1) that an event handler can run a script statement directly. But if the event handler must run several script statements, it is usually more convenient to put those statements in a function definition and then have the event handler *invoke* that function. That's what happens in Listing 5-7: When the page completes loading, the onLoad event handler triggers the done() function. That function (simplified for this example) displays an alert dialog box.

Listing 5-7: **Running a Script from the onLoad Event Handler**

```
<HTML>
<HEAD>
<TITLE>An onLoad script</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function done() {
    alert("The page has finished loading.")
}
// -->
</SCRIPT>
</HEAD>
<BODY onLoad="done()">
Here is some body text.
</BODY>
</HTML>
```

Don't worry about the curly braces or other oddities in Listing 5-7 that cause you concern at this point. Focus instead on the structure of the document and the flow. The entire page loads without running any script statements, although the page loads the done() function in memory so that it is ready to run at a moment's notice. After the document loads, the browser fires the onLoad event handler, which causes the done() function to run. Then the user sees the alert dialog box.

Getting a script to execute in response to a user action is very similar to the preceding example for running a deferred script right after the document loads. Commonly, a script function is defined in the Head portion, and an event handler in, say, a form element calls upon that function to run. Listing 5-8 includes a script that runs when a user clicks a button.

Listing 5-8: **Running a Script from User Action**

```
<HTML>
<HEAD>
<TITLE>An onClick script</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function alertUser() {
    alert("Ouch!")
}
// -->
</SCRIPT>
</HEAD>
<BODY>
Here is some body text.
<FORM>
    <INPUT TYPE="text" NAME="entry">
    <INPUT TYPE="button" NAME="oneButton" VALUE="Press Me!"
onClick="alertUser()">
</FORM>
</BODY>
</HTML>
```

Not every object must have an event handler defined for it in the HTML, as shown in Listing 5-8 — only the ones for which scripting is needed. No script statements execute in Listing 5-8 until the user clicks the button. The `alertUser()` function is defined as the page loads, and it waits to run as long as the page remains loaded in the browser. If it is never called upon to run, there's no harm done.

The last scenario for when script statements run also involves functions. In this case, a function is called upon to run by another script statement. Before you see how that works, it helps to read through the next lesson (Chapter 6). Therefore, I will hold off on this example until later in the tutorial.

Viewing Script Errors

In the early days of JavaScript in browsers, script errors displayed themselves in very obvious dialog boxes. These boxes were certainly helpful for scripters who wanted to debug their scripts. However, if a bug got through to a page served up to a non-technical user, the error alert dialog boxes were not only disruptive, but also scary. To prevent such dialog boxes from disturbing unsuspecting users, the browser makers tried to diminish the visual impact of errors in the browser window. Unfortunately for scripters, it is often easy to overlook the fact that your script contains an error because the error is not so obvious. Recent versions of IE and NN have different ways of letting scripters see the errors.

In IE5+, you can set its preferences so that scripts do not generate error dialog boxes (got to Tools ➪ Internet Options ➪ Advanced ➪ Browsing and find the checkbox entry that says "Display a notification about every script error"). Even with error dialog boxes turned off, error indications are displayed subtly at the left edge of the browser window's status bar. An alert icon and message ("Error on page.") appear in the status bar. If you double-click the icon, the error dialog box appears (see Figure 5-1). Be sure to expand the dialog box by clicking the Show Details button. Unless you turn on script error dialog boxes and keep them coming, you have to train yourself to monitor the status bar when a page loads and after each script runs.

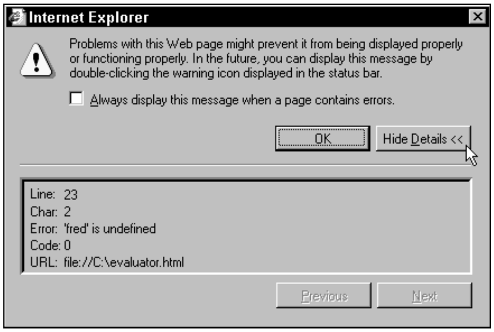


Figure 5-1: The expanded IE error dialog box

For NN 4.07 and later, the status bar is also your first indication of a script error. A message appears in the status bar that instructs you to go to the location `javascript:` to see the error details. Viewing the details of the error requires different steps, depending on the Navigator version. For NN 4.07 and all subsequent 4.*x* versions, choose File ➪ Open and enter

```
javascript:
```

For NN6, choose Tasks ➪ Tools ➪ JavaScript Console. The JavaScript console window (a separate window from the Java console) opens to reveal the error message details (see Figure 5-2). You can keep this window open all the time if you like. Unless you clear the window, subsequent error messages are appended to the bottom of the window.

Understanding error messages and doing something about them is a very large subject, reserved for advanced discussion in Chapter 45. During this tutorial, however, you can use the error messages to see if you have perhaps mistyped a script from a listing in the book.

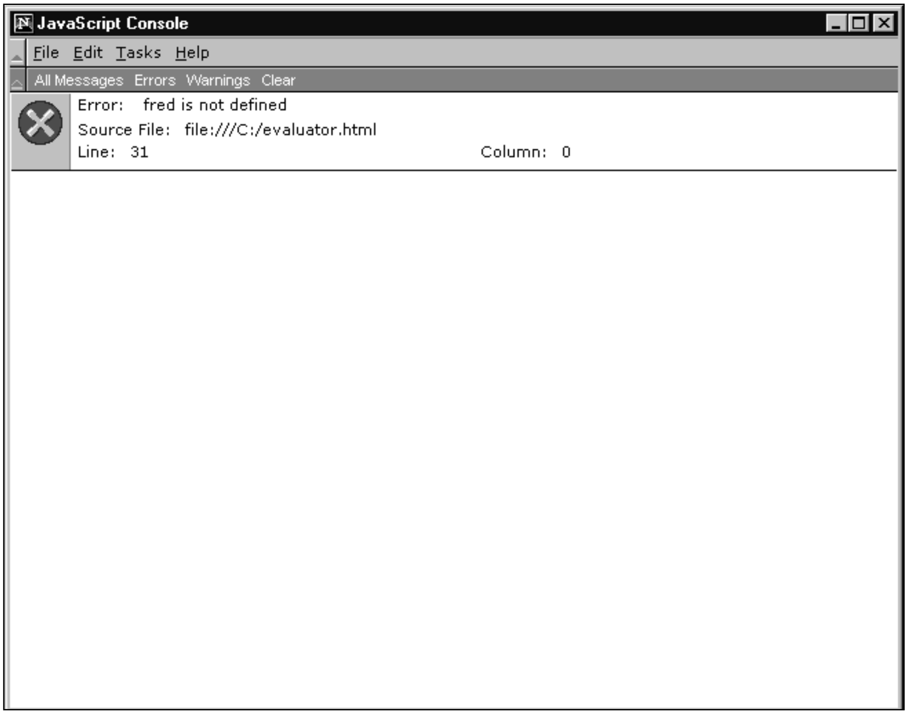


Figure 5-2: The NN6 JavaScript Console window

Scripting versus Programming

You may get the impression that scripting is easier than programming. "Scripting" simply sounds easier or more friendly than "programming." In many respects, this is true. One of my favorite analogies is the difference between a hobbyist who builds model airplanes from scratch and a hobbyist who builds model airplanes from commercial kits. The "from scratch" hobbyist carefully cuts and shapes each piece of wood and metal according to very detailed plans before the model starts to take shape. The commercial kit builder starts with many prefabricated parts and assembles them into the finished product. When both builders are finished, you may not be able to tell which airplane was built from scratch and which one came out of a box of components. In the end, both builders used many of the same techniques to complete the assembly, and each can take pride in the result.

As you've seen with the document object model, the browser gives scripters many prefabricated components with which to work. Without the browser, you'd have to be a pretty good programmer to develop from scratch your own application that served up content and offered user interaction. In the end, both authors have working applications that look equally professional.

Beyond the document object model, however, "real programming" nibbles its way into the scripting world. That's because scripts (and programs) work with more than just objects. When I said earlier in this lesson that each statement of a JavaScript script does something, that "something" involves *data* of some kind. Data is the information associated with objects or other pieces of information that a script pushes around from place to place with each statement.

Data takes many forms. In JavaScript, the common incarnations of data are numbers; text (called *strings*); objects (both from the object model and others you can create with scripts); and `true` and `false` (called *Boolean values*).

Each programming or scripting language determines numerous structures and limits for each kind of data. Fortunately for newcomers to JavaScript, the universe of knowledge necessary for working with data is smaller than in a language such as Java. At the same time, what you learn about data in JavaScript is immediately applicable to future learning you may undertake in any other programming language — don't believe for an instant that your efforts in learning scripting will be wasted.

Because deep down scripting is programming, you need to have a basic knowledge of fundamental programming concepts to consider yourself a good JavaScript scripter. In the next two lessons, I set aside most discussion about the document object model and focus on the programming principles that will serve you well in JavaScript and future programming endeavors.

Exercises

1. Write the complete script tag set for a script whose lone statement is

   ```
   document.write("Hello, world.")
   ```

2. Build an HTML document and include the answer to the previous question such that the page executes the script as it loads. Open the document in your browser.

3. Add a comment to the script in the previous answer that explains what the script does.

4. Create an HTML document that displays an alert dialog box immediately after the page loads and displays a different alert dialog box when the user clicks a form button.

5. Carefully study the document in Listing 5-9. Without entering and loading the document, predict

   a. What the page looks like

   b. How users interact with the page

   c. What the script does

   Then type the listing into a text editor as shown (observe all capitalization and punctuation). **Do not type a carriage return after the "=" sign in the** `upperMe` **function statement; let the line word-wrap as it does in the following listing.** It's okay to use a carriage return between attribute name/value pairs, as shown in the first `<INPUT>` tag. Save the document as an HTML file, and load the file into your browser to see how well you did.

Listing 5-9: How Does This Page Work?

```
<HTML>
<HEAD>
<TITLE>Text Object Value</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function upperMe() {
    document.converter.output.value =
document.converter.input.value.toUpperCase()
}
// -->
</SCRIPT>
</HEAD>

<BODY>
Enter lowercase letters for conversion to uppercase:<BR>
<FORM NAME="converter">
    <INPUT TYPE="text" NAME="input" VALUE="sample"
        onChange="upperMe()"><BR>
    <INPUT TYPE="text" NAME="output" VALUE="">
</FORM>
</BODY>
</HTML>
```

✦ ✦ ✦

CHAPTER 6

Programming Fundamentals, Part I

In This Chapter

What variables are and how to use them

Why you must learn how to evaluate expressions

How to convert data from one type to another

How to use basic operators

The tutorial breaks away from HTML and documents for a while as you begin to learn programming fundamentals that apply to practically every scripting and programming language you will encounter. Here, you start learning about variables, expressions, data types, and operators — things that might sound scary if you haven't programmed before. Don't worry. With a little practice, you will become quite comfortable with these terms and concepts.

What Language Is This?

The language you're studying is called JavaScript. But the language has some other names that you may have heard. JScript is Microsoft's name for the language. By leaving out the "ava," the company doesn't have to license the "Java" name from its trademark owner: Sun Microsystems.

A standards body called ECMA (pronounced ECK-ma) now governs the specifications for the language (no matter what you call it). The document that provides all of the details about the language is known as *ECMA-262* (it's the 262nd standard published by ECMA). Both JavaScript and JScript are ECMA-262 compatible. Some earlier browser versions exhibit very slight deviations from ECMA-262 (which came later than the earliest browsers). The most serious discrepancies are noted in the core language reference in Part IV of this book.

Working with Information

With rare exception, every JavaScript statement you write does something with a hunk of information — *data*. Data may be text information displayed on the screen by a JavaScript statement or the on/off setting of a radio button in a form. Each single piece of information in programming is also called a *value*. Outside of programming, the term *value* usually connotes a number of some kind; in the programming world, however, the term is not as restrictive. A string of letters is a value. A number is a value. The setting of a check box (whether it is checked or not) is a value.

In JavaScript, a value can be one of several types. Table 6-1 lists JavaScript's formal data types, with examples of the values you will see displayed from time to time.

Table 6-1 JavaScript Value (Data) Types

Type	*Example*	*Description*
String	`"Howdy"`	A series of characters inside quote marks
Number	`4.5`	Any number not inside quote marks
Boolean	`true`	A logical true or false
Null	`null`	Completely devoid of any value
Object		A software "thing" that is defined by its properties and methods (arrays are also objects)
Function		A function definition

A language that contains these few data types simplifies programming tasks, especially those involving what other languages consider to be incompatible types of numbers (integers versus real or floating-point values). In some definitions of syntax and parts of objects later in this book, I make specific reference to the type of value accepted in placeholders. When a string is required, any text inside a set of quotes suffices.

You will encounter situations, however, in which the value type may get in the way of a smooth script step. For example, if a user enters a number into a form's text input field, the browser stores that number as a string value type. If the script is to perform some arithmetic on that number, you must convert the string to a number before you can apply the value to any math operations. You see examples of this later in this lesson.

Variables

Cooking up a dish according to a recipe in the kitchen has one advantage over cooking up some data in a program. In the kitchen, you follow recipe steps and work with real things: carrots, milk, or a salmon fillet. A computer, on the other hand, follows a list of instructions to work with data. Even if the data represents something that looks real, such as the text entered into a form's input field, once the value gets into the program, you can no longer reach out and touch it.

In truth, the data that a program works with is merely a collection of bits (on and off states) in your computer's memory. More specifically, data in a JavaScript-enhanced Web page occupies parts of the computer's memory set aside for exclusive use by the browser software. In the olden days, programmers had to know the numeric address in memory (RAM) where a value was stored to retrieve a copy of it for, say, some addition. Although the innards of a program have that level of complexity, programming languages such as JavaScript shield you from it.

The most convenient way to work with data in a script is to first assign the data to a *variable*. It's usually easier to think of a variable as a basket that holds information. How long the variable holds the information depends on a number of factors. But the instant a Web page clears the window (or frame), any variables it knows about are immediately discarded.

Creating a variable

You have a couple of ways to create a variable in JavaScript, but one covers you properly in all cases. Use the `var` keyword, followed by the name you want to give that variable. Therefore, to *declare* a new variable called `myAge`, the JavaScript statement is

```
var myAge
```

That statement lets the browser know that you can use that variable later to hold information or to modify any of the data in that variable.

To assign a value to a variable, use one of the *assignment operators*. The most common one by far is the equal sign. If I want to assign a value to the `myAge` variable at the same time I declare it (a combined process known as *initializing the variable*), I use that operator in the same statement as the `var` keyword:

```
var myAge = 45
```

On the other hand, if I declare a variable in one statement and later want to assign a value to it, the sequence of statements is

```
var myAge
myAge = 45
```

Use the `var` keyword **only for declaration or initialization**—once for the life of any variable name in a document.

A JavaScript variable can hold any value type. Unlike many other languages, you don't have to tell JavaScript during variable declaration what type of value the variable will hold. In fact, the value type of a variable can change during the execution of a program. (This flexibility drives experienced programmers crazy because they're accustomed to assigning both a data type and a value to a variable.)

Variable names

Choose the names you assign to variables with care. You'll often find scripts that use vague variable names, such as single letters. Other than a few specific times where using letters is a common practice (for example, using `i` as a counting variable in repeat loops in Chapter 7), I recommend using names that truly describe a variable's contents. This practice can help you follow the state of your data through a long series of statements or jumps, especially for complex scripts.

A number of restrictions help instill good practice in assigning names. First, you cannot use any reserved keyword as a variable name. That includes all keywords currently used by the language and all others held in reserve for future versions of JavaScript. The designers of JavaScript, however, cannot foresee every keyword that the language may need in the future. By using the kind of single words that currently appear in the list of reserved keywords (see Appendix B), you always run a risk of a future conflict.

To complicate matters, a variable name cannot contain space characters. Therefore, one-word variable names are fine. Should your description really benefit from more than one word, you can use one of two conventions to join multiple words as one. One convention is to place an underscore character between the words; the other is to start the combination word with a lowercase letter and capitalize the first letter of each subsequent word within the name — I refer to this as the *interCap format*. Both of the following examples are valid variable names:

```
my_age
myAge
```

My preference is for the second version. I find it easier to type as I write JavaScript code and easier to read later. In fact, because of the potential conflict with future keywords, using multiword combinations for variable names is a good idea. Multiword combinations are less likely to appear in the reserved word list.

Variable names have a couple of other important restrictions. Avoid all punctuation symbols except for the underscore character. Also, the first character of a variable name cannot be a numeral. If these restrictions sound familiar, it's because they're identical to those for HTML element identifiers described in Chapter 5.

Expressions and Evaluation

Another concept closely related to the value and variable is *expression evaluation* — perhaps the most important concept of learning how to program a computer.

We use expressions in our everyday language. Remember the theme song of *The Beverly Hillbillies*?

Then one day he was shootin' at some food

And up through the ground came a-bubblin' crude

Oil that is. Black gold. Texas tea.

At the end of the song, you find four quite different references ("crude," "oil," "black gold," and "Texas tea"). They all mean oil. They're all *expressions* for oil. Say any one of them and other people know what you mean. In our minds, we *evaluate* those expressions to mean one thing: oil.

In programming, a variable always evaluates to its contents, or value. For example, after assigning a value to a variable, such as

```
var myAge = 45
```

anytime the variable is used in a statement, its value (45) is automatically applied to whatever operation that statement calls. Therefore, if you're 15 years my junior, I can assign a value to a variable representing your age based on the evaluated value of `myAge`:

```
var yourAge = myAge - 15
```

The variable, `yourAge`, evaluates to 30 the next time the script uses it. If the `myAge` value changes later in the script, the change has no link to the `yourAge` variable because `myAge` evaluated to 45 when it was used to assign a value to `yourAge`.

Expressions in script1.htm

You probably didn't recognize it at the time, but you saw how expression evaluation came in handy in your first script of Chapter 3. Recall the second `document.write()` statement:

```
document.write(" of " + navigator.appName + ".")
```

The `document.write()` method (remember, JavaScript uses the term *method* to mean *command*) requires a parameter in parentheses: the text string to be displayed on the Web page. The parameter here consists of one expression that joins three distinct strings:

```
" of "
navigator.appName
"."
```

The plus symbol is one of JavaScript's ways of joining strings. Before JavaScript can display this line, it must perform some quick evaluations. The first evaluation is the value of the `navigator.appName` property. This property evaluates to a string of the name of your browser. With that expression safely evaluated to a string, JavaScript can finish the job of joining the three strings in the final evaluation. That evaluated string expression is what ultimately appears on the Web page.

Expressions and variables

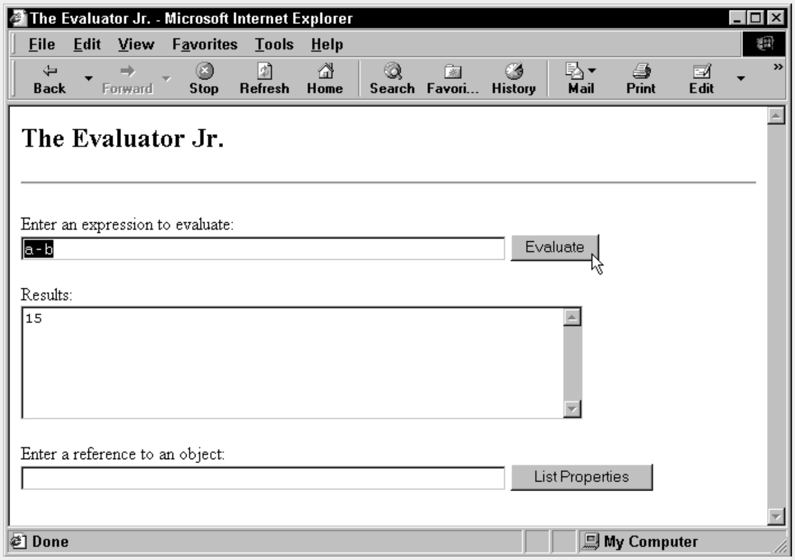
As one more demonstration of the flexibility that expression evaluation offers, this section shows you a slightly different route to the `document.write()` statement. Rather than join those strings as the direct parameter to the `document.write()` method, I can gather the strings in a variable and then apply the variable to the `document.write()` method. Here's how that method looks, as I simultaneously declare a new variable and assign it a value:

```
var textToWrite = " of " + navigator.appName + "."
document.write(textToWrite)
```

This method works because the variable, `textToWrite`, evaluates to the combined string. The `document.write()` method accepts that string value and does its display job. As you read a script or try to work through a bug, pay special attention to how each expression (variable, statement, object property) evaluates. I guarantee that as you learn JavaScript (or any language), you will end up scratching your head from time to time because you haven't stopped to examine how expressions evaluate when a particular kind of value is required in a script.

Testing Evaluation in Navigator

You can begin experimenting with the way JavaScript evaluates expressions with the help of The Evaluator Jr. (seen in the following figure), an HTML page you can find on the companion CD-ROM. (I introduce the Senior version in Chapter 13.) Enter any JavaScript expression into the top text box, and either press Enter/Return or click the Evaluate button.



The Evaluator Jr. has 26 variables (lowercase `a` through `z`) predefined for you. Therefore, you can assign values to variables, test comparison operators, and even do math here. Using the age variable examples from earlier in this chapter, type each of the following statements into the upper text box and observe how each expression evaluates in the Results field. Be sure to observe case-sensitivity in your entries.

```
a = 45
a
b = a - 15
b
a - b
a > b
```

To start over, click the Refresh/Reload button.

Data Type Conversions

I mentioned earlier that the type of data in an expression can trip up some script operations if the expected components of the operation are not of the right type. JavaScript tries its best to perform internal conversions to head off such problems, but JavaScript cannot read your mind. If your intentions differ from the way JavaScript treats the values, you won't get the results you expect.

A case in point is adding numbers that may be in the form of text strings. In a simple arithmetic statement that adds two numbers together, you get the expected result:

```
3 + 3          // result = 6
```

But if one of those numbers is a string, JavaScript leans toward converting the other value to a string—thus turning the plus sign's action from arithmetic addition to joining strings. Therefore, in the statement

```
3 + "3"        // result = "33"
```

the "string-ness" of the second value prevails over the entire operation. The first value is automatically converted to a string, and the result joins the two strings. Try this yourself in The Evaluator Jr.

If I take this progression one step further, look what happens when another number is added to the statement:

```
3 + 3 + "3"    // result = "63"
```

This might seem totally illogical, but there is logic behind this result. The expression is evaluated from left to right. The first plus operation works on two numbers, yielding a value of 6. But as the 6 is about to be added to the "3," JavaScript lets the "string-ness" of the "3" rule. The 6 is converted to a string, and two string values are joined to yield "63."

Most of your concern about data types will focus on performing math operations like the ones here. However, some object methods also require one or more parameters of particular data types. While JavaScript provides numerous ways to convert data from one type to another, it is appropriate at this stage of the tutorial to introduce you to the two most common data conversions: string to number and number to string.

Converting strings to numbers

As you saw in the last section, if a numeric value is stored as a string—as it is when entered into a form text field—your scripts will have difficulty applying that value to a math operation. The JavaScript language provides two built-in functions to convert string representations of numbers to true numbers: `parseInt()` and `parseFloat()`.

There is a difference between integers and floating-point numbers in JavaScript. *Integers* are always whole numbers, with no decimal point or numbers to the right of a decimal. *Floating-point numbers*, on the other hand, can have fractional values to the right of the decimal. By and large, JavaScript math operations don't differentiate between integers and floating-point numbers: A number is a number. The only time you need to be cognizant of the difference is when a method parameter requires an integer because it can't handle fractional values. For example, parameters to the `scroll()` method of a window require integer values of the number of pixels vertically and horizontally you want to scroll the window. That's because you can't scroll a window a fraction of a pixel on the screen.

To use either of these conversion functions, insert the string value you wish to convert as a parameter to the function. For example, look at the results of two different string values when passed through the `parseInt()` function:

```
parseInt("42")        // result = 42
parseInt("42.33")     // result = 42
```

Even though the second expression passes the string version of a floating-point number to the function, the value returned by the function is an integer. No rounding of the value occurs here (although other math functions can help with that if necessary). The decimal and everything to its right are simply stripped off.

The `parseFloat()` function returns an integer if it can; otherwise, it returns a floating-point number as follows:

```
parseFloat("42")       // result = 42
parseFloat("42.33")    // result = 42.33
```

Because these two conversion functions evaluate to their results, you simply insert the entire function wherever you need a string value converted to a number. Therefore, modifying an earlier example in which one of three values was a string, the complete expression can evaluate to the desired result:

```
3 + 3 + parseInt("3")  // result = 9
```

Converting numbers to strings

You'll have less need for converting a number to its string equivalent than the other way around. As you saw in the previous section, JavaScript gravitates toward strings when faced with an expression containing mixed data types. Even so, it is good practice to perform data type conversions explicitly in your code to prevent any potential ambiguity. The simplest way to convert a number to a string is to take advantage of JavaScript's string tendencies in addition operations. By adding an empty string to a number, you convert the number to its string equivalent:

```
("" + 2500)           // result = "2500"
("" + 2500).length    // result = 4
```

In the second example, you can see the power of expression evaluation at work. The parentheses force the conversion of the number to a string. A *string* is a JavaScript object that has properties associated with it. One of those properties is the `length` property, which evaluates to the number of characters in the string. Therefore, the length of the string "2500" is 4. Note that the length value is a number, not a string.

Operators

You will use lots of *operators* in expressions. Earlier, you used the equal sign (=) as an assignment operator to assign a value to a variable. In the preceding examples with strings, you used the plus symbol (+) to join two strings. An operator generally performs some kind of calculation (operation) or comparison with two values (the value on each side of an operator is called an *operand*) to reach a third value. In this lesson, I briefly describe two categories of operators — arithmetic and comparison. Chapter 40 covers many more operators, but once you understand the basics here, the others are easier to grasp.

Arithmetic operators

It may seem odd to talk about text strings in the context of "arithmetic" operators, but you have already seen the special case of the plus (+) operator when one or more of the operands is a string. The plus operator instructs JavaScript to *concatenate* (pronounced kon-KAT-en-eight), or join, two strings together precisely where you place the operator. The string concatenation operator doesn't know about words and spaces, so the programmer must make sure that any two strings to be joined have the proper word spacing as part of the strings — even if that means adding a space:

```
firstName = "John"
lastName = "Doe"
fullName = firstName + " " + lastName
```

JavaScript uses the same plus operator for arithmetic addition. When both operands are numbers, JavaScript knows to treat the expression as an arithmetic addition rather than a string concatenation. The standard math operators for addition, subtraction, multiplication, and division (+, -, *, /) are built into JavaScript.

Comparison operators

Another category of operator helps you compare values in scripts — whether two values are the same, for example. These kinds of comparisons return a value of the Boolean type — `true` or `false`. Table 6-2 lists the comparison operators. The operator that tests whether two items are equal consists of a pair of equal signs to distinguish it from the single equal sign assignment operator.

Table 6-2 JavaScript Comparison Operators

Symbol	*Description*
`==`	Equals
`!=`	Does not equal
`>`	Is greater than
`>=`	Is greater than or equal to
`<`	Is less than
`<=`	Is less than or equal to

Where comparison operators come into greatest play is in the construction of scripts that make decisions as they run. A cook does this in the kitchen all the time: If the sauce is too watery, add a bit of flour. You see comparison operators in action in the next chapter.

Exercises

1. Which of the following are valid variable declarations or initializations? Explain why each one is or is not valid. If an item is invalid, how do you fix it so that it is?

   a. `my_name = "Cindy"`

   b. `var how many = 25`

   c. `var zipCode = document.form1.zip.value`

   d. `var 1address = document.nameForm.address1.value`

2. For each of the statements in the following sequence, write down how the `someVal` expression evaluates after the statement executes in JavaScript.

```
var someVal = 2
someVal = someVal + 2
someVal = someVal * 10
someVal = someVal + "20"
someVal = "Robert"
```

3. Name the two JavaScript functions that convert strings to numbers. How do you give the function a string value to convert to a number?

4. Type and load the HTML page and script shown in Listing 6-1. Enter a three-digit number into the top two fields and click the Add button. Examine the code and explain what is wrong with the script. How do you fix the script so the proper sum is displayed in the output field?

Listing 6-1: **What's Wrong with This Page?**

```
<HTML>
<HEAD>
<TITLE>Sum Maker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function addIt() {
    var value1 = document.adder.inputA.value
    var value2 = document.adder.inputB.value
    document.adder.output.value = value1 + value2
}
// -->
</SCRIPT>
</HEAD>
```

```
<BODY>
<FORM NAME="adder">
<INPUT TYPE="text" NAME="inputA" VALUE="0" SIZE=4><BR>
<INPUT TYPE="text" NAME="inputB" VALUE="0" SIZE=4>
<INPUT TYPE="button" VALUE="Add" onClick="addIt()">
<P>____________</P>
<INPUT TYPE="text" NAME="output" SIZE=6> <BR>
</FORM>
</BODY>
</HTML>
```

5. What does the term *concatenate* mean in the context of JavaScript programming?

✦ ✦ ✦

CHAPTER 7

Programming Fundamentals, Part II

✦ ✦ ✦ ✦

In This Chapter

How control structures make decisions

How to define functions

Where to initialize variables efficiently

What those darned curly braces are all about

The basics of data arrays

✦ ✦ ✦ ✦

Your tour of programming fundamentals continues in this chapter with subjects that have more intriguing possibilities. For example, I show you how programs make decisions and why a program must sometimes repeat statements over and over. Before you're finished here, you will learn how to use one of the most powerful information holders in the JavaScript language: the array.

Decisions and Loops

Every waking hour of every day you make decisions of some kind — most of the time you probably don't even realize it. Don't think so? Well, look at the number of decisions you make at the grocery store, from the moment you enter the store to the moment you clear the checkout aisle.

No sooner do you enter the store than you are faced with a decision. Based on the number and size of items you intend to buy, do you pick up a hand-carried basket or attempt to extricate a shopping cart from the metallic conga line near the front of the store? That key decision may have impact later when you see a special offer on an item that is too heavy to put into the hand basket.

Next, you head for the food aisles. Before entering an aisle, you compare the range of goods stocked in that aisle against items on your shopping list. If an item you need is likely to be found in this aisle, you turn into the aisle and start looking for the item; otherwise, you skip the aisle and move to the head of the next aisle.

Later, you reach the produce section in search of a juicy tomato. Standing in front of the bin of tomatoes, you begin inspecting them one by one — picking one up, feeling its firmness, checking the color, looking for blemishes or signs of pests. You discard one, pick up another, and continue this process until one matches the criteria you set in your mind for an acceptable morsel. Your last stop in the store is the checkout aisle. "Paper or plastic?" the clerk asks. One more decision to make. What you choose impacts how you get the groceries from the car to the kitchen as well as your recycling habits.

In your trip to the store, you go through the same kinds of decisions and repetitions that your JavaScript programs also encounter. If you understand these frameworks in real life, you can now look into the JavaScript equivalents and the syntax required to make them work.

Control Structures

In the vernacular of programming, the kinds of statements that make decisions and loop around to repeat themselves are called *control structures*. A control structure directs the execution flow through a sequence of script statements based on simple decisions and other factors.

An important part of a control structure is the condition. Just as you may travel different routes to work depending on certain conditions (for example, nice weather, nighttime, attending a soccer game), so, too, does a program sometimes have to branch to an execution route if a certain condition exists. Each condition is an expression that evaluates to `true` or `false`—one of those Boolean data types mentioned in Chapter 6. The kinds of expressions commonly used for conditions are expressions that include a comparison operator. You do the same in real life: If it is true that the outdoor temperature is less than freezing, then you put on a coat before going outside. In programming, however, the comparisons are strictly comparisons of number or string values.

JavaScript provides several kinds of control structures for different programming situations. Three of the most common control structures you'll use are `if` constructions, `if...else` constructions, and `for` loops.

Chapter 39 covers in great detail other common control structures you should know, some of which were introduced only in Navigator 4 and Internet Explorer 4. For this tutorial, however, you need to learn about the three common ones just mentioned.

if constructions

The simplest program decision is to follow a special branch or path of the program if a certain condition is true. Formal syntax for this construction follows. Items in italics get replaced in a real script with expressions and statements that fit the situation.

```
if (condition) {
    statement[s] if true
}
```

Don't worry about the curly braces yet. Instead, get a feel for the basic structure. The keyword, `if`, is a must. In the parentheses goes an expression that evaluates to a Boolean value. This is the condition being tested as the program runs past this point. If the condition evaluates to `true`, then one or more statements inside the curly braces execute before continuing on with the next statement after the closing brace. If the condition evaluates to `false`, then the statements inside the curly brace are ignored and processing continues with the next statement after the closing brace.

The following example assumes that a variable, `myAge`, has had its value set earlier in the script (exactly how is not important for this example). The condition expression compares the value `myAge` against a numeric value of 18.

```
if (myAge < 18) {
    alert("Sorry, you cannot vote.")
}
```

The data type of the value inside `myAge` must be a number so that the proper comparison (via the `<` comparison operator) does the right thing. For all instances of `myAge` less than 18, the nested statement inside the curly braces runs and displays the alert to the user. After the user closes the alert dialog box, the script continues with whatever statement follows the entire `if` construction.

if . . . else constructions

Not all program decisions are as simple as the one shown for the `if` construction. Rather than specifying one detour for a given condition, you might want the program to follow either of two branches depending on that condition. It is a fine, but important, distinction. In the plain `if` construction, no special processing is performed when the condition evaluates to `false`. But if processing must follow one of two special paths, you need the `if...else` construction. The formal syntax definition for an `if...else` construction is as follows:

```
if (condition) {
    statement[s] if true
} else {
    statement[s] if false
}
```

Everything you know about the condition for an `if` construction applies here. The only difference is the `else` keyword, which provides an alternate path for execution to follow if the condition evaluates to `false`.

As an example, the following `if...else` construction determines how many days are in February for a given year. To simplify the demo, the condition simply tests whether the year divides equally by 4. (True testing for this value includes special treatment of end-of-century dates, but I'm ignoring that for now.) The `%` operator symbol is called the *modulus operator* (covered in more detail in Chapter 40). The result of an operation with this operator yields the remainder of division of the two values. If the remainder is zero, then the first value divides evenly by the second.

```
var febDays
var theYear = 1993
if (theYear % 4 == 0) {
    febDays = 29
} else {
    febDays = 28
}
```

The important point to see from this example is that by the end of the `if...else` construction, the `febDays` variable is set to either 28 or 29. No other value is possible. For years evenly divisible by 4, the first nested statement runs. For all other cases, the second statement runs. Processing then picks up with the next statement after the `if...else` construction.

About Repeat Loops

Repeat loops in real life generally mean the repetition of a series of steps until some condition is met, thus enabling you to break out of that loop. Such was the case earlier in this chapter when you looked through a bushel of tomatoes for the one that came closest to your ideal tomato. The same can be said for driving around the block in a crowded neighborhood until a parking space opens up.

A *repeat loop* lets a script cycle through a sequence of statements until some condition is met. For example, a JavaScript data validation routine might inspect every character that you enter into a form text field to make sure that each one is a number. Or if you have a collection of data stored in a list, the loop can check whether an entered value is in that list. Once that condition is met, the script can then break out of the loop and continue with the next statement after the loop construction.

The most common repeat loop construction used in JavaScript is called the `for` loop. It gets its name from the keyword that begins the construction. A `for` loop is a powerful device because you can set it up to keep track of the number of times the loop repeats itself. The formal syntax of the `for` loop is as follows:

```
for ([initial expression]; [condition]; [update expression]) {
    statement[s] inside loop
}
```

The square brackets mean that the item is optional. However, until you get to know the `for` loop better, I recommend designing your loops to utilize all three items inside the parentheses. The *initial expression* portion usually sets the starting value of a counter. The *condition*—the same kind of condition you saw for `if` constructions—defines the condition that forces the loop to stop going around and around. Finally, the *update expression* is a statement that executes each time all of the statements nested inside the construction complete running.

A common implementation initializes a counting variable, `i`, increments the value of `i` by one each time through the loop, and repeats the loop until the value of `i` exceeds some maximum value, as in the following:

```
for (var i = startValue; i <= maxValue; i++) {
    statement[s] inside loop
}
```

Placeholders `startValue` and `maxValue` represent any numeric values, including explicit numbers or variables holding numbers. In the update expression is an operator you have not seen yet. The ++ operator adds 1 to the value of `i` each time the update expression runs at the end of the loop. If `startValue` is 1, the value of `i` is 1 the first time through the loop, 2 the second time through, and so on. Therefore, if `maxValue` is 10, the loop repeats itself 10 times (in other words, as long as `i` is less than or equal to 10). Generally speaking, the statements inside the loop use the value of the counting variable in their execution. Later in this lesson, I show how the variable can play a key role in the statements inside a loop. At the same time, you see how to break out of a loop prematurely and why you may need to do this in a script.

Functions

In Chapter 5, you saw a preview of the JavaScript function. A *function* is a definition of a set of deferred actions. Functions are invoked by event handlers or by statements elsewhere in the script. Whenever possible, good functions are designed for reuse in other documents. They can become building blocks you use over and over again.

If you have programmed before, you can see parallels between JavaScript functions and other languages' subroutines. But unlike some languages that distinguish between procedures (which carry out actions) and functions (which carry out actions and return values), only one classification of routine exists for JavaScript. A function is capable of returning a value to the statement that invoked it, but this is not a requirement. However, when a function does return a value, the calling statement treats the function call like any expression — plugging in the returned value right where the function call is made. I will show some examples in a moment.

Formal syntax for a function is as follows:

```
function functionName ( [parameter1]...[,parameterN] ) {
    statement[s]
}
```

Names you assign to functions have the same restrictions as names you assign HTML elements and variables. You should devise a name that succinctly describes what the function does. I tend to use multiword names with the interCap (internally capitalized) format that start with a verb because functions are action items, even if they do nothing more than get or set a value.

Another practice to keep in mind as you start to create functions is to keep the focus of each function as narrow as possible. It is possible to generate functions that are literally hundreds of lines long. Such functions are usually difficult to maintain and debug. Chances are that you can divide the long function into smaller, more tightly focused segments.

Function parameters

In Chapter 5, you saw how an event handler invokes a function by calling the function by name. Any call to a function, including one that comes from another JavaScript statement, works the same way: a set of parentheses follows the function name.

You also can define functions so they receive parameter values from the calling statement. Listing 7-1 shows a simple document that has a button whose `onClick` event handler calls a function while passing text data to the function. The text string in the event handler call is in a *nested string* — a set of single quotes inside the double quotes required for the entire event handler attribute.

Listing 7-1: Calling a Function from an Event Handler

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function showMsg(msg) {
    alert("The button sent: " + msg)
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
    <INPUT TYPE="button" VALUE="Click Me"
    onClick="showMsg ('The button has been clicked!')">
</FORM>
</BODY>
</HTML>
```

Parameters (also known as *arguments*) provide a mechanism for "handing off" a value from one statement to another by way of a function call. If no parameters occur in the function definition, both the function definition and call to the function have only empty sets of parentheses (as shown in Chapter 5, Listing 5-8).

When a function receives parameters, it assigns the incoming values to the variable names specified in the function definition's parentheses. Consider the following script segment:

```
function sayHiToFirst(a, b, c) {
    alert("Say hello, " + a)
}
sayHiToFirst("Gracie", "George", "Harry")
sayHiToFirst("Larry", "Moe", "Curly")
```

After the function is defined in the script, the next statement calls that very function, passing three strings as parameters. The function definition automatically assigns the strings to variables `a`, `b`, and `c`. Therefore, before the `alert()` statement inside the function ever runs, `a` evaluates to "Gracie," `b` evaluates to "George," and `c` evaluates to "Harry." In the `alert()` statement, only the `a` value is used and the alert reads

```
Say hello, Gracie
```

When the user closes the first alert, the next call to the function occurs. This time through, different values are passed to the function and assigned to `a`, `b`, and `c`. The alert dialog box reads

```
Say hello, Larry
```

Unlike other variables that you define in your script, function parameters do not use the `var` keyword to initialize them. They are automatically initialized whenever the function is called.

Variable scope

Speaking of variables, it's time to distinguish between variables that are defined outside and those defined inside of functions. Variables defined outside of functions are called *global variables*; those defined inside functions are called *local variables*.

A global variable has a slightly different connotation in JavaScript than it has in most other languages. For a JavaScript script, the "globe" of a global variable is the current document loaded in a browser window or frame. Therefore, when you initialize a variable as a global variable, it means that all script statements in the page (including those inside functions) have direct access to that variable value. Statements can retrieve and modify global variables from anywhere in the page. In programming terminology, this kind of variable is said to have *global scope* because everything on the page can "see" it.

It is important to remember that the instant a page unloads itself, all global variables defined in that page are erased from memory. If you need a value to persist from one page to another, you must use other techniques to store that value (for example, as a global variable in a framesetting document, as described in Chapter 16; or in a cookie, as described in Chapter 18). While the `var` keyword is usually optional for initializing global variables, I strongly recommend you use it for all variable initializations to guard against future changes to the JavaScript language.

In contrast to the global variable, a local variable is defined inside a function. You already saw how parameter variables are defined inside functions (without `var` keyword initializations). But you can also define other variables with the `var` keyword (absolutely required for local variables). The scope of a local variable is only within the statements of the function. No other functions or statements outside of functions have access to a local variable.

Local scope allows for the reuse of variable names within a document. For most variables, I strongly discourage this practice because it leads to confusion and bugs that are difficult to track down. At the same time, it is convenient to reuse certain kinds of variable names, such as `for` loop counters. These are safe because they are always reinitialized with a starting value whenever a `for` loop starts. You cannot, however, nest a `for` loop inside another without specifying a different loop counting variable.

To demonstrate the structure and behavior of global and local variables — and show you why you shouldn't reuse most variable names inside a document — Listing 7-2 defines two global and two local variables. I intentionally use bad form by initializing a local variable that has the same name as a global variable.

Listing 7-2: **Global and Local Variable Scope Demonstration**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
var aBoy = "Charlie Brown"   // global
var hisDog = "Snoopy"        // global
function demo() {
    // using improper design to demonstrate a point
    var hisDog = "Gromit"    // local version of hisDog
    var output = hisDog + " does not belong to " + aBoy + ".<BR>"
    document.write(output)
}
```

Continued

Listing 7-2 *(continued)*

```
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
demo()        // runs as document loads
document.write(hisDog + " belongs to " + aBoy + ".")
</SCRIPT>
</BODY>
</HTML>
```

When the page loads, the script in the Head portion initializes the two global variables (`aBoy` and `hisDog`) and defines the `demo()` function in memory. In the Body, another script begins by invoking the function. Inside the function, a local variable is initialized with the same name as one of the global variables — `hisDog`. In JavaScript, such a local initialization overrides the global variable for all statements inside the function. (But note that if the `var` keyword is left off of the local initialization, the statement reassigns the value of the global version to "Gromit.")

Another local variable, `output`, is merely a repository for accumulating the text that is to be written to the screen. The accumulation begins by evaluating the local version of the `hisDog` variable. Then it concatenates some hard-wired text (note the extra spaces at the edges of the string segment). Next comes the evaluated value of the `aBoy` global variable — any global not overridden by a local is available for use inside the function. The expression is accumulating HTML to be written to the page, so it ends with a period and a `<BR>` tag. The final statement of the function writes the content to the page.

After the function completes its task, the next statement in the Body script writes another string to the page. Because this script statement is executing in global space (that is, not inside any function), it accesses only global variables — including those defined in another `<SCRIPT>` tag set in the document. By the time the complete page finishes loading, it contains the following text lines:

```
Gromit does not belong to Charlie Brown.
Snoopy belongs to Charlie Brown.
```

About Curly Braces

Despite the fact that you probably rarely — if ever — use curly braces (`{ }`) in your writing, there is no mystery to their usage in JavaScript (and many other languages). Curly braces enclose blocks of statements that belong together. While they do assist humans who are reading scripts in knowing what's going on, curly braces also help the browser to know which statements belong together. You always must use curly braces in matched pairs.

You use curly braces most commonly in function definitions and control structures. In the function definition in Listing 7-2, curly braces enclose four statements that make up the function definition (including the comment line). The closing brace lets the browser know that whatever statement comes next is a statement outside of the function definition.

Physical placement of curly braces is not critical (nor is the indentation style you see in the code I provide). The following function definitions are treated identically by scriptable browsers:

```
function sayHiToFirst(a, b, c) {
    alert("Say hello, " + a)
}

function sayHiToFirst(a, b, c)
{
    alert("Say hello, " + a)
}

function sayHiToFirst(a, b, c) {alert("Say hello, " + a)}
```

Throughout this book, I use the style shown in the first example because I find that it makes lengthy and complex scripts easier to read — especially scripts that have many levels of nested control structures.

Arrays

The JavaScript array is one of the most useful data constructions you have available to you. You can visualize the structure of a basic array as if it were a single-column spreadsheet. Each row of the column holds a distinct piece of data, and each row is numbered. Numbers assigned to rows are in strict numerical sequence, starting with zero as the first row (programmers always start counting with zero). This row number is called an *index*. To access an item in an array, you need to know the name of the array and the index for the row. Because index values start with zero, the total number of items of the array (as determined by the array's `length` property) is always one more than the highest index value of the array. More advanced array concepts enable you to create the equivalent of an array with multiple columns (described in Chapter 37). For this tutorial, I stay with the single-column basic array.

Data elements inside JavaScript arrays can be any data type, including objects. And, unlike a lot of other programming languages, different rows of the same JavaScript array can contain different data types.

Creating an array

An array is stored in a variable, so when you create an array you assign the new array object to the variable. (Yes, arrays are JavaScript objects, but they belong to the core JavaScript language rather than the document object model.) A special keyword — `new` — preceding a call to the JavaScript function that generates arrays creates space in memory for the array. An optional parameter to the `Array()` function enables you to specify at the time of creation how many elements (rows) of data eventually will occupy the array. JavaScript is very forgiving about this because you can change the size of an array at any time. Therefore, if you omit a parameter when generating a new array, your script incurs no penalty.

To demonstrate the array creation process, I create an array that holds the names of the 50 states plus the District of Columbia (a total of 51). The first task is to create that array and assign it to a variable of any name that helps me remember what this collection of data is about:

```
var USStates = new Array(51)
```

At this point, the USStates array is sitting in memory like a 51-row table with no data in it. To fill the rows, I must assign data to each row. Addressing each row of an array requires a special way of indicating the index value of the row: square brackets after the name of the array. The first row of the USStates array is addressed as

```
USStates[0]
```

To assign the string name of the first state of the alphabet to that row, I use a simple assignment operator:

```
USStates[0] = "Alabama"
```

To fill in the rest of the rows, I include a statement for each row:

```
USStates[1] = "Alaska"
USStates[2] = "Arizona"
USStates[3] = "Arkansas"
...
USStates[50] = "Wyoming"
```

Therefore, if you want to include a table of information in a document from which a script can look up information without accessing the server, you include the data in the document in the form of an array creation sequence. When the statements run as the document loads, by the time the document finishes loading into the browser, the data collection array is built and ready to go. Despite what appears to be the potential for a lot of statements in a document for such a data collection, the amount of data that must download for typical array collections is small enough not to severely impact page loading — even for dial-up users at 28.8 Kbps.

Accessing array data

The array index is the key to accessing an array element. The name of the array and an index in square brackets evaluates to the content of that array location. For example, after the USStates array is built, a script can display an alert with Alaska's name in it with the following statement:

```
alert("The largest state is " + USStates[1] + ".")
```

Just as you can retrieve data from an indexed array element, so can you change the element by reassigning a new value to any indexed element in the array.

Although I don't dwell on it in this tutorial, you can also use string names as index values instead of numbers. In essence, this enables you to create an array that has named labels for each row of the array — a definite convenience for certain circumstances. But whichever way you use to assign data to an array element, the first time dictates the way you must access that element thereafter in the page's scripts.

Parallel arrays

Now I show you why the numeric index methodology works well in JavaScript. To help with the demonstration, I generate another array that is parallel with the USStates array. This new array is also 51 elements long, and it contains the year in which the state in the corresponding row of `USStates` entered the Union. That array construction looks like the following:

```
var stateEntered = new Array(51)
stateEntered [0] = 1819
stateEntered [1] = 1959
stateEntered [2] = 1912
stateEntered [3] = 1836
...
stateEntered [50] = 1890
```

In the browser's memory, then, are two tables that you can visualize as looking like the model in Figure 7-1. I can build more arrays that are parallel to these for items such as the postal abbreviation and capital city. The important point is that the zeroth element in each of these tables applies to Alabama, the first state in the `USStates` array.

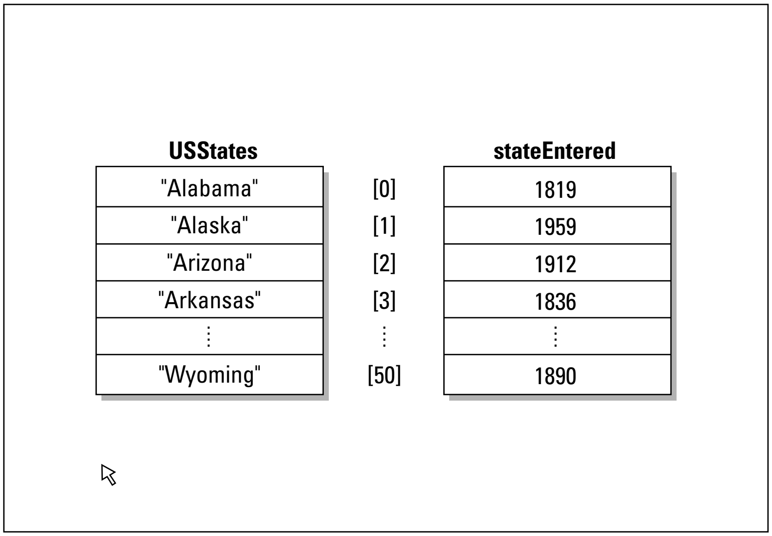


Figure 7-1: Visualization of two related parallel tables

If a Web page included these tables and a way for a user to look up the entry date for a given state, the page would need a way to look through all of the `USStates` entries to find the index value of the one that matches the user's entry. Then, that index value could be applied to the `stateEntered` array to find the matching year.

For this demo, the page includes a text entry field in which the user types the name of the state to look up. In a real application, this methodology is fraught with peril unless the script performs some error checking in case the user makes a mistake. But for now, I assume that the user always types a valid state name. (Don't ever make this assumption in your Web site's pages.) An event handler from either the text field or a clickable button calls a function that looks up the state name, fetches the corresponding entry year, and displays an alert message with the information. The function is as follows.

```
function getStateDate() {
    var selectedState = document.entryForm.entry.value
    for ( var i = 0; i < USStates.length; i++) {
        if (USStates[i] == selectedState) {
            break
        }
    }
    alert("That state entered the Union in " + stateEntered[i] + ".")
}
```

In the first statement of the function, I grab the value of the text box and assign the value to a variable, `selectedState`. This is mostly for convenience because I can use the shorter variable name later in the script. In fact, the usage of that value is inside a `for` loop, so the script is marginally more efficient because the browser doesn't have to evaluate that long reference to the text field each time through the loop.

The key to this function is in the `for` loop. Here is where I combine the natural behavior of incrementing a loop counter with the index values assigned to the two arrays. Specifications for the loop indicate that the counter variable, `i`, is initialized with a value of zero. The loop is directed to continue as long as the value of `i` is less than the length of the `USStates` array. Remember that the length of an array is always one more than the index value of the last item. Therefore, the last time the loop runs is when `i` is 50, which is both less than the length of 51 and equal to the index value of the last element. Each time after the loop runs, the counter increments by one.

Nested inside the `for` loop is an `if` construction. The condition it tests is the value of an element of the array against the value typed in by the user. Each time through the loop, the condition tests a different row of the array starting with row zero. In other words, this `if` construction can be performed dozens of times before a match is found, but each time the value of `i` is one larger than the previous try.

The equality comparison operator (==) is very strict when it comes to comparing string values. Such comparisons respect the case of each letter. In our example, the user must type the state name exactly as it is stored in the `USStates` array for the match to be found. In Chapter 10, you learn about some helper methods that eliminate case and sensitivity in string comparisons.

When a match is found, the statement nested inside the `if` construction runs. The `break` statement is designed to help control structures bail out if the program needs it. For this application, it is imperative that the `for` loop stop running when a match for the state name is found. When the `for` loop breaks, the value of the `i` counter is fixed at the row of the `USStates` array containing the entered state. I need that index value to find the corresponding entry in the other array. Even though the counting variable, `i`, is initialized in the `for` loop, it is still "alive" and in the scope of the function for all statements after the initialization. That's why I can use it to extract the value of the row of the `stateEntered` array in the final statement that displays the results in an alert message.

This application of a `for` loop and array indexes is a common one in JavaScript. Study the code carefully and be sure you understand how it works. This way of cycling through arrays plays a role not only in the kinds of arrays you create in your code, but also with the arrays that browsers generate for the document object model.

Document objects in arrays

If you look at the `document` object portions of the Quick Reference in Appendix A, you can see that the properties of some objects are listed with square brackets after them. These are, indeed, the same kind of square brackets you just saw for array indexes. That's because when a document loads, the browser creates arrays of like objects in the document. For example, if your page includes two `<FORM>` tag sets, then two forms appear in the document. The browser maintains an array of form objects for that document. References to those forms are

```
document.forms[0]
document.forms[1]
```

Index values for document objects are assigned according to the loading order of the objects. In the case of form objects, the order is dictated by the order of the `<FORM>` tags in the document. This indexed array syntax is another way to reference forms in an object reference. You can still use a form's name if you prefer — and I heartily recommend using object names wherever possible because even if you change the physical order of the objects in your HTML, references that use names still work without modification. But if your page contains only one form, you can use the reference types interchangeably, as in the following examples of equivalent references to a text field's `value` property in a form:

```
document.entryForm.entry.value
document.forms[0].entry.value
```

In examples throughout this book, you can see that I often use the array type of reference to simple forms in simple documents. But in my production pages, I almost always use named references.

Exercises

1. With your newly acquired knowledge of functions, event handlers, and control structures, use the script fragments from this chapter to complete the page that has the lookup table for all of the states and the years they entered into the Union. If you do not have a reference book for the dates, then use different year numbers starting with 1800 for each entry. In the page, create a text entry field for the state and a button that triggers the lookup in the arrays.

2. Examine the following function definition. Can you spot any problems with the definition? If so, how can you fix the problems?

```
function format(ohmage) {
    var result
    if ohmage >= 1e6 {
        ohmage = ohmage / 1e5
        result = ohmage + " Mohms"
    } else {
        if (ohmage >= 1e3)
            ohmage = ohmage / 1e2
            result = ohmage + " Kohms"
        else
            result = ohmage + " ohms"
}
alert(result)
```

3. Devise your own syntax for the scenario of looking for a ripe tomato at the grocery store, and write a `for` loop using that object and property syntax.
4. Modify Listing 7-2 so it does not reuse the `hisDog` variable inside the function.
5. Given the following table of data about several planets of our solar system, create a Web page that enables users to enter a planet name and, at the click of a button, have the distance and diameter appear either in an alert box or (as extra credit) in separate fields of the page.

Planet	***Distance from the Sun***	***Diameter***
Mercury	36 million miles	3,100 miles
Venus	67 million miles	7,700 miles
Earth	93 million miles	7,920 miles
Mars	141 million miles	4,200 miles

✦ ✦ ✦

CHAPTER 8

Window and Document Objects

✦ ✦ ✦ ✦

In This Chapter

What the `window` object does

How to access key `window` object properties and methods

How to trigger script actions after a document loads

The purposes of the `location` and `history` objects

How the `document` object is created

How to access key `document` object properties and methods

✦ ✦ ✦ ✦

Now that you have exposure to programming fundamentals, it is easier to demonstrate how to script objects in documents. Starting with this lesson, the tutorial turns back to the document object model, diving more deeply into each of the objects you will place in many of your documents.

Document Objects

As a refresher, study the lowest common denominator document object hierarchy in Figure 8-1. This chapter focuses on objects at or near the top of the hierarchy: `window`, `location`, `history`, and `document`. The goal is not only to equip you with the basics so you can script simple tasks, but also to prepare you for in-depth examinations of each object and its properties, methods, and event handlers in Part III of this book. I introduce only the basic properties, methods, and event handlers for objects in this tutorial — you can find far more in Part III. Examples in that part of the book assume you know the programming fundamentals covered in previous chapters.

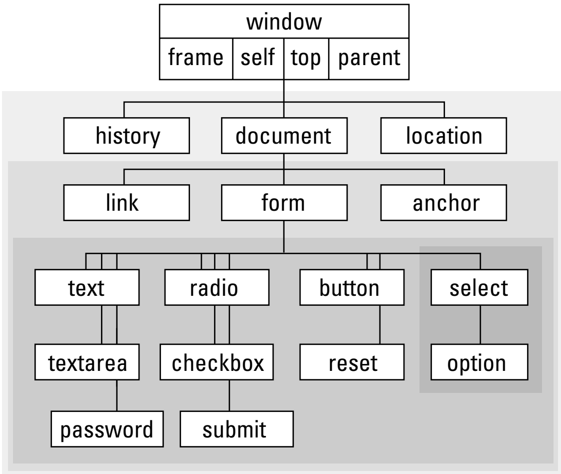


Figure 8-1: The lowest common denominator document object model for all scriptable browsers

The Window Object

At the very top of the document object hierarchy is the `window` object. This object gains that exalted spot in the object food chain because it is the master container for all content you view in the Web browser. As long as a browser window is open — even if no document is loaded in the window — the `window` object is defined in the current model in memory.

In addition to the content part of the window where documents go, a window's sphere of influence includes the dimensions of the window and all of the "stuff" that surrounds the content area. The area where scrollbars, toolbars, the status bar, and (non-Macintosh) menu bar live is known as a window's *chrome*. Not every browser has full scripted control over the chrome of the main browser window, but you can easily script the creation of additional windows sized the way you want and have only the chrome elements you wish to display in that subwindow.

Although the discussion about frames comes in Chapter 11, I can safely say now that each frame is also considered a `window` object. If you think about it, that makes sense because each frame can hold a different document. When a script runs in one of those documents, it regards the frame that holds the document as the `window` object in its view of the object hierarchy.

As you learn in this chapter, the `window` object is a convenient place for the document object model to attach methods that display modal dialog boxes and adjust the text that displays in the status bar at the bottom of the browser window. A `window` object method enables you to create a separate window that appears on the screen. When you look at all of the properties, methods, and event handlers defined for the window object (see Chapter 16), it should be clear why they are attached to window objects — visualize their scope and the scope of a browser window.

Accessing window properties and methods

You can word script references to properties and methods of the window object in several ways, depending more on whim and style than on specific syntactical requirements. The most logical and common way to compose such references includes the window object in the reference:

```
window.propertyName
window.methodName([parameters])
```

A window object also has a synonym when the script doing the referencing points to the window that houses the document. The synonym is self. Reference syntax then becomes

```
self.propertyName
self.methodName([parameters])
```

You can use these initial reference object names interchangeably, but I tend to reserve the use of self for more complex scripts that involve multiple frames and windows. The self moniker more clearly denotes the current window holding the script's document. It makes the script more readable — by me and by others.

Back in Chapter 4, I indicated that because the window object is always "there" when a script runs, you could omit it from references to any objects inside that window. Therefore, the following syntax models assume properties and methods of the current window:

```
propertyName
methodName([parameters])
```

In fact, as you will see in a few moments, some methods may be more understandable if you omit the window object reference. The methods run just fine either way.

Creating a window

A script does not create the main browser window. A user does that by virtue of launching the browser or by opening a URL or file from the browser's menus (if the window is not already open). But a script can generate any number of subwindows once the main window is open (and that window contains a document whose script needs to open subwindows).

The method that generates a new window is window.open(). This method contains up to three parameters that define window characteristics, such as the URL of the document to load, its name for TARGET attribute reference purposes in HTML tags, and physical appearance (size and chrome contingent). I don't go into the details of the parameters here (they're covered in great depth in Chapter 16), but I do want to expose you to an important concept involved with the window.open() method.

Consider the following statement that opens a new window to a specific size and with an HTML document from the same server directory that holds the current page:

```
var subWindow = window.open("define.html","def","HEIGHT=200,WIDTH=300")
```

The important thing to note about this statement is that it is an assignment statement. Something gets assigned to that variable `subWindow`. What is it? It turns out that when the `window.open()` method runs, it not only opens up that new window according to specifications set as parameters, but it also evaluates to a reference to that new window. In programming parlance, the method is said to *return a value*—in this case, a genuine object reference. The value returned by the method is assigned to the variable.

Your script can now use that variable as a valid reference to the second window. If you need to access one of its properties or methods, you must use that reference as part of the complete reference. For example, to close the subwindow from a script in the main window, use this reference to the `close()` method for that subwindow:

```
subWindow.close()
```

If you issue `window.close()`, `self.close()`, or just `close()` in the main window's script, the method closes the main window and not the subwindow. To address another window, then, you must include a reference to that window as part of the complete reference. This has an impact on your code because you probably want the variable holding the reference to the subwindow to be valid as long as the main document is loaded into the browser. For that to happen, the variable has to be initialized as a global variable, rather than inside a function (although you can set its value inside a function). That way, one function can open the window while another function closes it.

Listing 8-1 is a page that has a button for opening a blank, new window and closing that window from the main window. To view this demonstration, shrink your main browser window to less than full screen. Then when the new window is generated, reposition the windows so you can see the smaller, new window when the main window is in front. (If you "lose" a window behind another, use the browser's Window menu to choose the hidden window.) The key point of Listing 8-1 is that the `newWindow` variable is defined as a global variable so that both the `makeNewWindow()` and `closeNewWindow()` functions have access to it. When a variable is declared with no value assignment, its value is `null`. A `null` value is interpreted to be the same as `false` in a condition, while the presence of any non-zero value is the same as `true` in a condition. Therefore, in the `closeNewWindow()` function, the condition tests whether the window has been created before issuing the subwindow's `close()` method. Then, to clean up, the function sets the `newWindow` variable to `null` so that another click of the Close button doesn't try to close a nonexistent window.

Listing 8-1: **References to Window Objects**

```
<HTML>
<HEAD>
<TITLE>Window Opener and Closer</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var newWindow
function makeNewWindow() {
    newWindow = window.open("","","HEIGHT=300,WIDTH=300")
}
function closeNewWindow() {
    if (newWindow) {
        newWindow.close()
        newWindow = null
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="button" VALUE="Create New Window" onClick="makeNewWindow()">
<INPUT TYPE="button" VALUE="Close New Window" onClick="closeNewWindow()">
</FORM>
</BODY>
</HTML>
```

Window Properties and Methods

The one property and three methods for the `window` object described in this section have an immediate impact on user interaction. They work with all scriptable browsers. You can find extensive code examples in Part III for each property and method. You can also experiment with the one-statement script examples by entering them in the top text box of The Evaluator Jr. (from Chapter 6).

window.status property

The status bar at the bottom of the browser window normally displays the URL of a link when you roll the mouse pointer atop it. Other messages also appear in that space during document loading, Java applet initialization, and the like. However, you can use JavaScript to display your own messages in the status bar at times that may be beneficial to your users. For example, rather than display the URL of a link, you can display a friendlier, plain-language description of the page at the other end of the link (or a combination of both to accommodate both newbies and geeks).

You can assign the `window.status` property some other text at any time. To change the status bar text of a link as the cursor hovers atop the link, you trigger the action with an `onMouseOver` event handler of a link object. A peculiarity of the `onMouseOver` event handler for setting the status bar is that an additional statement — `return true` — must be part of the event handler. This is very rare in JavaScript, but it is required here for your script to successfully override the status bar.

Due to the simplicity of setting the `window.status` property, it is most common for the script statements to run as inline scripts in the event handler definition. This is handy for short scripts because you don't have to specify a separate function or add `<SCRIPT>` tags to your page. You simply add the script statements to the `<A>` tag:

```
<A HREF="http://home.netscape.com" onMouseOver=
"window.status='Visit the Netscape Home page (home.netscape.com)'; return true">
Netscape</A>
```

Look closely at the script statements assigned to the `onMouseOver` event handler. The two statements are

```
window.status='Visit the Netscape Home page (home.netscape.com)'
return true
```

When you run these as inline scripts, you must separate the two statements with a semicolon. (The space after the semicolon is optional, but often improves readability.) Equally important, the entire set of statements is surrounded by double quotes (" . . . "). To nest the string being assigned to the `window.status` property inside the double-quoted script, you surround the string with single quotes (' . . . '). You get a big payoff for a little bit of script when you set the status bar. The downside is that scripting this property is how those awful status bar scrolling banners are created. Yech!

window.alert() method

I have already used the `alert()` method many times so far in this tutorial. This window method generates a dialog box that displays whatever text you pass as a parameter (see Figure 8-2). A single OK button (whose label you cannot change) enables the user to dismiss the alert.

The appearance of this and two other JavaScript dialog boxes (described next) has changed since the first scriptable browsers. In older browser versions (as shown in Figure 8-2), the browser inserted words clearly indicating that the dialog box was a "JavaScript Alert." Different browsers display different title bars whose content cannot be altered by script. You can change only the other message content.

All three dialog box methods are good cases for using a `window` object's methods without the reference to the window. Even though the `alert()` method is technically a `window` object method, no special relationship exists between the dialog box and the window that generates it. In production scripts, I usually use the shortcut reference:

```
alert("This is a JavaScript alert dialog.")
```

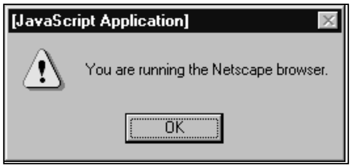


Figure 8-2: A JavaScript alert dialog box (old style)

window.confirm() method

The second style of dialog box presents two buttons (Cancel and OK in most versions on most platforms) and is called a confirm dialog box (see Figure 8-3). More importantly, this is one of those methods that returns a value: `true` if the user clicks OK, `false` if the user clicks Cancel. You can use this dialog box and its returned value as a way to have a user make a decision about how a script progresses.

Figure 8-3: A JavaScript confirm dialog box (IE5/Win32 style)

Because the method always returns a Boolean value, you can use the evaluated value of the entire method as a condition statement in an `if` or `if...else` construction. For example, in the following code fragment, the user is asked about starting the application over. Doing so causes the default page of the site to load into the browser.

```
if (confirm("Are you sure you want to start over?")) {
    location.href = "index.html"
}
```

window.prompt() method

The final dialog box of the `window` object, the prompt dialog box (see Figure 8-4), displays a message that you set and provides a text field for the user to enter a response. Two buttons, Cancel and OK, enable the user to dismiss the dialog box with two opposite expectations: canceling the entire operation or accepting the input typed into the dialog box.

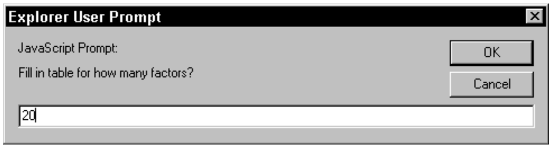


Figure 8-4: A JavaScript prompt dialog box (IE5/Win32 style)

The `window.prompt()` method has two parameters. The first is the message that acts as a prompt to the user. You can suggest a default answer in the text field by including a string as the second parameter. If you don't want any default answer to appear, then include an empty string (two double quotes without any space between them).

This method returns one value when the user clicks either button. A click of the Cancel button returns a value of `null`, regardless of what the user types into the field. A click of the OK button returns a string value of the typed entry. Your scripts can use this information in conditions for `if` and `if...else` constructions. A value of `null` is treated as `false` in a condition. It turns out that an empty string is also treated as `false`. Therefore, a condition can easily test for the presence of real characters typed into the field to simplify a condition test, as shown in the following fragment:

```
var answer = prompt("What is your name?","")
if (answer) {
    alert("Hello, " + answer + "!")
}
```

The only time the `alert()` method is called is when the user enters something into the prompt dialog box and clicks the OK button.

onLoad event handler

The `window` object reacts to several system and user events, but the one you will probably use most often is the event that fires as soon as everything in a page finishes loading. This event waits for images, Java applets, and data files for plug-ins to download fully to the browser. It can be dangerous to script access to elements of a document object while the page loads because if the object has not loaded yet (perhaps due to a slow network connection or server), a script error results. The advantage of using the `onLoad` event to invoke functions is that you are assured that all document objects are in the browser's document object model. All window event handlers are placed inside the `<BODY>` tag. Even though you will come to associate the `<BODY>` tag's attributes with the `document` object's properties, it is the `window` object's event handlers that go inside the tag.

The Location Object

Sometimes an object in the hierarchy represents something that doesn't seem to have the kind of physical presence that a window or a button does. That's the case with the `location` object. This object represents the URL loaded into the window.

This differs from the `document` object (discussed later in this lesson) because the document is the real content; the location is simply the URL.

Unless you are truly Web-savvy, you may not realize a URL consists of many components that define the address and method of data transfer for a file. Pieces of a URL include the protocol (such as `http:`) and the hostname (such as `www.giantco.com`). You can access all of these items as properties of the `location` object. For the most part, though, your scripts will be interested in only one property: the `href` property, which defines the complete URL.

Setting the `location.href` property is the primary way your scripts navigate to other pages:

```
location.href = "http://www.dannyg.com"
```

You can generally navigate to a page in your own Web site by specifying a relative URL (that is, relative to the currently loaded page) rather than the complete URL with protocol and host information. For pages outside of the domain of the current page, you need to specify the complete URL.

If the page to be loaded is in another window or frame, the window reference must be part of the statement. For example, if your script opens a new window and assigns its reference to a variable named `newWindow`, the statement that loads a page into the subwindow is

```
newWindow.location.href = "http://www.dannyg.com"
```

The History Object

Another object that doesn't have a physical presence on the page is the `history` object. Each window maintains a list of recent pages that the browser has visited. While the `history` object's list contains the URLs of recently visited pages, those URLs are not generally accessible by script due to privacy and security limits imposed by browsers. But methods of the `history` object allow for navigating backward and forward through the history relative to the currently loaded page. You can find details in Chapter 17.

The Document Object

The `document` object holds the real content of the page. Properties and methods of the `document` object generally affect the look and content of the document that occupies the window. Only more recent browsers (IE4+ and NN6+) allow script access to the text contents of a page once the document has loaded. However, as you saw in your first script of Chapter 3, the `document.write()` method lets a script dynamically create content as the page loads. A great many of the `document` object's properties are established by attributes of the `<BODY>` tag. Many other properties are arrays of other objects in the document.

Accessing a `document` object's properties and methods is straightforward, as shown in the following syntax examples:

```
[window.]document.propertyName
[window.]document.methodName([parameters])
```

The `window` reference is optional when the script is accessing the `document` object that contains the script. If you want a preview of the `document` object properties of the browser you're using, enter `document` into the bottom text box of The Evaluator Jr. and press Enter/Return. The object's properties and current values appear in the Results box.

document.forms[] property

One of the object types contained by a document is the FORM element object. Because conceivably there can be more than one form in a document, forms are stored as arrays in the `document.forms[]` property. As you recall from the discussion of arrays in Chapter 7, an index number inside the square brackets points to one of the elements in the array. To find out how many `FORM` objects are in the current document, use

```
document.forms.length
```

To access the first form in a document, for example, the reference is

```
document.forms[0]
```

In general, however, I recommend that you access a form by way of a name you assign to the form in its `NAME` attribute, as in

```
document.formName
```

Either methodology reaches the same object. When a script needs to reference elements inside a form, the complete address to that object must include `document` and form references.

document.title property

Not every property of a `document` object is set in a `<BODY>` tag attribute. If you assign a title to the page in the `<TITLE>` tag set within the Head portion, that title text is reflected by the `document.title` property. A document's title is mostly a cosmetic setting that gives a plain-language name of the page appearing in the browser's title bar, as well as the user's history listing and bookmark of your page.

document.write() method

The `document.write()` method operates in both immediate scripts to create content in a page as it loads and in deferred scripts that create new content in the same or different window. The method requires one string parameter, which is the HTML content to write to the window or frame. Such string parameters can be variables or any other expressions that evaluate to a string. Very often, the written content includes HTML tags.

Bear in mind that after a page loads, the browser's *output stream* is automatically closed. After that, any `document.write()` method issued to the current page opens a new stream that immediately erases the current page (along with any variables or other values in the original document). Therefore, if you wish to replace the current page with script-generated HTML, you need to accumulate that HTML in a variable and perform the writing with just one `document.write()` method. You don't have to explicitly clear a document and open a new data stream; one `document.write()` call does it all.

One last piece of housekeeping advice about the `document.write()` method involves its companion method, `document.close()`. Your script must close the output stream when it finishes writing its content to the window (either the same window or another). After the last `document.write()` method in a deferred script, be sure to include a `document.close()` method. Failure to do this may cause images and forms not to appear. Also, any `document.write()` method invoked later will only append to the page, rather than clear the existing content to write anew. To demonstrate the `document.write()` method, I show two versions of the same application. One writes to the same document that contains the script; the other writes to a separate window. Type in each document in a new text editor document, save it with an `.html` file name extension, and open it in your browser.

Listing 8-2 creates a button that assembles new HTML content for a document, including HTML tags for a new document title and color attribute for the `<BODY>` tag. An operator in the listing that may be unfamiliar to you is +=. It appends a string on its right side to whatever string is stored in the variable on its left side. This operator is a convenient way to accumulate a long string across several separate statements. With the content gathered in the `newContent` variable, one `document.write()` statement blasts the entire new content to the same document, obliterating all vestiges of the content of Listing 8-2. The `document.close()` statement, however, is required to close the output stream properly. When you load this document and click the button, notice that the document title in the browser's title bar changes accordingly. As you click back to the original and try the button again, notice that the dynamically written second page loads much faster than even a reload of the original document.

Listing 8-2: **Using document.write() on the Current Window**

```
<HTML>
<HEAD>
<TITLE>Writing to Same Doc</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function reWrite() {
    // assemble content for new window
    var newContent = "<HTML><HEAD><TITLE>A New Doc</TITLE></HEAD>"
    newContent += "<BODY BGCOLOR='aqua'><H1>This document is brand new.</H1>"
    newContent += "Click the Back button to see original document."
    newContent += "</BODY></HTML>"
    // write HTML to new window document
    document.write(newContent)
    document.close() // close layout stream
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="button" VALUE="Replace Content" onClick="reWrite()">
</FORM>
</BODY>
</HTML>
```

In Listing 8-3, the situation is a bit more complex because the script generates a subwindow to which is written an entirely script-generated document. To keep the reference to the new window alive across both functions, the `newWindow` variable is declared as a global variable. As soon as the page loads, the `onLoad` event handler invokes the makeNewWindow() function. This function generates a blank subwindow. I added a property to the third parameter of the window.open() method that instructs the status bar of the subwindow to appear.

A button in the page invokes the subWrite() method. The first task it performs is to check the closed property of the subwindow. This property (which exists only in newer browser versions) returns true if the referenced window is closed. If that's the case (if the user manually closed the window), the function invokes the makeNewWindow() function again to reopen that window.

With the window open, new content is assembled as a string variable. As with Listing 8-2, the content is written in one blast (although that isn't necessary for a separate window), followed by a close() method. But notice an important difference: both the write() and close() methods explicitly specify the subwindow.

Listing 8-3: Using document.write() on Another Window

```
<HTML>
<HEAD>
<TITLE>Writing to Subwindow</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var newWindow
function makeNewWindow() {
    newWindow = window.open("","","status,height=200,width=300")
}

function subWrite() {
    // make new window if someone has closed it
    if (newWindow.closed) {
        makeNewWindow()
    }
    // bring subwindow to front
    newWindow.focus()
    // assemble content for new window
    var newContent = "<HTML><HEAD><TITLE>A New Doc</TITLE></HEAD>"
    newContent += "<BODY BGCOLOR='coral'><H1>This document is brand new.</H1>"
    newContent += "</BODY></HTML>"
    // write HTML to new window document
    newWindow.document.write(newContent)
    newWindow.document.close() // close layout stream
}
</SCRIPT>
</HEAD>
<BODY onLoad="makeNewWindow()">
<FORM>
<INPUT TYPE="button" VALUE="Write to Subwindow" onClick="subWrite()">
</FORM>
</BODY>
</HTML>
```

The Link Object

Belonging to the document object in the hierarchy is the link object. A link object is the object model equivalent of an <A> tag when the tag includes an HREF attribute. A document can have any number of links, so references to links (if necessary) are usually made via the array index method:

```
document.links[n].propertyName
```

More commonly, though, links are not scripted. However, there is an important JavaScript component to these objects. When you want to click a link to execute a script rather than navigate directly to another URL, you can redirect the HREF attribute to call a script function. The technique involves a pseudo-URL called the javascript: URL. If you place the name of a function after the javascript: URL, then a scriptable browser runs that function. So as not to mess with the minds of users, the function should probably perform some navigation in the end. However, the script can do other things as well, such as simultaneously changing the content of two frames within a frameset.

The syntax for this construction in a link is as follows:

```
<A HREF="javascript:void functionName([parameter1]...[parameterN])">...</A>
```

The void keyword prevents the link from trying to display any value that the function may return. Remember this javascript: URL technique for all tags that include HREF and SRC attributes: If an attribute accepts a URL, it can accept this javascript: URL as well. This can come in handy as a way to script actions for client-side image maps that don't necessarily navigate anywhere, but which cause something to happen on the page just the same.

The next logical step past the document level in the object hierarchy is the form. That's where you will spend the next lesson.

Exercises

1. Which of the following references are valid and which are not? Explain what is wrong with the invalid references.

   a. `window.document.form[0]`

   b. `self.entryForm.entryField.value`

   c. `document.forms[2].name`

   d. `entryForm.entryField.value`

   e. `newWindow.document.write("Howdy")`

2. Write the JavaScript statement that displays a message in the status bar welcoming visitors to your Web page.

3. Write the JavaScript statement that displays the same message to the document as an `<H1>`-level headline on the page.
4. Create a page that prompts the user for his or her name as the page loads (via a dialog box) and then welcomes the user by name in the body of the page.
5. Create a page with any content you like, but one that automatically displays a dialog box after the page loads to show the user the URL of the current page.

✦ ✦ ✦

CHAPTER 9

Forms and Form Elements

In This Chapter

What the FORM object represents

How to access key FORM object properties and methods

How text, button, and SELECT objects work

How to submit forms from a script

How to pass information from form elements to functions

Most interactivity between a Web page and the user takes place inside a form. That's where a lot of the interactive HTML stuff lives for every browser: text fields, buttons, checkboxes, option lists, and so on. As you can tell from the (by now) familiar basic object hierarchy diagram (refer back to Figure 8-1), a form is always contained by a document. Even so, the `document` object must be part of the reference to the form and its elements.

The FORM Object

A FORM object can be referenced either by its position in the array of forms contained by a document or by name (if you assign an identifier to the `NAME` attribute inside the `<FORM>` tag). If only one form appears in the document, it is still a member of an array (a one-element array) and is referenced as follows:

```
document.forms[0]
```

Notice that the array reference uses the plural version of the word, followed by a set of square brackets containing the index number of the element (zero is always first). But if you assign a name to the form, simply plug the form's name into the reference:

```
document.formName
```

Form as object and container

In the simplified, compatible object model of this tutorial, a form has a relatively small set of properties, methods, and event handlers. Almost all of the properties are the same as the attributes for forms. All scriptable versions of Navigator, and most versions of Internet Explorer, allow scripts to change these properties under script control, which gives your scripts potentially significant power to direct the behavior of a form submission in response to user selections on the page.

A form is contained by a document, and the form in turn contains any number of elements (sometimes called *form controls*). All of those interactive elements that enable users to enter information or make selections belong to the `form` object. This relationship mirrors the HTML tag organization in which items such as `<INPUT>` tags are nested between the `<FORM>` and `</FORM>` tag "bookends."

Accessing form properties

Forms are created entirely from standard HTML tags in the page. You can set attributes for `NAME`, `TARGET`, `ACTION`, `METHOD`, and `ENCTYPE`. Each of these is a property of a FORM object, accessed by all lowercase versions of those words, as in

```
document.forms[0].action
document.formName.action
```

To change any of these properties, simply assign new values to them:

```
document.forms[0].action = "http://www.giantco.com/cgi/login.pl"
```

form.elements[] property

In addition to keeping track of each type of element inside a form, the browser also maintains a list of all control elements within a form. This list is another array, with items listed according to the order in which their HTML tags appear in the source code. It is generally more efficient to create references to elements directly, using their names. However, sometimes a script needs to look through all of the elements in a form. This is especially true if the content of a form changes with each loading of the page because the number of text fields changes based on the user's browser type. (For example, a script on the page uses `document.write()` to add an extra text box for information required only from Windows users.)

The following code fragment shows the `form.elements[]` property at work in a `for` repeat loop that looks at every element in a form to set the contents of text fields to an empty string. The script cannot simply barge through the form and set every element's content to an empty string because some elements may be buttons, which don't have a `value` property that you can set to an empty string.

```
var form = window.document.forms[0]
for (var i = 0; i < form.elements.length; i++) {
    if (form.elements[i].type == "text") {
        form.elements[i].value = ""
    }
}
```

In the first statement, I create a variable — `form` — that holds a reference to the first form of the document. I do this so that when I make many references to form elements later in the script, the typical length of each reference is much shorter (and marginally faster). I can use the `form` variable as a shortcut to building references to items more deeply nested in the form.

Next, I start looping through the items in the `elements` array for the form. Each form element has a `type` property, which reveals what kind of form element it is:

text, button, radio, checkbox, and so on. I'm interested in finding elements whose type is `text`. For each of those, I set the `value` property to an empty string.

I return to forms later in this chapter to show you how to submit a form without a Submit button and how client-side form validation works.

Form Controls as Objects

Three kinds of HTML elements nested inside a `<FORM>` tag become scriptable objects in all browser document object models. Most of the objects owe their existence to the `<INPUT>` tag in the page's source code. Only the value assigned to the `TYPE` attribute of an `<INPUT>` tag determines whether the element is a text box, password entry field, hidden field, button, checkbox, or radio button. The other two kinds of form controls, TEXTAREA and SELECT, have their own tags.

While form controls have several properties in common, some properties are unique to a particular control type or related types. For example, only a SELECT object offers a property that reveals which item in its list is currently selected. But checkbox and radio buttons both have a property that indicates whether the control is currently set to "on." Similarly, all text-oriented controls operate the same way for reading and modifying their content.

Having a good grasp of the scriptable features of form control objects is important to your success with JavaScript. In the next sections, you meet the most important form control objects and see how scripts interact with them.

Text-related objects

Each of the four text-related HTML form elements — text, password, hidden, and TEXTAREA — is an element in the document object hierarchy. All but the hidden object display themselves in the page, enabling users to enter information. These objects also display text information that changes in the course of using a page (although Dynamic HTML in IE4+ and NN6+ also allows the scripted change of body text in a document).

To make these objects scriptable in a page, you do nothing special to their normal HTML tags — with the possible exception of assigning a `NAME` attribute. I strongly recommend assigning unique names to every form control element if your scripts will be getting or setting properties or invoking their methods. Besides, if the form is actually submitted to a server program, the `NAME` attributes must be assigned in order for the server to process the element's data.

For the visible objects in this category, event handlers are triggered from many user actions, such as giving a field focus (getting the text insertion pointer in the field) and changing text (entering new text and leaving the field). Most of your text field actions are triggered by the change of text (the `onChange` event handler). In IE and NN version 4 browsers and later, event handlers fire in response to individual keystrokes as well.

Without a doubt, the single most used property of a text-related element is the `value` property. This property represents the current contents of the text element. A script can retrieve and set its content at any time. Content of the `value` property

Text Object Behavior

Many scripters look to JavaScript to solve what are perceived as shortcomings or behavioral anomalies with text-related objects in forms. I want to single these out early in your scripting experience so that they do not confuse you later.

First, only the most recent browsers let scripts reliably alter the font, font size, font style, and text alignment of a text object's content. You can access changes through the element's style-related properties (Chapter 30).

Second, most browser forms practice a behavior that was recommended long ago as an informal standard by Web pioneers. When a form contains only one text INPUT object, a press of the Enter/Return key while the text object has focus automatically submits the form. For two or more fields in browsers other than IE5/Mac, you need another way to submit the form (for example, a Submit button). This one-field submission scheme works well in many cases, such as the search page of most Web search sites. But if you are experimenting with simple forms containing only one field, you can submit the form with a press of the Enter/Return key. Submitting a form that has no other action or target specified means the page performs an unconditional reload—wiping out any information entered into the form. You can, however, cancel the submission through an `onSubmit` event handler in the form, as shown later in this chapter. Also, starting with version 4 browsers, you can script the press of the Enter/Return key in any text field to submit a form (see Chapter 29).

is always a string. This may require conversion to numbers (see Chapter 6) if text fields are used to enter values for some math operations.

To demonstrate how a text field's `value` property can be read and written, Listing 9-1 provides a complete HTML page with a single-entry field. Its `onChange` event handler invokes the `upperMe()` function, which converts the text to uppercase. In the `upperMe()` function, the first statement assigns the text object reference to a more convenient variable: `field`. A lot goes on in the second statement of the function. The right side of the assignment statement performs a couple of key tasks. The reference to the `value` property of the object (`field.value`) evaluates to whatever content is in the text field at that instant. That string is then handed over to one of JavaScript's string functions, `toUpperCase()`, which converts the value to uppercase. The evaluated result of the right side statement is then assigned to the second variable: `upperCaseVersion`. Nothing has changed yet in the text box. That comes in the third statement where the `value` property of the text box is assigned whatever the `upperCaseVersion` variable holds. The need for the second statement is more for learning purposes, so you can see the process more slowly. In practice, you can combine the actions of steps two and three into one power-packed statement:

```
field.value = field.value.toUpperCase()
```

Listing 9-1: **Getting and Setting a Text Object's value Property**

```
<HTML>
<HEAD>
<TITLE>Text Object value Property</TITLE>
```

```
<SCRIPT LANGUAGE="JavaScript">
function upperMe() {
    var field = document.forms[0].converter
    var upperCaseVersion = field.value.toUpperCase()
    field.value = upperCaseVersion
}
</SCRIPT>
</HEAD>
<BODY>
<FORM onSubmit="return false">
<INPUT TYPE="text" NAME="converter" VALUE="sample" onChange="upperMe()">
</FORM>
</BODY>
</HTML>
```

Later in this chapter, I show you how to reduce even further the need for explicit references in functions such as `upperMe()` in Listing 9-1. In the meantime, notice for a moment the `onSubmit` event handler in the `<FORM>` tag. I delve more deeply into this event handler later in this chapter, but I want to point out the construction that prevents a single-field form from being submitted when you press the Enter key.

The Button Object

I have used the button INPUT element in many examples up to this point in the tutorial. The button is one of the simplest objects to script. In the simplified object model of this tutorial, the button object has only a few properties that are rarely accessed or modified in day-to-day scripts. Like the text object, the visual aspects of the button are governed not by HTML or scripts, but by the operating system and browser that the page visitor uses. By far, the most useful event handler of the button object is the `onClick` event handler. It fires whenever the user clicks the button. Simple enough. No magic here.

The Checkbox Object

A checkbox is also a simple element of the FORM object, but some of the properties may not be intuitive entirely. Unlike the `value` property of a plain button object (the text of the button label), the `value` property of a checkbox is any other text you want associated with the object. This text does not appear on the page in any fashion, but the property (initially set via the `VALUE` tag attribute) might be important to a script that wants to know more about the purpose of the checkbox within the form.

The key property of a checkbox object is whether or not the box is checked. The `checked` property is a Boolean value: `true` if the box is checked, `false` if not. When you see that a property is a Boolean value, it's a clue that the value might be usable in an `if` or `if...else` condition expression. In Listing 9-2, the value of the checked property determines which alert box the user sees.

Listing 9-2: The Checkbox Object's checked Property

```
<HTML>
<HEAD>
<TITLE>Checkbox Inspector</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function inspectBox() {
    if (document.forms[0].checkThis.checked) {
        alert("The box is checked.")
    } else {
        alert("The box is not checked at the moment.")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="checkbox" NAME="checkThis">Check here<BR>
<INPUT TYPE="button" VALUE="Inspect Box" onClick="inspectBox()">
</FORM>
</BODY>
</HTML>
```

Checkboxes are generally used as preferences setters, rather than as action inducers. While a checkbox object has an `onClick` event handler, a click of a checkbox should never do anything drastic, such as navigate to another page.

The Radio Object

Setting up a group of radio objects for scripting requires a bit more work. To let the browser manage the highlighting and unhighlighting of a related group of buttons, you must assign the same name to each of the buttons in the group. You can have multiple groups within a form, but each member of the same group must have the same name.

Assigning the same name to a form element forces the browser to manage the elements differently than if they each had a unique name. Instead, the browser maintains an array list of objects with the same name. The name assigned to the group becomes the name of the array. Some properties apply to the group as a whole; other properties apply to individual buttons within the group and must be addressed via array index references. For example, you can find out how many buttons are in a group by reading the `length` property of the group:

```
document.forms[0].groupName.length
```

If you want to find out if a particular button is currently highlighted — via the same checked property used for the checkbox — you must access the button element individually:

```
document.forms[0].groupName[0].checked
```

Listing 9-3 demonstrates several aspects of the radio button object, including how to look through a group of buttons to find out which one is checked and how to use the VALUE attribute and corresponding property for meaningful work.

The page includes three radio buttons and a plain button. Each radio button's VALUE attribute contains the full name of one of the Three Stooges. When the user clicks the button, the onClick event handler invokes the fullName() function. In that function, the first statement creates a shortcut reference to the form. Next, a for repeat loop looks through all of the buttons in the stooges radio button group. An if construction looks at the checked property of each button. When a button is highlighted, the break statement bails out of the for loop, leaving the value of the i loop counter at the number where the loop broke ranks. The alert dialog box then uses a reference to the value property of the ith button so that the full name can be displayed in the alert.

Listing 9-3: **Scripting a Group of Radio Objects**

```
<HTML>
<HEAD>
<TITLE>Extracting Highlighted Radio Button</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function fullName() {
    var form = document.forms[0]
    for (var i = 0; i < form.stooges.length; i++) {
        if (form.stooges[i].checked) {
            break
        }
    }
    alert("You chose " + form.stooges[i].value + ".")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<B>Select your favorite Stooge:</B>
<INPUT TYPE="radio" NAME="stooges" VALUE="Moe Howard" CHECKED>Moe
<INPUT TYPE="radio" NAME="stooges" VALUE="Larry Fine" >Larry
<INPUT TYPE="radio" NAME="stooges" VALUE="Curly Howard" >Curly<BR>
<INPUT TYPE="button" NAME="Viewer" VALUE="View Full Name..."
onClick="fullName()">
</FORM>
</BODY>
</HTML>
```

As you learn about form elements in later chapters of this book, the browser's tendency to create arrays out of identically named objects of the same type (except for Internet Explorer 3) can be a benefit to scripts that work with, say, columns of fields in an HTML order form.

The SELECT Object

The most complex form element to script is the SELECT element object. As you can see from the lowest common denominator object hierarchy diagram (Figures 4-6 or 8-1), the SELECT object is really a compound object: an object that contains an array of OPTION objects. Moreover, you can establish this object in HTML to display itself as either a pop-up list or a scrolling list — the latter configurable to accept multiple selections by users. For the sake of simplicity at this stage, this lesson focuses on deployment as a pop-up list that allows only single selections.

Some properties belong to the entire SELECT object; others belong to individual options inside the SELECT object. If your goal is to determine which item the user selects, you must use properties of both the SELECT and OPTION objects.

The most important property of the SELECT object itself is the `selectedIndex` property, accessed as follows:

```
document.form[0].selectName.selectedIndex
```

This value is the index number of the currently selected item. As with most index counting schemes in JavaScript, the first item (the one at the top of the list) has an index of zero. The `selectedIndex` value is critical for enabling you to access properties of the selected option. Two important properties of an option item are `text` and `value`, accessed as follows:

```
document.forms[0].selectName.options[n].text
document.forms[0].selectName.options[n].value
```

The `text` property is the string that appears onscreen in the SELECT object. It is unusual for this information to be exposed as a FORM object property because in the HTML that generates a SELECT object, the text is defined outside of the `<OPTION>` tag. But inside the `<OPTION>` tag, you can set a `VALUE` attribute, which, like the radio buttons shown earlier, enables you to associate some hidden string information with each visible entry in the list.

To read the `value` or `text` property of a selected option most efficiently, you can use the SELECT object's `selectedIndex` property as an index value to the option. References for this kind of operation get pretty long, so take the time to understand what's happening here. In the following function, the first statement creates a shortcut reference to the SELECT object. The `selectedIndex` property of the SELECT object is then substituted for the `index` value of the `options` array of that same object:

```
function inspect() {
    var list = document.forms[0].choices
    var chosenItemText = list.options[list.selectedIndex].text
}
```

To bring a SELECT object to life, use the `onChange` event handler. As soon as a user makes a new selection in the list, this event handler runs the script associated with that event handler (except for Windows versions of Navigator 2, whose `onChange` event handler doesn't work for SELECT objects). Listing 9-4 shows a common application for a SELECT object. Its text entries describe places to go in and out of a Web site, while the `VALUE` attributes hold the URLs for those locations.

When a user makes a selection in the list, the `onChange` event handler triggers a script that extracts the `value` property of the selected option and assigns that value to the `location` object to effect the navigation. Under JavaScript control, this kind of navigation doesn't need a separate Go button on the page.

Listing 9-4: **Navigating with a SELECT Object**

```
<HTML>
<HEAD>
<TITLE>Select Navigation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function goThere() {
    var list = document.forms[0].urlList
    location = list.options[list.selectedIndex].value
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Choose a place to go:
<SELECT NAME="urlList" onChange="goThere()">
    <OPTION SELECTED VALUE="index.html">Home Page
    <OPTION VALUE="store.html">Shop Our Store
    <OPTION VALUE="policies.html">Shipping Policies
    <OPTION VALUE="http://www.yahoo.com">Search the Web
</SELECT>
</FORM>
</BODY>
</HTML>
```

Note

Internet Explorer and NN6 expose the `value` property of the selected option item as the `value` property of the SELECT object. While this is certainly a logical and convenient shortcut, for compatibility reasons you should use the long way shown in Listing 9-4.

There is much more to the SELECT object, including the ability to change the contents of a list in newer browsers. Chapter 26 covers the object in depth.

Passing Form Data and Elements to Functions

In all of the examples so far in this lesson, when an event handler invokes a function that works with form elements, the form or form element is explicitly referenced in the function. But valuable shortcuts do exist for transferring information about the form or form control directly to the function without dealing with those typically long references that start with the `window` or `document` object level.

JavaScript features a keyword — `this` — that always refers to whatever object contains the script in which the keyword is used. Thus, in an `onChange` event handler for a text field, you can pass a reference to the text object to the function by inserting the `this` keyword as a parameter to the function:

```
<INPUT TYPE="text" NAME="entry" onChange="upperMe(this)">
```

At the receiving end, the function defines a parameter variable that turns that reference into a variable that the rest of the function can use:

```
function upperMe(field) {
 statement[s]
}
```

The name you assign to the function's parameter variable is purely arbitrary, but it is helpful to give it a name that expresses what the reference is. Importantly, this reference is a "live" connection back to the object. Therefore, statements in the script can get and set property values of the object at will.

For other functions, you may wish to receive a reference to the entire form, rather than just the object calling the function. This is certainly true if the function needs to access other elements of the same form. To pass the entire form, you reference the `form` property of the INPUT object, still using the `this` keyword:

```
<INPUT TYPE="button" VALUE="Click Here" onClick="inspect(this.form)">
```

The function definition should then have a parameter variable ready to be assigned to the form object reference. Again, you decide the name of the variable. I tend to use the variable name `form` as a way to remind me exactly what kind of object is referenced.

```
function inspect(form) {
    statement[s]
}
```

Listing 9-5 demonstrates passing both an individual form element and the entire form in the performance of two separate acts. This page makes believe it is connected to a database of Beatles songs. When you click the Process Data button, it passes the `form` object, which the `processData()` function uses to access the group of radio buttons inside a `for` loop. Additional references using the passed `form` object extract the `value` properties of the selected radio button and the text field.

The text field has its own event handler, which passes just the text field to the `verifySong()` function. Notice how short the reference is to reach the `value` property of the song field inside the function.

Listing 9-5: **Passing a Form Object and Form Element to Functions**

```
<HTML>
<HEAD>
<TITLE>Beatle Picker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function processData(form) {
    for (var i = 0; i < form.Beatles.length; i++) {
        if (form.Beatles[i].checked) {
            break
        }
    }
```

```
    // assign values to variables for convenience
    var beatle = form.Beatles[i].value
    var song = form.song.value
    alert("Checking whether " + song + " features " + beatle + "...")
}

function verifySong(entry) {
    var song = entry.value
    alert("Checking whether " + song + " is a Beatles tune...")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="return false">
Choose your favorite Beatle:
<INPUT TYPE="radio" NAME="Beatles" VALUE="John Lennon" CHECKED>John
<INPUT TYPE="radio" NAME="Beatles" VALUE="Paul McCartney">Paul
<INPUT TYPE="radio" NAME="Beatles" VALUE="George Harrison">George
<INPUT TYPE="radio" NAME="Beatles" VALUE="Ringo Starr">Ringo<P>

Enter the name of your favorite Beatles song:<BR>
<INPUT TYPE="text" NAME="song" VALUE = "Eleanor Rigby"
onChange="verifySong(this)"><P>
<INPUT TYPE="button" NAME="process" VALUE="Process Request..."
onClick="processData(this.form)">
</FORM>
</BODY>
</HTML>
```

Get to know the usage of the `this` keyword in passing `form` and `form element` objects to functions. The technique not only saves you typing in your code, but it also ensures accuracy in references to those objects.

Submitting and Prevalidating Forms

If you have worked with Web pages and forms before, you are familiar with how simple it is to add a Submit-style button that sends the form to your server. However, design goals for your page may rule out the use of ugly system-generated buttons. If you'd rather display a pretty image, the link tag surrounding that image should use the `javascript:` URL technique to invoke a script that submits the form (the image type of `INPUT` element is not recognized prior to IE4 and NN6).

The scripted equivalent of submitting a form is the FORM object's `submit()` method. All you need in the statement is a reference to the form and this method:

```
document.forms[0].submit()
```

One limitation might inhibit your plans to secretly have a script send you an e-mail message from every visitor who comes to your Web site. If the form's `ACTION` attribute is set to a `mailTo:` URL, JavaScript does not pass along the `submit()` method to the form. See Chapter 23 for cautions about using the `mailTo:` URL as a form's action.

Before a form is submitted, you may wish to perform some last-second validation of data in the form or in other scripting (for example, changing the form's `action` property based on user choices). You can do this in a function invoked by the form's `onSubmit` event handler. Specific validation routines are beyond the scope of this tutorial (but are explained in substantial detail in Chapter 43), but I want to show you how the `onSubmit` event handler works.

In all but the first generation of scriptable browsers from Microsoft (IE3) and Netscape (NN2), you can let the results of a validation function cancel a submission if the validation shows some incorrect data or empty fields. To control submission, the `onSubmit` event handler must evaluate to `return true` (to allow submission to continue) or `returnfalse` (to cancel submission). This is a bit tricky at first because it involves more than just having the function called by the event handler return `true` or `false`. The `return` keyword must be part of the final evaluation.

Listing 9-6 shows a page with a simple validation routine that ensures all fields have something in them before allowing submission to continue. (The form has no `ACTION` attribute, so this sample form doesn't get sent to the server.) Notice how the `onSubmit` event handler (which passes a reference to the FORM object as a parameter — in this case the `this` keyword points to the FORM object because its tag holds the event handler) includes the `return` keyword before the function name. When the function returns its `true` or `false` value, the event handler evaluates to the requisite `return true` or `return false`.

Listing 9-6: **Last-Minute Checking Before Form Submission**

```
<HTML>
<HEAD>
<TITLE>Validator</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkForm(form) {
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].value == "") {
            alert("Fill out ALL fields.")
            return false
        }
    }
    return true
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="return checkForm(this)">
Please enter all requested information:<BR>
First Name:<INPUT TYPE="text" NAME="firstName"><BR>
Last Name:<INPUT TYPE="text" NAME="lastName"><BR>
Rank:<INPUT TYPE="text" NAME="rank"><BR>
Serial Number:<INPUT TYPE="text" NAME="serialNumber"><BR>

<INPUT TYPE="submit">
</FORM>
</BODY>
</HTML>
```

One quirky bit of behavior involving the `submit()` method and `onSubmit` event handler needs explanation. While you might think (and logically so, in my opinion) that the `submit()` method would be the exact scripted equivalent of a click of a real Submit button, it's not. In Navigator, the `submit()` method does not cause the form's `onSubmit` event handler to fire at all. If you want to perform validation on a form submitted via the `submit()` method, invoke the validation in the script function that ultimately calls the `submit()` method.

So much for the basics of forms and form elements. In the next chapter, you step away from HTML for a moment to look at more advanced JavaScript core language items: strings, math, and dates.

Exercises

1. Rework Listings 9-1, 9-2, 9-3, and 9-4 so that the script functions all receive the most efficient form or form element references from the invoking event handler.

2. Modify Listing 9-6 so that instead of the Submit button making the submission, the submission is performed from a hyperlink. Be sure to include the form validation in the process.

3. In the following HTML tag, what kind of information do you think is being passed with the event handler? Write a function that displays in an alert dialog box the information being passed.

```
<INPUT TYPE="text"NAME="phone" onChange="format(this.value)">
```

4. A document contains two forms named `specifications` and `accessories`. In the `accessories` form is a field named `acc1`. Write two different statements that set the contents of that field to `Leather Carrying Case`.

5. Create a page that includes a SELECT object to change the background color of the current page. The property that you need to set is `document.bgColor`, and the three values you should offer as options are `red`, `yellow`, and `green`. In the SELECT object, the colors should display as `Stop`, `Caution`, and `Go`. Note: If you use a Macintosh or UNIX version of Navigator, you must employ version 4 or later for this exercise.

✦ ✦ ✦

CHAPTER 10

Strings, Math, and Dates

In This Chapter

How to modify strings with common string methods

When and how to use the `Math` object

How to use the `Date` object

For most of the lessons in the tutorial so far, the objects at the center of attention belong to the document object model. But as indicated in Chapter 2, a clear dividing line exists between the document object model and the JavaScript language. The language has some of its own objects that are independent of the document object model. These objects are defined such that if a vendor wished to implement JavaScript as the programming language for an entirely different kind of product, the language would still use these core facilities for handling text, advanced math (beyond simple arithmetic), and dates. You can find formal specifications of these objects in the ECMA-262 recommendation.

Core Language Objects

It is often difficult for newcomers to programming — or even experienced programmers who have not worked in object-oriented worlds before — to think about objects, especially when attributed to "things" that don't seem to have a physical presence. For example, it doesn't require lengthy study to grasp the notion that a button on a page is an object. It has several physical properties that make perfect sense. But what about a string of characters? As you learn in this chapter, in an object-based environment such as JavaScript, everything that moves is treated as an object — each piece of data from a Boolean value to a date. Each such object probably has one or more properties that help define the content; such an object may also have methods associated with it to define what the object can do or what you can do to the object.

I call all objects that are not part of the document object model *core language objects*. You can see the full complement of them in the Quick Reference in Appendix A. In this chapter, I focus on the `String`, `Math`, and `Date` objects.

String Objects

You have already used `String` objects many times in earlier lessons. A *string* is any text inside a quote pair. A quote pair consists of either double quotes or single quotes. This allows one string to nest inside another, as often happens in event handlers. In the following example, the `alert()` method requires a quoted string as a parameter, but the entire method call also must be inside quotes.

```
onClick="alert('Hello, all')"
```

JavaScript imposes no practical limit on the number of characters that a string can hold. However, most older browsers have a limit of 255 characters in length for a script statement. This limit is sometimes exceeded when a script includes a lengthy string that is to become scripted content in a page. You need to divide such lines into smaller chunks using techniques described in a moment.

You have two ways to assign a string value to a variable. The simplest is a basic assignment statement:

```
var myString = "Howdy"
```

This works perfectly well except in some exceedingly rare instances. Beginning with Navigator 3 and Internet Explorer 4, you can also create a string object using the more formal syntax that involves the `new` keyword and a constructor function (that is, it "constructs" a new object):

```
var myString = new String("Howdy")
```

Whichever way you use to initialize a variable with a string, the variable receiving the assignment can respond to all `String` object methods.

Joining strings

Bringing two strings together as a single string is called *concatenating* strings, a term you learned in Chapter 6. String concatenation requires one of two JavaScript operators. Even in your first script in Chapter 3, you saw how the addition operator (+) linked multiple strings together to produce the text dynamically written to the loading Web page:

```
document.write(" of <B>" + navigator.appName + "</B>.")
```

As valuable as that operator is, another operator can be even more scripter friendly. This operator is helpful when you are assembling large strings in a single variable. The strings may be so long or cumbersome that you need to divide the building process into multiple statements. The pieces may be combinations of *string literals* (strings inside quotes) or variable values. The clumsy way to do it (perfectly doable in JavaScript) is to use the addition operator to append more text to the existing chunk:

```
var msg = "Four score"
msg = msg + " and seven"
msg = msg + " years ago,"
```

But another operator, called the *add-by-value operator*, offers a handy shortcut. The symbol for the operator is a plus and equal sign together (+=). This operator means "append the stuff on the right of me to the end of the stuff on the left of me." Therefore, the preceding sequence is shortened as follows:

```
var msg = "Four score"
msg += " and seven"
msg += " years ago,"
```

You can also combine the operators if the need arises:

```
var msg = "Four score"
msg += " and seven" + " years ago"
```

I use the add-by-value operator a lot when accumulating HTML text to be written to the current document or another window.

String methods

Of all the core JavaScript objects, the `String` object has the most diverse collection of methods associated with it. Many methods are designed to help scripts extract segments of a string. Another group, rarely used in my experience, wraps a string with one of several style-oriented tags (a scripted equivalent of tags for font size, style, and the like).

To use a string method, the string being acted upon becomes part of the reference followed by the method name. All methods return a value of some kind. Most of the time, the returned value is a converted version of the string object referred to in the method call — but the original string is still intact. To capture the modified version, you need to assign the results of the method to a variable:

```
var result = string.methodName()
```

The following sections introduce you to several important string methods available to all browser brands and versions.

Changing string case

Two methods convert a string to all uppercase or lowercase letters:

```
var result = string.toUpperCase()
var result = string.toLowerCase()
```

Not surprisingly, you must observe the case of each letter of the method names if you want them to work. These methods come in handy when your scripts need to compare strings that may not have the same case (for example, a string in a lookup table compared with a string typed by a user). Because the methods don't change the original strings attached to the expressions, you can simply compare the evaluated results of the methods:

```
var foundMatch = false
if (stringA.toUpperCase() == stringB.toUpperCase()) {
    foundMatch = true
}
```

String searches

You can use the *`string`*`.indexOf()` method to determine if one string is contained by another. Even within JavaScript's own object data, this can be useful information. For example, another property of the `navigator` object in Chapter 3 (`navigator.userAgent`) reveals a lot about the browser that loads the page. A script can investigate the value of that property for the existence of, say, "Win" to determine that the user has a Windows operating system. That short string might be buried somewhere inside a long string, and all the script needs to know is whether the short string is present in the longer one — wherever it might be.

The *string*.indexOf() method returns a number indicating the index value (zero based) of the character in the larger string where the smaller string begins. The key point about this method is that if no match occurs, the returned value is -1. To find out whether the smaller string is inside, all you need to test is whether the returned value is something other than -1.

Two strings are involved with this method: the shorter one and the longer one. The longer string is the one that appears in the reference to the left of the method name; the shorter string is inserted as a parameter to the indexOf() method. To demonstrate the method in action, the following fragment looks to see if the user is running Windows:

```
var isWindows = false
if (navigator.userAgent.indexOf("Win") != -1) {
    isWindows = true
}
```

The operator in the if construction's condition (!=) is the inequality operator. You can read it as meaning "is not equal to."

Extracting copies of characters and substrings

To extract a single character at a known position within a string, use the charAt() method. The parameter of the method is an index number (zero based) of the character to extract. When I say *extract*, I don't mean delete, but rather grab a snapshot of the character. The original string is not modified in any way.

For example, consider a script in a main window that is capable of inspecting a variable, stringA, in another window that displays map images of different corporate buildings. When the window has a map of Building C in it, the stringA variable contains "Building C." The building letter is always at the tenth character position of the string (or number 9 in a zero-based counting world), so the script can examine that one character to identify the map currently in that other window:

```
var stringA = "Building C"
var bldgLetter = stringA.charAt(9)
    // result: bldgLetter = "C"
```

Another method — *string*.substring() — enables you to extract a contiguous sequence of characters, provided you know the starting and ending positions of the substring of which you want to grab a copy. Importantly, the character at the ending position value is not part of the extraction: All applicable characters, up to but not including that character, are part of the extraction. The string from which the extraction is made appears to the left of the method name in the reference. Two parameters specify the starting and ending index values (zero based) for the start and end positions:

```
var stringA = "banana daiquiri"
var excerpt = stringA.substring(2,6)
    // result: excerpt = "nana"
```

String manipulation in JavaScript is fairly cumbersome compared to some other scripting languages. Higher-level notions of words, sentences, or paragraphs are completely absent. Therefore, sometimes it takes a bit of scripting with string methods to accomplish what seems like a simple goal. And yet you can put your knowledge of expression evaluation to the test as you assemble expressions that utilize heavily nested constructions. For example, the following fragment needs to create a new string that consists of everything from the larger string except the first word. Assuming the first word of other strings can be of any length, the second statement utilizes the *string*.indexOf() method to look for the first space character and adds 1 to that value to serve as the starting index value for an outer *string*.substring() method. For the second parameter, the length property of the string provides a basis for the ending character's index value (one more than the actual character needed).

```
var stringA = "The United States of America"
var excerpt = stringA.substring(stringA.indexOf(" ") + 1, stringA.length)
    // result: excerpt = "United States of America"
```

Creating statements like this one is not something you are likely to enjoy over and over again, so in Chapter 34 I show you how to create your own library of string functions you can reuse in all of your scripts that need their string-handling facilities. More powerful string matching facilities are built into NN4+ and IE4+ by way of regular expressions (see Chapters 34 and 38).

The Math Object

JavaScript provides ample facilities for math — far more than most scripters who don't have a background in computer science and math will use in a lifetime. But every genuine programming language needs these powers to accommodate clever programmers who can make windows fly in circles on the screen.

The Math object contains all of these powers. This object is unlike most of the other objects in JavaScript in that you don't generate copies of the object to use. Instead your scripts summon a single Math object's properties and methods. (One Math object actually occurs per window or frame, but this has no impact whatsoever on your scripts.) Programmers call this kind of fixed object a *static object*. That Math object (with an uppercase M) is part of the reference to the property or method. Properties of the Math object are constant values, such as pi and the square root of two:

```
var piValue = Math.PI
var rootOfTwo = Math.SQRT2
```

Math object methods cover a wide range of trigonometric functions and other math functions that work on numeric values already defined in your script. For example, you can find which of two numbers is the larger:

```
var larger = Math.max(value1, value2)
```

Or you can raise one number to a power of ten:

```
var result = Math.pow(value1, 10)
```

More common, perhaps, is the method that rounds a value to the nearest integer value:

```
var result = Math.round(value1)
```

Another common request of the Math object is a random number. Although the feature was broken on Windows and Macintosh versions of Navigator 2, it works in all other versions and brands since. The Math.random() method returns a floating-point number between 0 and 1. If you design a script to act like a card game, you need random integers between 1 and 52; for dice, the range is 1 to 6 per die. To generate a random integer between zero and any top value, use the following formula:

```
Math.floor(Math.random() * (n + 1))
```

where n is the top number. (Math.floor() returns the integer part of any floating-point number.) To generate random numbers between one and any higher number, use this formula:

```
Math.floor(Math.random() * n) + 1
```

where n equals the top number of the range. For the dice game, the formula for each die is

```
newDieValue = Math.floor(Math.random() * 6) + 1
```

To see this, enter the right-hand part of the preceding statement in the top text box of The Evaluator Jr. and repeatedly press the Evaluate button.

One bit of help JavaScript doesn't offer except in IE5.5 and NN6 is a way to specify a number-formatting scheme. Floating-point math can display more than a dozen numbers to the right of the decimal. Moreover, results can be influenced by each operating system's platform-specific floating-point errors, especially in earlier versions of scriptable browsers. For browsers prior to IE5.5 and NN6 you must perform any number formatting — for dollars and cents, for example — through your own scripts. Chapter 35 provides an example.

The Date Object

Working with dates beyond simple tasks can be difficult business in JavaScript. A lot of the difficulty comes with the fact that dates and times are calculated internally according to *Greenwich Mean Time (GMT)* — provided the visitor's own internal PC clock and control panel are set accurately. As a result of this complexity, better left for Chapter 36, this section of the tutorial touches on only the basics of the JavaScript Date object.

A scriptable browser contains one global Date object (in truth, one Date object per window) that is always present, ready to be called upon at any moment. The Date object is another one of those static objects. When you wish to work with a date, such as displaying today's date, you need to invoke the Date object constructor to obtain an instance of a Date object tied to a specific time and date. For example, when you invoke the constructor without any parameters, as in

```
var today = new Date()
```

the Date object takes a snapshot of the PC's internal clock and returns a date object for that instant. Notice the distinction between the static Date object and a date object instance, which contains an actual date value. The variable, today, contains not a ticking clock, but a value that you can examine, tear apart, and reassemble as needed for your script.

Internally, the value of a date object instance is the time, in milliseconds, from zero o'clock on January 1, 1970, in the Greenwich Mean Time zone — the world standard reference point for all time conversions. That's how a date object contains both date and time information.

You can also grab a snapshot of the Date object for a particular date and time in the past or future by specifying that information as parameters to the Date object constructor function:

```
var someDate = new Date("Month dd, yyyy hh:mm:ss")
var someDate = new Date("Month dd, yyyy")
var someDate = new Date(yy,mm,dd,hh,mm,ss)
var someDate = new Date(yy,mm,dd)
var someDate = new Date(GMT milliseconds from 1/1/1970)
```

If you attempt to view the contents of a raw date object, JavaScript converts the value to the local time zone string as indicated by your PC's control panel setting. To see this in action, use The Evaluator Jr.'s top text box to enter the following:

```
new Date()
```

Your PC's clock supplies the current date and time as the clock calculates them (even though JavaScript still stores the date object's millisecond count in the GMT zone). You can, however, extract components of the date object via a series of methods that you apply to a date object instance. Table 10-1 shows an abbreviated listing of these properties and information about their values.

Table 10-1 Some Date Object Methods

Method	***Value Range***	***Description***
dateObj.getTime()	0-...	Milliseconds since 1/1/70 00:00:00 GMT
dateObj.getYear()	70-...	Specified year minus 1900; four-digit year for 2000+
dateObj.getFullYear()	1970-...	Four-digit year (Y2K-compliant); version 4+ browsers
dateObj.getMonth()	0-11	Month within the year (January = 0)
dateObj.getDate()	1-31	Date within the month
dateObj.getDay()	0-6	Day of week (Sunday = 0)
dateObj.getHours()	0-23	Hour of the day in 24-hour time
dateObj.getMinutes()	0-59	Minute of the specified hour
dateObj.getSeconds()	0-59	Second within the specified minute
dateObj.setTime(*val*)	0-...	Milliseconds since 1/1/70 00:00:00 GMT
dateObj.setYear(*val*)	70-...	Specified year minus 1900; four-digit year for 2000+
dateObj.setMonth(*val*)	0-11	Month within the year (January = 0)
dateObj.setDate(*val*)	1-31	Date within the month
dateObj.setDay(*val*)	0-6	Day of week (Sunday = 0)
dateObj.setHours(*val*)	0-23	Hour of the day in 24-hour time
dateObj.setMinutes(*val*)	0-59	Minute of the specified hour
dateObj.setSeconds(*val*)	0-59	Second within the specified minute

Caution

Be careful about values whose ranges start with zero, especially the months. The `getMonth()` and `setMonth()` method values are zero based, so the numbers are one less than the month numbers you are accustomed to working with (for example, January is 0, December is 11).

You may notice one difference about the methods that set values of a date object. Rather than returning some new value, these methods actually modify the value of the date object referenced in the call to the method.

Date Calculations

Performing calculations with dates requires working with the millisecond values of the date objects. This is the surest way to add, subtract, or compare date values. To demonstrate a few date object machinations, Listing 10-1 displays the current date and time as the page loads. Another script calculates the date and time seven days from the current date and time value.

Listing 10-1: **Date Object Calculations**

```
<HTML>
<HEAD>
<TITLE>Date Calculation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function nextWeek() {
    var todayInMS = today.getTime()
    var nextWeekInMS = todayInMS + (60 * 60 * 24 * 7 * 1000)
    return new Date(nextWeekInMS)
}
</SCRIPT>
</HEAD>

<BODY>
Today is:
<SCRIPT LANGUAGE="JavaScript">
var today = new Date()
document.write(today)
</SCRIPT>
<BR>
Next week will be:
<SCRIPT LANGUAGE="JavaScript">
document.write(nextWeek())
</SCRIPT>
</BODY>
</HTML>
```

In the Body portion, the first script runs as the page loads, setting a global variable (`today`) to the current date and time. The string equivalent is written to the page. In the second Body script, the `document.write()` method invokes the `nextWeek()` function to get a value to display. That function utilizes the `today` global variable, copying its millisecond value to a new variable: `todayInMS`. To get a date seven days from now, the next statement adds the number of milliseconds in seven days (60 seconds times 60 minutes times 24 hours times seven days times 1000 milliseconds) to today's millisecond value. The script now needs a new date object calculated from the total milliseconds. This requires invoking the `Date` object constructor with the milliseconds as a parameter. The returned value is a date object, which is automatically converted to a string version for writing to the page. Letting JavaScript create the new date with the accumulated number of milliseconds is more accurate than trying to add 7 to the value returned by the date object's `getDate()` method. JavaScript automatically takes care of figuring out how many days there are in a month as well as in leap years.

Many other quirks and complicated behavior await you if you script dates in your page. As later chapters demonstrate, however, the results may be worth the effort.

Exercises

1. Create a Web page that has one form field for entry of the user's e-mail address and a Submit button. Include a pre-submission validation routine that verifies that the text field has the @ symbol found in all e-mail addresses before you allow submission of the form.

2. Given the string "`Netscape Navigator`," fill in the blanks of the `myString.substring()` method parameters here that yield the results shown to the right of each method call:

```
var myString = "Netscape Navigator"
myString.substring(___,___)      // result = "Net"
myString.substring(___,___)      // result = "gator"
myString.substring(___,___)      // result = "cape Nav"
```

3. Fill in the rest of the function in the listing that follows so that it looks through every character of the entry field and counts how many times the letter "e" appears in the field. (Hint: All that is missing is a `for` repeat loop.)

```
<HTML>
<HEAD>
<TITLE>Wheel o' Fortuna</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function countE(form) {
    var count = 0
    var inputString = form.mainstring.value.toUpperCase()
    missing code
    alert("The string has " + count + " instances of the letter e.")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
```

```
Enter any string: <INPUT TYPE="text" NAME="mainstring"
SIZE=30><BR>
<INPUT TYPE="button" VALUE="Count the Es"
onClick="countE(this.form)">
</FORM>
</BODY>
</HTML>
```

4. Create a page that has two fields and one button. The button should trigger a function that generates two random numbers between 1 and 6, placing each number in one of the fields. (Think of using this page as a substitute for rolling a pair of dice in a board game.)

5. Create a page that displays the number of days between today and next Christmas.

✦ ✦ ✦

CHAPTER 11

Scripting Frames and Multiple Windows

In This Chapter

Relationships among frames in the browser window

How to access objects and values in other frames

How to control navigation of multiple frames

Communication skills between separate windows

One of the cool aspects of JavaScript on the client is that it allows user actions in one frame or window to influence what happens in other frames and windows. In this section of the tutorial, you extend your existing knowledge of object references to the realm of multiple frames and windows.

Frames: Parents and Children

You probably noticed that at the top of the simplified document object hierarchy diagram (refer to Figure 8-1) the `window` object has some other object references associated with it. In Chapter 8, you learned that `self` is synonymous with `window` when the reference applies to the same window that contains the script's document. In this lesson, you learn the roles of the other three object references — `frame`, `top`, and `parent`.

Loading an ordinary HTML document into the browser creates a model in the browser that starts out with one `window` object and the document it contains. (The document likely contains other elements, but I'm not concerned with that stuff yet.) The top rungs of the hierarchy model are as simple as can be, as shown in Figure 11-1. This is where references begin with `window` or `self` (or with `document` because the current window is assumed).

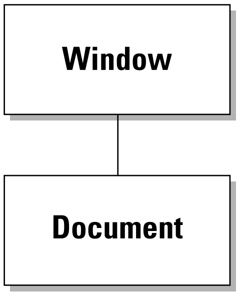


Figure 11-1: Single-frame window and document hierarchy

The instant a framesetting document loads into a browser, the browser starts building a slightly different hierarchy model. The precise structure of that model depends entirely on the structure of the frameset defined in that framesetting document. Consider the following skeletal frameset definition:

```
<HTML>
<FRAMESET COLS="50%,50%">
    <FRAME NAME="leftFrame" SRC="somedoc1.html">
    <FRAME NAME="rightFrame" SRC="somedoc2.html">
</FRAMESET>
</HTML>
```

This HTML splits the browser window into two frames side by side, with a different document loaded into each frame. The model is concerned only with structure—it doesn't care about the relative sizes of the frames or whether they're set up in columns or rows.

Framesets establish relationships among the frames in the collection. Borrowing terminology from the object-oriented programming world, the framesetting document loads into a *parent window*. Each of the frames defined in that parent window document is a *child frame*. Figure 11-2 shows the hierarchical model of a two-frame environment. This illustration reveals a lot of subtleties about the relationships among framesets and their frames.

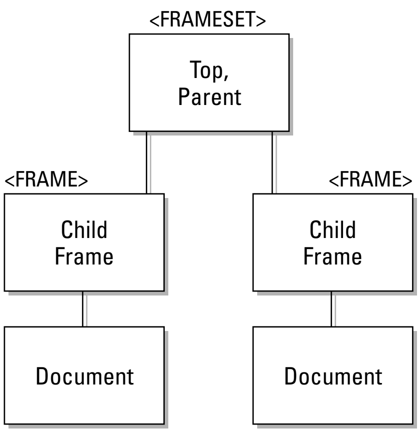


Figure 11-2: Two-frame window and document hierarchy

It is often difficult at first to visualize the frameset as a window object in the hierarchy. After all, with the exception of the URL showing in the Location/Address field, you don't see anything about the frameset in the browser. But that window object exists in the object model. Notice, too, that in the diagram the framesetting parent window has no document object showing. This may also seem odd because the window obviously requires an HTML file containing the specifications for the frameset. In truth, the parent window has a document object associated with it, but it is omitted from the diagram to better portray the relationships among parent and child windows. A frameset parent's document cannot contain most of the typical HTML objects such as forms and controls, so references to the parent's document are rarely, if ever, used.

If you add a script to the framesetting document that needs to access a property or method of that window object, references are like any single-frame situation. Think about the point of view of a script located in that window. Its immediate universe is the very same window.

Things get more interesting when you start looking at the child frames. Each of these frames contains a document object whose content you see in the browser window. And the structure is such that each document is entirely independent of the other. It is as if each document lived in its own browser window. Indeed, that's why each child frame is also a window type of object. A frame has the same kinds of properties and methods of the window object that occupies the entire browser.

From the point of view of either child window in Figure 11-2, its immediate container is the parent window. When a parent window is at the very top of the hierarchical model loaded in the browser, that window is also referred to as the top object.

References among Family Members

Given the frame structure of Figure 11-2, it's time to look at how a script in any one of those windows can access objects, functions, or variables in the others. An important point to remember about this facility is that if a script has access to an object, function, or global variable in its own window, that same item can be reached by a script from another frame in the hierarchy (provided both documents come from the same Web server).

A script reference may need to take one of three possible routes in the two-generation hierarchy described so far: parent to child; child to parent; or child to child.

Each of the paths between these windows requires a different reference style.

Parent-to-child references

Probably the least common direction taken by references is when a script in the parent document needs to access some element of one of its frames. The parent contains two or more frames, which means the parent maintains an array of the child frame objects. You can address a frame by array syntax or by the name you assign to it with the `NAME` attribute inside the `<FRAME>` tag. In the following examples of reference syntax, I substitute a placeholder named *`ObjFuncVarName`* for whatever object, function, or global variable you intend to access in the distant window or frame. Remember that each visible frame contains a document object, which is generally the container of elements you script — be sure references to the element include `document`. With that in mind, a reference from a parent to one of its child frames follows either of these models:

```
[window.]frames[n].ObjFuncVarName
[window.]frameName.ObjFuncVarName
```

Index values for frames are based on the order in which their `<FRAME>` tags appear in the framesetting document. You will make your life easier, however, if you assign recognizable names to each frame and use the frame's name in the reference. Note that some problems existed in early scriptable browsers when references to other frames started with `window`. I recommend omitting `window` from all such references.

Child-to-parent references

It is not uncommon to place scripts in the parent (in the Head portion) that multiple child frames or multiple documents in a frame use as a kind of script library. By loading in the frameset, these scripts load only once while the frameset is visible. If other documents load into the frames over time, they can take advantage of the parent's scripts without having to load their own copies into the browser.

From the child's point of view, the next level up the hierarchy is called the `parent`. Therefore, a reference from a child frame to items at the parent level is simply

```
parent.ObjFuncVarName
```

If the item accessed in the parent is a function that returns a value, the returned value transcends the parent/child borders down to the child without hesitation.

When the parent window is also at the very top of the object hierarchy currently loaded into the browser, you can optionally refer to it as the *top window*, as in

```
top.ObjFuncVarName
```

Using the `top` reference can be hazardous if for some reason your Web page gets displayed in some other Web site's frameset. What is your top window is not the master frameset's top window. Therefore, I recommend using the `parent` reference whenever possible (unless you want to blow away an unwanted framer of your Web site).

Child-to-child references

The browser needs a bit more assistance when it comes to getting one child window to communicate with one of its siblings. One of the properties of any window or frame is its `parent` (whose value is `null` for a single window). A reference must use the `parent` property to work its way out of the current frame to a point that both child frames have in common — the parent in this case. Once the reference is at the parent level, the rest of the reference can carry on as if starting at the parent. Thus, from one child to one of its siblings, you can use either of the following reference formats:

```
parent.frames[n].ObjFuncVarName
parent.frameName.ObjFuncVarName
```

A reference from the other sibling back to the first looks the same, but the `frames[]` array index or *`frameName`* part of the reference differs. Of course, much more complex frame hierarchies exist in HTML. Even so, the document object model and referencing scheme provide a solution for the most deeply nested and gnarled frame arrangement you can think of — following the same precepts you just learned.

Frame Scripting Tips

One of the first mistakes that frame scripting newcomers make is writing immediate script statements that call upon other frames while the pages load. The problem here is that you cannot rely on the document loading sequence to follow the frameset source code order. All you know for sure is that the parent document *begins* loading first. Regardless of the order of `<FRAME>` tags, child frames can begin loading at any time. Moreover, a frame's loading time depends on other elements in the document, such as images or Java applets.

Fortunately, you can use a certain technique to initiate a script once all of the documents in the frameset are completely loaded. Just as the `onLoad` event handler for a document fires when that document is fully loaded, a parent's `onLoad` event handler fires after the `onLoad` event handler in its child frames is fired. Therefore, you can specify an `onLoad` event handler in the `<FRAMESET>` tag. That handler might invoke a function in the framesetting document that then has the freedom to tap the objects, functions, or variables of all frames throughout the object hierarchy.

Controlling Multiple Frames — Navigation Bars

If you are enamored of frames as a way to help organize a complex Web page, you may find yourself wanting to control the navigation of one or more frames from a static navigation panel. Here, I demonstrate scripting concepts for such control using an application called Decision Helper (which you can find in Chapter 54 on the CD-ROM). The application consists of three frames (see Figure 11-3). The top-left frame is one image that has four graphical buttons in it. The goal is to turn that image into a client-side image map and script it so the pages change in the right-hand and bottom frames. In the upper-right frame, the script loads an entirely different document along the sequence of five different documents that go in there. In the bottom frame, the script navigates to one of five anchors to display the segment of instructions that applies to the document loaded in the upper-right frame.

Listing 11-1 shows a slightly modified version of the actual file for the Decision Helper application's navigation frame. The listing contains a couple of new objects and concepts not yet covered in this tutorial. But as you will see, they are extensions to what you already know about JavaScript and objects. To help simplify the discussion here, I remove the scripting and HTML for the top and bottom button of the area map. In addition, I cover only the two navigation arrows.

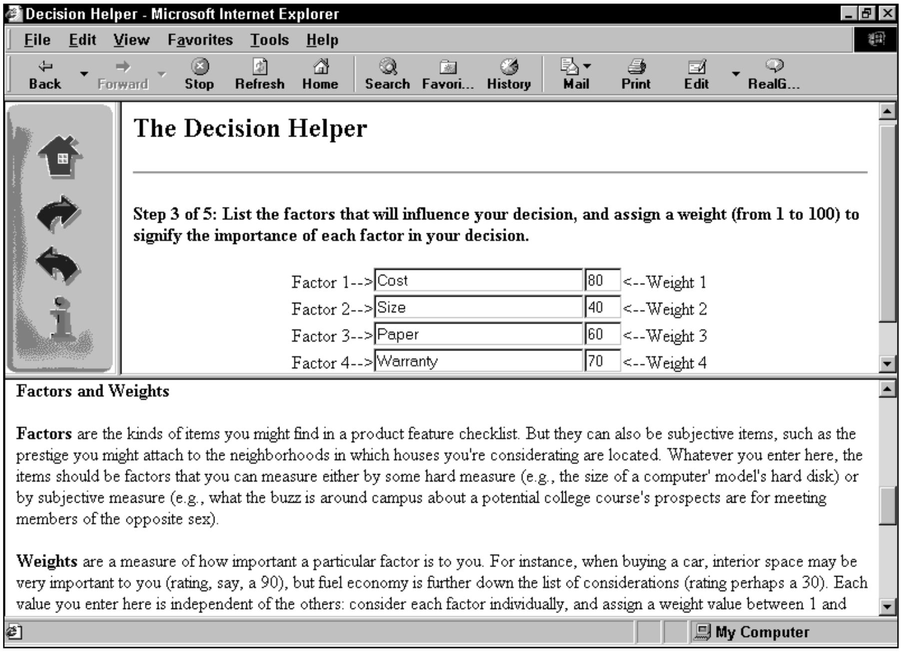


Figure 11-3: The Decision Helper screen

Listing 11-1: A Graphical Navigation Bar

```
<HTML>
<HEAD>
<TITLE>Navigation Bar</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
function goNext() {
    var currOffset = parseInt(parent.currTitle)
    if (currOffset < 5) {
        currOffset += 1
        parent.entryForms.location.href = "dh" + currOffset + ".htm"
        parent.instructions.location.hash = "help" + currOffset
    } else {
        alert("This is the last form.")
    }
}
function goPrev() {
    var currOffset = parseInt(parent.currTitle)
    if (currOffset > 1) {
        currOffset -= 1
        parent.entryForms.location.href = "dh" + currOffset + ".htm"
        parent.instructions.location.hash = "help" + currOffset
    } else {
        alert("This is the first form.")
    }
}
```

```
// end -->
</SCRIPT>
</HEAD>
<BODY bgColor="white">
<MAP NAME="navigation">
<AREA SHAPE="RECT" COORDS="25,80,66,116" HREF="javascript:goNext()">
<AREA SHAPE="RECT" COORDS="24,125,67,161" HREF="javascript:goPrev()">
</MAP>
<IMG SRC="dhNav.gif" HEIGHT=240 WIDTH=96 BORDER=0 USEMAP="#navigation">
</BODY>
</HTML>
```

Look first at the HTML section for the Body portion. Almost everything there is standard stuff for defining client-side image maps. The coordinates define rectangles around each of the arrows in the larger image. The `HREF` attributes for the two areas point to JavaScript functions defined in the Head portion of the document.

In the frameset that defines the Decision Helper application, names are assigned to each frame. The upper-right frame is called `entryForms`; the bottom frame is called `instructions`.

Knowing that navigation from page to page in the upper-right frame requires knowledge of which page is currently loaded there, I build some other scripting into both the parent document and each of the documents that loads into that frame. A global variable called `currTitle` is defined in the parent document. Its value is an integer indicating which page of the sequence (1 through 5) is currently loaded. An `onLoad` event handler in each of the five documents (named `dh1.htm`, `dh2.htm`, `dh3.htm`, `dh4.htm`, and `dh5.htm`) assigns its page number to that parent global variable. This arrangement allows all frames in the frameset to share that value easily.

When a user clicks the right-facing arrow to move to the next page, the `goNext()` function is called. The first statement gets the `currTitle` value from the parent window and assigns it to a local variable: `currOffset`. An `if...else` construction tests whether the current page number is less than five. If so, the add-by-value operator adds one to the local variable so I can use that value in the next two statements.

In those next two statements, I adjust the content of the two right frames. Using the `parent` reference to gain access to both frames, I set the `location.href` property of the top-right frame to the name of the file next in line (by concatenating the number with the surrounding parts of the filename). The second statement sets the `location.hash` property (which controls the anchor being navigated to) to the corresponding anchor in the `instructions` frame (anchor names `help1`, `help2`, `help3`, `help4`, and `help5`).

A click of the left-facing arrow reverses the process, subtracting 1 from the current page number (using the subtract-by-value operator) and changing the same frames accordingly.

The example shown in Listing 11-1 is one of many ways to script a navigation frame in JavaScript. Whatever methodology you use, much interaction occurs among the frames in the frameset.

More about Window References

In Chapter 8, you saw how to create a new window and communicate with it by way of the `window` object reference returned from the `window.open()` method. In this section, I show you how one of those subwindows can communicate with objects, functions, and variables in the window or frame that creates the subwindow.

In scriptable browsers (except for Navigator 2), every window has a property called `opener`. This property contains a reference to the window or frame that held the script whose `window.open()` statement generated the subwindow. For the main browser window and frames therein, this value is `null`. Because the `opener` property is a valid window reference, you can use it to begin the reference to items in the original window—just like a script in a child frame uses `parent` to access items in the parent document. The parent-child terminology doesn't apply to subwindows, however.

Listings 11-2 and 11-3 contain documents that work together in separate windows. Listing 11-2 displays a button that opens a smaller window and loads Listing 11-3 into it. The main window document also contains a text field that gets filled in when you enter text into a corresponding field in the subwindow.

In the main window document, the `newWindow()` function generates the new window. Because no other statements in the document require the reference to the new window just opened, the statement does not assign its returned value to any variable. This is an acceptable practice in JavaScript if you don't need the returned value of a function or method.

Listing 11-2: A Main Window Document

```
<HTML>
<HEAD>
<TITLE>Main Document</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function newWindow() {
    window.open("subwind.htm","sub","HEIGHT=200,WIDTH=200")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="button" VALUE="New Window" onClick="newWindow()">
<BR>
Text incoming from subwindow:
<INPUT TYPE="Text" NAME="entry">
</FORM>
</BODY>
</HTML>
```

All of the action in the subwindow document comes in the `onChange` event handler of the text field. It assigns the subwindow field's own value to the value of the field in the opener window's document. Remember that the contents of each window and frame belong to a document. So even after your reference targets a specific window or frame, the reference must continue helping the browser find the ultimate destination, which is generally some element of the document.

Listing 11-3: A Subwindow Document

```
<HTML>
<HEAD>
<TITLE>A SubDocument</TITLE>
</HEAD>
<BODY>
<FORM onSubmit="return false">
Enter text to be copied to the main window:
<INPUT TYPE="text"
onChange="opener.document.forms[0].entry.value = this.value">
</FORM>
</BODY>
</HTML>
```

Just one more lesson to go before I let you explore all the details elsewhere in the book. I use the final tutorial chapter to show you some fun things you can do with your Web pages, such as changing images when the user rolls the mouse atop a picture.

Exercises

Before answering the first three questions, study the structure of the following frameset for a Web site that lists college courses:

```
<FRAMESET ROWS="85%,15%">
    <FRAMESET COLS="20%,80%">
        <FRAME NAME="mechanics" SRC="history101M.html">
        <FRAME NAME="description" SRC="history101D.html">
    </FRAMESET>
    <FRAMESET COLS="100%">
        <FRAME NAME="navigation" SRC="navigator.html">
    </FRAMESET>
</FRAMESET>
</HTML>
```

1. Whenever a document loads into the description frame, it has an `onLoad` event handler that stores a course identifier in the framesetting document's global variable called `currCourse`. Write the `onLoad` event handler that sets this value to `"history101"`.

2. Draw a block diagram that describes the hierarchy of the windows and frames represented in the frameset definition.

3. Write the JavaScript statements located in the navigation frame that loads the file `"french201M.html"` into the mechanics frame and the file `"french201D.html"` into the description frame.

4. While a frameset is still loading, a JavaScript error message suddenly appears saying that "window.document.navigation.form.selector is undefined." What do you think is happening in the application's scripts, and how can you solve the problem?

5. A script in a child frame of the main window uses `window.open()` to generate a second window. How can a script in the second window access the location object (URL) of the parent window in the main browser window?

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CHAPTER 12

Images and Dynamic HTML

In This Chapter

How to precache images

How to swap images for mouse rollovers

What you can do with Dynamic HTML and scripting

The previous eight lessons have been intensive, covering a lot of ground for both programming concepts and JavaScript. Now it's time to apply those fundamentals to the learning of more advanced techniques. I cover two areas here. First, I show you how to implement the ever-popular *mouse rollover* in which images swap when the user rolls the cursor around the screen. Then I introduce you to concepts surrounding scripted control of Dynamic HTML in the version 4 and later browsers.

The Image Object

One of the objects contained by the document is the image object. Unfortunately, this object is not available in all scriptable browsers. The earliest browsers that you can use this technique with are NN3 and IE4. Therefore, everything you learn here about the image object doesn't apply to NN2 (all versions) or IE3 (for Windows). Even so, I show you how to insert rollover code in pages so that it doesn't cause errors in earlier browsers.

Because a document can have more than one image, image object references for a document are stored in the object model as an array belonging to the `document` object. You can therefore reference an image by array index or image name. Moreover, the array index can be a string version of the image's name. Thus, all of the following are valid references to an image object:

```
document.images[n]
document.images["imageName"]
document.imageName
```

Each of the `<IMG>` tag's attributes is accessible to JavaScript as a property of the image object. No mouse-related event handlers are affiliated with the image object (until you get to IE4+ and NN6+). If you want to make an image a clickable item in older browsers, surround it with a link (and set the image's border to zero) or attach a client-side image map to it. The combination of a link and image is how you make a clickable image button (the image type of form input element is not a scriptable object until IE4+ and NN6+).

Interchangeable images

The advantage of having a scriptable image object is that a script can change the image occupying the rectangular space already occupied by an image. In IE4+ and NN6+, the images can even change size, with surrounding content reflowing accordingly.

The script behind this kind of image change is simple enough. All it entails is assigning a new URL to the image object's `src` property. The size of the image on the page is governed by the `HEIGHT` and `WIDTH` attributes set in the `<IMG>` tag as the page loads. The most common image rollovers use the same size image for each of the rollover states. In NN3 and NN4, the image can't change size on the page, which causes a differently sized replacement image to scale to fit the original dimensions.

Precaching images

Images often take several extra seconds to download from a Web server. If you design your page so an image changes in response to user action, you usually want the same fast response that users are accustomed to in multimedia programs. Making the user wait many seconds for an image to change can severely detract from enjoyment of the page.

JavaScript comes to the rescue by enabling scripts to load images into the browser's memory cache without displaying the image, a technique called *pre-caching images*. The tactic that works best is to preload the image into the browser's image cache when the page initially loads. Users are less impatient for those few extra seconds as the main page loads than waiting for an image to download in response to some mouse action.

Precaching an image requires constructing an image object in memory. An image object created in memory differs in some respects from the document image object that you create with the `<IMG>` tag. Memory-only objects are created by script, and you don't see them on the page at all. But their presence in the document code forces the browser to load the images as the page loads. The object model provides an `Image` object constructor function to create the memory type of image object as follows:

```
var myImage = new Image(width, height)
```

Parameters to the constructor function are the pixel width and height of the image. These dimensions should match the `<IMG>` tag's `WIDTH` and `HEIGHT` attributes. Once the image object exists in memory, you can then assign a filename or URL to the `src` property of that image object:

```
myImage.src = "someArt.gif"
```

When the browser encounters a statement assigning a URL to an image object's `src` property, the browser goes out and loads that image into the image cache. All the user sees is some extra loading information in the status bar, as if another image were in the page. By the time the entire page loads, all images generated in this way are tucked away in the image cache. You can then assign your cached image's `src` property or the actual image URL to the `src` property of the document image created with the `<IMG>` tag:

```
document.images[0].src = myImage.src
```

The change to the image in the document is instantaneous.

Listing 12-1 is a simple listing for a page that has one `<IMG>` tag and a select list that enables you to replace the image in the document with any of four precached images (including the original image specified for the tag). If you type this listing — as I strongly recommend — you can obtain copies of the four image files from the companion CD-ROM in the Chapter 12 directory of listings (you must still type the HTML and code, however).

Listing 12-1: **Precaching Images**

```
<HTML>
<HEAD>
<TITLE>Image Object</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
// pre-cache four images
image1 = new Image(120,90)
image1.src = "desk1.gif"
image2 = new Image(120,90)
image2.src = "desk2.gif"
image3 = new Image(120,90)
image3.src = "desk3.gif"
image4 = new Image(120,90)
image4.src = "desk4.gif"

// load an image chosen from select list
function loadCached(list) {
    var img = list.options[list.selectedIndex].value
    document.thumbnail.src = eval(img + ".src")
}
</SCRIPT>
</HEAD>

<BODY >
<H2>Image Object</H2>
<IMG SRC="desk1.gif" NAME="thumbnail" HEIGHT=90 WIDTH=120>
<FORM>
<SELECT NAME="cached" onChange="loadCached(this)">
<OPTION VALUE="image1">Bands
<OPTION VALUE="image2">Clips
<OPTION VALUE="image3">Lamp
<OPTION VALUE="image4">Erasers
</SELECT>
</FORM>
</BODY>
</HTML>
```

As the page loads, it executes several statements immediately. These statements create four new memory image objects and assign filenames to the objects' `src` properties. These images are loaded into the image cache as the page loads. Down in the Body portion of the document, an `<IMG>` tag stakes its turf on the page and loads one of the images as a starting image.

A SELECT element lists user-friendly names for the pictures while housing the names of image objects already precached in memory. When the user makes a selection from the list, the `loadCached()` function extracts the selected item's value — which is a string version of the image object name. To convert a string name to a reference to the object of that same name, use the `eval()` function (part of the core JavaScript language). You need the `src` property of that object, so the `eval()` function is applied to a string version of the reference to an image object's `src` property. The `src` property of the chosen image object is assigned to the `src` property of the visible image object on the page, and the precached image appears instantaneously.

Creating image rollovers

A favorite technique to add some pseudo-excitement to a page is to swap button images as the user rolls the cursor atop them. The degree of change to the image is largely a matter of taste. The effect can be subtle — a slight highlight or glow around the edge of the original image — or drastic — a radical change of color. Whatever your approach, the scripting is the same.

When several of these graphical buttons occur in a group, I tend to organize the memory image objects as arrays and create naming and numbering schemes that facilitate working with the arrays. Listing 12-2 shows such an arrangement for four buttons that control a jukebox. The code in the listing is confined to the image-swapping portion of the application. This is the most complex and lengthiest listing of the tutorial, so it requires a bit of explanation as it goes along.

Listing 12-2: **Image Rollovers**

```
<HTML>
<HEAD>
<TITLE>Jukebox/Image Rollovers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

Only browsers capable of handling image objects should execute statements that precache images. Therefore, the entire sequence is nested inside an `if` construction that tests for the presence of the `document.images` array. In older browsers, the condition evaluates to "undefined," which an `if` condition treats as `false`.

```
if (document.images) {
```

Image precaching starts by building two arrays of image objects. One array stores information about the images depicting the graphical button's "off" position; the other is for images depicting their "on" position. These arrays use strings (instead of integers) as index values. The string names correspond to the names given to the visible image objects whose tags come later in the source code. The code is clearer to read (for example, you know that the `offImgArray["play"]` entry has to do with the Play button image). Also, as you see later in this listing, rollover images don't conflict with other visible images on the page (a possibility if you rely exclusively on numeric index values when referring to the visible images for the swapping).

After creating the array and assigning new blank image objects to the first four elements of the array, I go through the array again, this time assigning file pathnames to the `src` property of each object stored in the array. These lines of code execute as the page loads, so the images load into the image cache along the way.

```
    // precache all 'off' button images
    var offImgArray = new Array()
    offImgArray["play"] = new Image(75,33)
    offImgArray["stop"] = new Image(75,33)
    offImgArray["pause"] = new Image(75,33)
    offImgArray["rewind"] = new Image(86,33)

    // off image array -- set 'off' image path for each button
    offImgArray["play"].src = "images/playoff.jpg"
    offImgArray["stop"].src = "images/stopoff.jpg"
    offImgArray["pause"].src = "images/pauseoff.jpg"
    offImgArray["rewind"].src = "images/rewindoff.jpg"

    // precache all 'on' button images
    var onImgArray = new Array()
    onImgArray["play"] = new Image(75,33)
    onImgArray["stop"] = new Image(75,33)
    onImgArray["pause"] = new Image(75,33)
    onImgArray["rewind"] = new Image(86,33)

    // on image array -- set 'on' image path for each button
    onImgArray["play"].src = "images/playon.jpg"
    onImgArray["stop"].src = "images/stopon.jpg"
    onImgArray["pause"].src = "images/pauseon.jpg"
    onImgArray["rewind"].src = "images/rewindon.jpg"
}
```

As you can see in the following HTML, when the user rolls the mouse atop any of the visible document image objects, the `onMouseOver` event handler (from the link object surrounding the image in the document) invokes the `imageOn()` function, passing the name of the particular image. The `imageOn()` function uses that name to synchronize the `document.images` array entry (the visible image) with the entry of the in-memory array of "on" images from the `onImgArray` array. The `src` property of the array entry is assigned to the corresponding document image `src` property.

```
// functions that swap images & status bar
function imageOn(imgName) {
    if (document.images) {
        document.images[imgName].src = onImgArray[imgName].src
    }
}
```

The same goes for the `onMouseOut` event handler, which needs to turn the image off by invoking the `imageOff()` function with the same index value.

```
function imageOff(imgName) {
    if (document.images) {
        document.images[imgName].src = offImgArray[imgName].src
    }
}
```

Both the `onMouseOver` and `onMouseOut` event handlers set the status bar to prevent the ugly `javascript:` URL from appearing there as the user rolls the mouse atop the image. The `onMouseOut` event handler sets the status bar message to an empty string.

```
function setMsg(msg) {
    window.status = msg
    return true
}
```

For this demonstration, I disable the functions that control the jukebox. But I leave the empty function definitions here so they catch the calls made by the clicks of the links associated with the images.

```
// controller functions (disabled)
function playIt() {
}
function stopIt() {
}
function pauseIt(){
}
function rewindIt() {
}
</SCRIPT>
</HEAD>

<BODY>
<CENTER>
<FORM>
Jukebox Controls<BR>
```

I surround each image in the document with a link because the link object has the event handlers needed to respond to the mouse rolling over the area for compatibility back to NN3. Each link's `onMouseOver` event handler calls the `imageOn()` function, passing the name of the image object to be swapped. Because both the `onMouseOver` and `onMouseOut` event handlers require a `return true` statement to work, I combine the second function call (`to setMsg()`) with the `return true` requirement. The `setMsg()` function always returns `true` and is combined with the `return` keyword before the call to the `setMsg()` function. It's just a trick to reduce the amount of code in these event handlers.

Note

If you are typing this listing to try it out, be sure to keep each entire `<A>` tag and its attributes in one unbroken line; or insert a carriage return *before* any event handler name.

```
<A HREF="javascript:playIt()"
    onMouseOver="imageOn('play'); return setMsg('Play the selected tune')"
    onMouseOut="imageOff('play'); return setMsg('')">
<IMG SRC="images/playoff.jpg" NAME="play" HEIGHT=33 WIDTH=75 BORDER=0>
</A>
<A HREF="javascript:stopIt()"
    onMouseOver="imageOn('stop'); return setMsg('Stop the playing tune')"
    onMouseOut="imageOff('stop'); return setMsg('')">
<IMG SRC="images/stopoff.jpg" NAME="stop" HEIGHT=33 WIDTH=75 BORDER=0>
</A>
<A HREF="javascript:pauseIt()"
    onMouseOver="imageOn('pause'); return setMsg('Pause the playing tune')"
    onMouseOut="imageOff('pause'); return setMsg('')">
<IMG SRC="images/pauseoff.jpg" NAME="pause" HEIGHT=33 WIDTH=75 BORDER=0>
</A>
<A HREF="javascript:rewindIt()"
    onMouseOver="imageOn('rewind'); return setMsg('Rewind tune')"
    onMouseOut="imageOff('rewind'); return setMsg('')">
<IMG SRC="images/rewindoff.jpg" NAME="rewind" HEIGHT=33 WIDTH=86 BORDER=0>
</A>
</FORM>
</CENTER>
</BODY>
</HTML>
```

You can see the results of this lengthy script in Figure 12-1. As the user rolls the mouse atop one of the images, it changes from a light to dark color by swapping the entire image. You can access the image files on the CD-ROM, and I encourage you to enter this lengthy listing and see the magic for yourself.

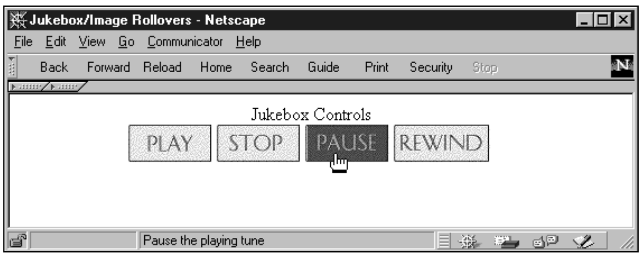

Figure 12-1: Typical mouse rollover image swapping

More Dynamism in HTML

The image object swapping technique is but a preview of what the newest developments in Dynamic HTML are all about. In IE4+ and NN6+, you can script changes to HTML element styles and content. Content can literally “dance” on the page.

Due to different approaches to document object models that Microsoft and Netscape have taken over the years, it is only with adoption of the W3C DOM in the IE5 and NN6 browsers that a lot of the same DHTML script code can run interchangeably on both IE and NN. (But even then, IE5 and IE5.5 do not support the W3C DOM as fully as NN6 does.) If your audience uses IE exclusively, you also have the option of using Microsoft's proprietary object model for compatibility back to IE4 (although with occasional compatibility problems accruing to the Macintosh version of IE4).

In Chapter 14, I provide some suggestions on how to approach the diversity of object models when developing content. Until W3C DOM-compatible browsers represent the majority of browsers accessing your pages, you may have to weigh a delicate balance between the gain to your Web site's prestige with very cool DHTML features and the pain in making those features work on a range of incompatible browsers. But even if you sit on the DHTML sidelines for a while, there is plenty to do with fully compatible scripting techniques demonstrated throughout this tutorial.

And so ends the final lesson of the *JavaScript Bible, Fourth Edition* tutorial. If you have gone through every lesson and tried your hand at the exercises, you are now ready to dive into the rest of the book to learn the fine details and many more features of both the document object model and the JavaScript language. You can work sequentially through the chapters of Parts III and IV, but before too long, you should also take a peek at Chapter 45 to learn some debugging techniques that help the learning process.

Exercises

1. Explain the difference between a document image object and the memory type of image object.
2. Write the JavaScript statements needed to precache an image named `jane.jpg` that later will be used to replace the document image defined by the following HTML:

   ```
   <IMG NAME="people" SRC="john.jpg" HEIGHT=120 WIDTH=100>
   ```
3. With the help of the code you wrote for Question 2, write the JavaScript statement that replaces the document image with the memory image.
4. Backward-compatible document image objects do not have event handlers for mouse events. How do you trigger scripts needed to swap images for mouse rollovers?

✦ ✦ ✦

Document Objects Reference

P A R T

III

CHAPTER 13

JavaScript Essentials

In This Chapter

How to separate the language from the document object model

Where scripts go in your documents

JavaScript language versions

Language highlights for experienced programmers

Whenever JavaScript is discussed in the context of the Web browser environment, it is sometimes difficult to distinguish between JavaScript the scripting language and the objects that you use the language to control. Even so, it's important to separate the language from the object model just enough to help you make important design decisions when considering JavaScript-enhanced pages. You may come to appreciate the separation in the future if you use JavaScript for other object models, such as server-side programming. All the basics of the language are identical. Only the objects differ.

This chapter elaborates on many of the fundamental subjects about the core JavaScript language raised throughout the tutorial (Part II), particularly as they relate to deploying scripts in a world in which visitors to your pages may use a wide variety of browsers. Along the way, you receive additional insights into the language itself. You can find details about the JavaScript core language syntax in Part IV.

JavaScript Versions

The JavaScript language has its own numbering system, which is completely independent of the version numbers assigned to browsers. The language's creator, Netscape, by and large controls the numbering system.

The first version, logically enough, was JavaScript 1.0. This was the version implemented in Navigator 2 and the first release of Internet Explorer 3. As the language evolved with succeeding browser versions, the JavaScript version number incremented in small steps. Internet Explorer 5, for example, uses JavaScript 1.3, whereas Navigator 6 uses JavaScript 1.5.

Each successive generation employs additional language features. For example, in JavaScript 1.0, arrays were not developed fully, causing scripted arrays to not track the number of items in the array. JavaScript 1.1 filled that hole by providing a constructor function for generating arrays and an inherent `length` property for any generated array. Later in this chapter, you see how to direct a browser to use a specific version of JavaScript for script execution if that makes sense to your application.

In practice, however, the JavaScript version implemented in a browser is not always a good predictor of core language features available for that browser. For example, while JavaScript 1.2 (as implemented by Netscape in NN4) includes broad support for regular expressions, not all of those features appear in Microsoft's JavaScript 1.2 implementation in IE4. By the same token, Microsoft implemented `try-catch` error handling in its version of JavaScript 1.3 in IE5, but Netscape didn't include that feature until its NN6 implementation of JavaScript 1.5. Therefore, the language version number is far less important than the browser version in determining which language features to use.

Core Language Standard — ECMAScript

Although Netscape first developed the JavaScript language, Microsoft incorporated the language in Internet Explorer 3. Because Microsoft did not want to license the "Java" name from its trademark owner (Sun Microsystems), the language became known in the IE environment as JScript. Except for some very esoteric exceptions and the pace of newly introduced features, the two languages are essentially identical. The levels of compatibility between browser brands for a comparable generation are remarkably high for the core language (unlike the vast disparities in object model implementations discussed in Chapter 14).

As mentioned in Chapter 2, standards efforts have been under way to create industry-wide recommendations for browser makers to follow (to make developers' lives easier). The core language was among the first components to achieve standard status. Through the European standards body called ECMA, a formal standard for the language has been agreed to and published. The first specification for the language, dubbed ECMAScript by the standards group, was roughly the same as JavaScript 1.1 in Netscape Navigator 3. The standard defines how various data types are treated, how operators work, what a particular data-specific syntax looks like, and other language characteristics. A newer version (called version 3) adds many enhancements to the core language (version 2 was version 1 with errata fixed). You can view the current version of the ECMA-262 specification at `http://www.ecma.ch`. If you are a student of programming languages, you will find the document fascinating; if you simply want to script your pages, you will probably find the minutia mind-boggling.

Both Netscape and Microsoft have pledged to make their browsers compliant with the ECMA standard. The vast majority of the ECMAScript standard has appeared in Navigator since version 3 and Internet Explorer since version 4. And, as new features are added to the ECMA standard, they tend to find their way into newer browsers as well.

Embedding Scripts in HTML Documents

Scriptable browsers offer several ways to include scripts or scripted elements in your HTML documents. Not all approaches are available in all versions of every browser, but you have sufficient flexibility starting with Navigator 3 and some versions of Internet Explorer 3.

<SCRIPT> tags

The simplest and most compatible way to include script statements in an HTML document is inside a `<SCRIPT>. . .</SCRIPT>` tag set that specifies the scripting language via the `LANGUAGE` attribute. You can have any number of such tag sets in your document. For example, you can define some functions in the Head section to be called by event handlers in HTML tags within the Body section. Another tag set can reside within the Body to write part of the content of the page as the page loads. Place only script statements and comments between the start and end tags of the tag set. Do not place any HTML tags inside unless they are part of a string parameter to a `document.write()` statement that creates content for the page.

Every opening `<SCRIPT>` tag should specify the `LANGUAGE` attribute. Because the `<SCRIPT>` tag is a generic tag indicating that the contained statements are to be interpreted as executable script and not renderable HTML, the tag is designed to accommodate any scripting language the browser knows.

Specifying the language version

All scriptable browsers (from Navigator 2 onward and Internet Explorer 3 onward) recognize the `LANGUAGE="JavaScript"` attribute setting. However, more recent browsers typically acknowledge additional versions of JavaScript or, in the case of Internet Explorer, other languages such as VBScript. For example, the JavaScript interpreter built into Navigator 3 knows the JavaScript 1.1 version of the language; Navigator 4 and Internet Explorer 4 include the JavaScript 1.2 version. For versions beyond the original JavaScript, you specify the language version by appending the version number after the language name without any spaces, as in

```
<SCRIPT LANGUAGE="JavaScript1.1">...</SCRIPT>

<SCRIPT LANGUAGE="JavaScript1.2">...</SCRIPT>
```

How you use these later-version attributes depends on the content of the scripts and your intended audience. For example, while Navigator 6 is JavaScript 1.5-compatible, it works with all previous versions of the JavaScript `LANGUAGE` attribute as well. Features of the language that are new in JavaScript 1.5 are executed if the `LANGUAGE` attribute is set to only `"JavaScript"`. On rare occasions (detailed where necessary in Part IV), the behavior of the language changes in a browser if you specify a later language version (usually to force the script to adhere to the ECMA specification when it varies from earlier implementations).

Writing scripts for a variety of browser versions requires a bit of care, especially when the scripts may contain language features available only in newer browsers. As demonstrated in an extensive discussion about browser detection later in this chapter, there may be a need to include multiple versions of a script function, each in its own `<SCRIPT>` tag with a different `LANGUAGE` attribute value.

Note

The HTML 4.0 specification defines the `<SCRIPT>` tag, but does not endorse the `LANGUAGE` attribute. In its place, HTML 4 recommends the `TYPE` attribute as a way of specifying a MIME type for the tag's content. Only IE5+ and NN6+ browsers recognize this attribute. Assign the attribute as `TYPE="text/javascript"` (IE5+ also accepts `text/ecmascript`). JavaScript versions, however, are not taken into account with this methodology. To be both backward compatible and forward looking, you can specify both the `LANGUAGE` and `TYPE` attributes in your `<SCRIPT>` tags because older browsers ignore the `TYPE` attribute.

<SCRIPT FOR> tags

Internet Explorer 4 (and later) offers a variation on the `<SCRIPT>` tag that binds a `<SCRIPT>` tag's statements to a specific object and event generated by that object. In addition to the language specification, the tag's attributes must include `FOR` and `EVENT` attributes (not part of the HTML 4.0 specification). The value assigned to the `FOR` attribute is a reference to the desired object. Most often, this is simply the identifier assigned to the object's ID attribute (IE4+ enables you to reference an object by either *`document.all.objectID`* or just *`objectID`*). The `EVENT` attribute is the event handler name that you wish the script to respond to. For example, if you design a script to perform some action upon a `mouseDown` event in a paragraph whose ID is `myParagraph`, the script statements are enclosed in the following tag set:

```
<SCRIPT FOR="myParagraph" EVENT="onmousedown" LANGUAGE="JavaScript"
TYPE="text/javascript">
...
</SCRIPT>
```

Statements inside the tag set execute only upon the firing of the event. No function definitions are required.

This way of binding an object's event to a script means that there is no event handler defined in the element's tag. Therefore, it guarantees that only IE4 or later can carry out the script when the event occurs. But the tag and attributes contain a lot of source code overhead for each object's script, so this is not a technique that you should use for script statements that need to be called by multiple objects.

Also be aware that you cannot use this tag variation if non-IE or pre-IE4 browsers load the page. In such browsers, script statements execute as the page loads, which certainly causes script errors.

JavaScript versus JScript and VBScript

As previously explained, Internet Explorer's version of JavaScript is called JScript. As a result, Internet Explorer's default script language is JScript. While Internet Explorer acknowledges the `LANGUAGE="JavaScript"` attribute, Netscape Navigator ignores the `LANGUAGE="JScript"` attribute. Therefore, if you write scripts that must work in all scriptable browsers, you can specify one language (`"JavaScript"`) and count on all browsers interpreting the code correctly (assuming you take into account other browser compatibility issues).

An entirely different issue is Internet Explorer's other scripting language, VBScript. This language, a derivative of Visual Basic, works only in Win32 versions of IE. You can mix scripts from both languages in the same document, but their tag sets must be separate with the `LANGUAGE` attributes clearly specifying the language for each `<SCRIPT>` tag.

Hiding script statements from older browsers

As more versions of scriptable browsers spread among the user community, the installed base of older, nonscriptable browsers diminishes. However, public Web sites can still attract a variety of browsers that date back to the World Wide Web Stone Age (before A.D.1996). But even new devices, such as palm-sized computers, typically employ compact browsers that don't have built-in JavaScript interpreters.

Nonscriptable browsers do not know about the <SCRIPT> tag. Normally, browsers ignore tags they don't understand. That's fine when a tag is just one line of HTML, but a <SCRIPT> tag sets off any number of script statement lines in a document. Old browsers don't know to expect a closing </SCRIPT> tag. Therefore, their natural inclination is to render any lines they encounter after the opening <SCRIPT> tag. Unfortunately, this places script statements squarely in the document — surely to confuse anyone who sees such gibberish on the page.

You can, however, exercise a technique that tricks most older browsers into ignoring the script statements: surround the script statements — inside the <SCRIPT> tag set — with HTML comment markers. An HTML comment begins with the sequence <!-- and ends with -->. Therefore, you should embed these comment sequences in your scripts according to the following format:

```
<SCRIPT LANGUAGE="JavaScript">
<!--
script statements here
//-->
</SCRIPT>
```

JavaScript interpreters also know to ignore a line that begins with the HTML beginning comment sequence, but the interpreter needs a little help with the ending sequence. The close of the HTML comment starts with a JavaScript comment sequence (//). This tells JavaScript to ignore the line; but a nonscriptable browser sees the ending HTML symbols and begins rendering the page with the next HTML tag or other text in the document. An older browser doesn't know what the </SCRIPT> tag is, so the tag is ignored and rendering begins after that.

Even with this subterfuge, not all browsers handle HTML comment tags gracefully. Some older America Online browsers display the script statements no matter what you do. Fortunately, these browsers are disappearing.

If you design your pages for public access, include these HTML comment lines in all your <SCRIPT> tag sets. Make sure they go inside the tags, not outside. Also note that most of the script examples in this book do not include these comments for the sake of saving space in the listings.

Hiding scripts entirely?

It may be misleading to say that this HTML comment technique "hides" scripts from older browsers. In truth, the comments hide the scripts from being rendered by the browsers. The tags and script statements, however, are still downloaded to the browser and appear in the source code when viewed by the user.

A common wish among authors is to truly hide scripts from visitors to a page. Client-side JavaScript must be downloaded with the page and is, therefore, visible in the source view of pages. There are, of course, some tricks you can implement that may disguise client-side scripts from prying eyes. The most easily implemented technique is to let the downloaded page contain no visible elements, only scripts that assemble the page that the visitor sees. Source code for such a page is simply the HTML for the page. But that page is not interactive because no scripting is attached unless it is written as part of the page — defeating the goal of hiding scripts. Any scripted solution for disguising scripts is immediately defeatable by the user turning off scripting temporarily before downloading the page. All of your code is ready for source view.

If you are worried about other scripters "stealing" your scripts, your best protection is to include a copyright notification in your page's source code. Not only are your scripts visible to the world, but so, too, are a thief's scripts. This way you can easily see when someone lifts your scripts verbatim.

Script libraries (.js files)

If you do a lot of scripting or script a lot of pages for a complex Web application, you will certainly develop some functions and techniques that you can use for several pages. Rather than duplicate the code in all of those pages (and go through the nightmare of making changes to all copies for new features or bug fixes), you can create reusable script library files and link them to your pages.

Such an external script file contains nothing but JavaScript code — no <SCRIPT> tags, no HTML. The script file you create must be a text-only file, but its filename must end with the two-character extension `.js`. To instruct the browser to load the external file at a particular point in your regular HTML file, you add an `SRC` attribute to the <SCRIPT> tag as follows:

```
<SCRIPT LANGUAGE="JavaScript" SRC="hotscript.js"></SCRIPT>
```

This kind of tag should go at the top of the document so it loads before any other in-document <SCRIPT> tags load. If you load more than one external library, include a series of these tag sets at the top of the document.

Note

For complex pages and pages that link multiple external `.js` files, Navigator 3 and 4 sometimes do not execute immediate statements in the `.js` file as it loads. If you encounter this problem, surround the statements in a function, and invoke the function from a script statement in the main document.

Take notice of two features about this external script tag construction. First, the <SCRIPT> . . . </SCRIPT> tag pair is required, even though nothing appears between them. You can mix <SCRIPT> tag sets that specify external libraries with in-document scripts in the same document. Second, avoid putting other script statements between the start and end tags when the start tag contains an `SRC` attribute.

How you reference the source file in the `SRC` attribute depends on its physical location and your HTML coding style. In the preceding example, the `.js` file is assumed to reside in the same directory as the HTML file containing the tag. But if you want to refer to an absolute URL, the protocol for the file is `http://` (just like with an HTML file):

```
<SCRIPT LANGUAGE="JavaScript" SRC="http://www.cool.com/hotscript.js">
</SCRIPT>
```

A very important prerequisite for using script libraries with your documents is that your Web server software must know how to map files with the `.js` extension to a MIME type of `application/x-javascript`. If you plan to deploy JavaScript in this manner, be sure to test a sample on your Web server beforehand and arrange for any necessary server adjustments.

When a user views the source of a page that links in an external script library, code from the `.js` file does not appear in the window even though the browser treats the loaded script as part of the current document. However, the name or URL of the `.js` file is plainly visible (displayed exactly as it appears in your source code). Anyone can then turn off JavaScript in the browser and open that file (using the `http://` protocol) to view the `.js` file's source code. In other words, an external JavaScript source file is no more hidden from view than JavaScript embedded directly in an HTML file.

Tip

NN3 exhibits a bug if you specify an external `.js` library file in a tag that specifies JavaScript 1.2 as the language. Unfortunately, NN3 ignores the language version and loads the external file no matter what language you specify in that tag. Therefore, if you don't want those scripts to run in NN3, surround the scripts in the external file in a version-checking `if` clause:

```
if (parseInt(navigator.appVersion) > 3) {
    statements to run here
}
```

Library compatibility issues

On the Netscape Navigator side, the external library capability was introduced with NN3. Therefore, the `SRC` attribute is ignored in NN2, and none of the external scripts become part of the document.

The situation is more clouded on the Internet Explorer side. When IE3 shipped for Windows, the external script library feature was not available. By most accounts, IE version 3.02 included support for external libraries, but I heard reports that this was not the case. I know that the version 3.02 installed on my Windows 95 computers loads external libraries from `.js` files. It may be a wise tactic to specify a complete URL for the `.js` file because this is known to assist IE3 in locating the script library file associated with an HTML file.

Navigator 3&4 JavaScript entities

A feature valid only for Navigator 3 and 4 is the JavaScript entity. The idea behind this technique is to provide a way for the browser to use script expressions to fill in the value for any HTML tag attribute. *Entities* are strings that allow special characters or symbols to be embedded in HTML. They begin with an ampersand symbol (&) and end with a semicolon (;). For example, the `©` entity is rendered in browsers as a copyright symbol (©).

To assign a JavaScript expression to an entity, the entity still begins and ends like all entities, but curly braces surround the expression. For example, consider a document containing a function that returns the current day of the week:

```
function today() {
    var days = new Array("Sunday","Monday","Tuesday","Wednesday","Thursday",
    "Friday","Saturday")
    var today = new Date()
    return days[today.getDay()]
}
```

You can assign this function to a JavaScript entity such that the label of a button is created with the returned value of the function:

```
<INPUT TYPE="button" VALUE="&{today()};" onClick="handleToday()">
```

You can use expressions to fulfill only attribute assignments, not other parts related to a tag, such as the text for a document title or link. Those items can be generated dynamically via `document.write()` statements as the document loads.

The dynamic content capabilities of NN6 (and IE4+) provide ample substitutes for JavaScript entities. At load time, a script can modify any element's attribute after the HTML creates the element, including those that impact its size or layout. The only difference is that with the dynamic version, the user sees both the "before" and "after" versions while the page loads.

Browser Version Detection

Without question, the biggest challenge facing many client-side scripters is how to program an application that accommodates a wide variety of browser versions and brands, each one of which can bring its own quirks and bugs. Happy is the intranet developer who knows for a fact that the company has standardized its computers with a particular brand and version of browser. But that is a rarity, especially in light of the concept of the *extranet*—private corporate networks and applications that open up for access to the company's suppliers and customers.

Having dealt with this problem since the original scripted browser (NN2) had to work alongside a hoard of nonscriptable browsers, I have identified several paths that an application developer can follow. Unless you decide to be autocratic about browser requirements for using your site, you must make compromises in desired functionality or provide multiple paths in your Web site for two or more classes of browsers. In this section, I give you several ideas about how to approach development in an increasingly fragmented browser world.

Is JavaScript on?

Very often, the first decision an application must make is whether the client accessing the site is JavaScript-enabled. Non-JavaScript-enabled browsers fall into two categories: a) JavaScript-capable browsers that have JavaScript turned off in the preferences; and b) browsers that have no built-in JavaScript interpreter.

Using the <NOSCRIPT> tag

Except for some of the earliest releases of NN2, all JavaScript-capable browsers have a preferences setting to turn off JavaScript (and a separate one for Java). You should know that even though JavaScript is turned on by default in most browsers, many institutional deployments turn it off when the browser is installed on client machines. The reasons behind this MIS deployment decision vary from scares about Java security violations incorrectly associated with JavaScript, valid JavaScript security concerns on some browser versions, and the fact that some firewalls try to filter JavaScript lines from incoming HTML streams.

All JavaScript-capable browsers include a set of `<NOSCRIPT>. . .</NOSCRIPT>` tags to balance the `<SCRIPT>. . .</SCRIPT>` tag set. If one of these browsers has JavaScript turned off, the `<SCRIPT>` tag is ignored but the `<NOSCRIPT>` tag is observed. As with the `<NOFRAMES>` tag, you can use the body of a `<NOSCRIPT>` tag set to display HTML that lets users know JavaScript is turned off, and therefore the full benefit of the page isn't available unless they turn on JavaScript. Listing 13-1 shows a skeletal HTML page that uses these tags.

Listing 13-1: Employing the <NOSCRIPT> Tag

```
<HTML>
<HEAD>
<TITLE>Some Document</TITLE>
<SCRIPT LANGUAGE="JavaScript">
    // script statements
</SCRIPT>
<NOSCRIPT>
<B>Your browser has JavaScript turned off.</B><BR>
You will experience a more enjoyable time at this Web site if you turn
JavaScript on.
<HR>
</NOSCRIPT>
</HEAD>
<BODY>
<H2>The body of your document.</H2>
</BODY>
</HTML>
```

You can display any standard HTML within the `<NOSCRIPT>` tag set. An icon image is a colorful way to draw the user's attention to the special advice at the top of the page. If your document is designed to create content dynamically in one or more places in the document, you may have to include a `<NOSCRIPT>` tag set after more than one `<SCRIPT>` tag set to let users know what they're missing. Do not include the HTML comment tags that you use in hiding JavaScript statements from older browsers. Their presence inside the `<NOSCRIPT>` tags prevents the HTML from rendering.

Other nonscriptable browsers

At this juncture, I must point out that newcomers to scripting frequently want to know what script to write to detect whether JavaScript is turned on. Because scripters are so ready to write a script to work around all situations, it takes some thought to realize that a non-JavaScript browser cannot execute such a script: If no JavaScript interpreter exists in the browser (or it is turned off), the script is ignored. I suppose that the existence of a JavaScript-accessible method for Java detection—the `navigator.javaEnabled()` method—promises a parallel method for JavaScript. But logic fails to deliver on that unspoken promise.

Another desire is to have JavaScript substitute document content when the browser is JavaScript-enabled. Only in IE4+ and NN6+ can a script replace regular HTML with scripted content. If you develop content that must be backward compatible with older browsers, remember that all HTML in a document appears in the browser window, while scripted content can be additive only.

You can use this additive scripting to create unusual effects when displaying different links and (with a caveat) body text for scriptable and nonscriptable browsers. Listing 13-2 shows a short document that uses HTML comment symbols to trick nonscriptable browsers into displaying a link to Netscape's Web site and two lines of text. A scriptable browser takes advantage of a behavior that allows only the nearest `<A>` tag to be associated with a closing `</A>` tag. Therefore, the Netscape link isn't rendered at all, but the link to my Web site is. For the body text, the script assigns the same text color to a segment of HTML body text as the document's background. While the colored text is camouflaged in a scriptable browser (and some other text written to the document), the "hidden" text remains invisible in the document. HTML fans frown upon this kind of element spoofing, which will likely run afoul of HTML validators. However, it can be fun to play with.

Listing 13-2: Rendering Different Content for Scriptable and Nonscriptable Browsers

```
<HTML>
<BODY BGCOLOR="#FFFFFF">
<A HREF="http://home.netscape.com">
<SCRIPT LANGUAGE="JavaScript">
<!--
document.writeln("<A HREF='http://www.dannyg.com'>")
//-->
</SCRIPT>
Where?</A>
<HR>
<SCRIPT LANGUAGE="JavaScript">
<!--
document.write("Howdy from the script!<FONT COLOR='#FFFFFF'>")
//-->
</SCRIPT>
If you can read this, JavaScript is not available.
<SCRIPT LANGUAGE="JavaScript">
<!--
document.write("</FONT>")
//-->
</SCRIPT>
<BR>
Here's some stuff afterward.
</BODY>
</HTML>
```

Scripting for different browsers

The number of solutions for accommodating different client browsers is large because the specific compatibility need might be as simple as letting a link navigate to a scripted page for script-enabled browsers, as involved as setting up distinct areas of your application for different browser classes, or any degree in between. The first step in planning for compatibility is determining what your goals are for various visitor classes.

Establishing goals

Once you map out your application, you must then look at the implementation details to see which browser is required for the most advanced aspect of the application. For example, if the design calls for image swapping on mouse rollovers, that feature requires NN3+ and IE4+. In implementing Dynamic HTML features, you have potentially three different ways to implement tricks (such as movable elements or changeable content) because the document object models require different scripting (and sometimes HTML) for NN4, IE4+, and the W3C DOM implemented in NN6 and IE5+.

In an ideal scenario, you have an appreciation for the kinds of browsers that your visitors use. For example, if you want to implement some DHTML features, but NN4 usage is only a small and decreasing percentage of hits, then you can probably get by with designing for the IE4+ and NN6 document object models. Or you may wish to forget the past and design your DHTML exclusively for W3C DOM-compatible browsers. If your Web hosting service maintains a log of visitor activity to your site, you can study the browsers listed among the hits to see which browsers your visitors use.

After you determine the lowest common denominator for the optimum experience, you then must decide how gracefully you want to degrade the application for visitors whose browsers do not meet the common denominator. For example, if you plan a page or site that requires a W3C DOM-compatible browser for all the bells and whistles, you can provide an escape path with content in a simple format that every browser from Lynx to IE4 and NN4 can view. Or perhaps you can provide for users of older scriptable browsers a third offering with limited scriptability that works on all scriptable browsers.

Creating an application or site that has multiple paths for viewing the same content may sound good at the outset, but don't forget that maintenance chores lie ahead as the site evolves. Will you have the time, budget, and inclination to keep all paths up to date? Despite whatever good intentions a designer of a new Web site may have, in my experience the likelihood that a site will be maintained properly diminishes rapidly with the complexity of the maintenance task.

Implementing a branching index page

If you decide to offer two or more paths into your application or content, one place you can start visitors down their individual paths is at the default page for your site. Numerous techniques are available that can redirect visitors to the appropriate perceived starting point of the site.

One design to avoid is placing the decision about the navigation path in the hands of the visitor. Offering buttons or links that describe the browser requirements may work for users who are HTML and browser geeks, but average consumers surfing the Web these days likely don't have a clue about what level of HTML their browsers support or whether they are JavaScript-enabled. It is incumbent upon the index page designer to automate the navigation task as much as possible.

A *branching index page* has almost no content. It is not the "home page" per se of the site, rather a gateway to the entire Web site. Its job is to redirect users to what appears to be the home page for the site. Listing 13-3 shows what such a branching index page looks like.

Listing 13-3: A Branching Index Page

```
<HTML>
<HEAD>
  <TITLE>GiantCo On The Web</TITLE>
  <SCRIPT LANGUAGE="JavaScript">
  <!--
      window.location.href = "home1.html"
  //-->
  </SCRIPT>
  <META HTTP-EQUIV="REFRESH"
  CONTENT="0; URL=http://www.giantco.com/home2.html">
</HEAD>

<BODY>
<CENTER>
   <A HREF="home2.html"><IMG SRC="images/giantcoLogo.gif" HEIGHT=60 WIDTH=120
BORDER=0 ALT="Go To GiantCo Home Page"></A>
</CENTER>
</BODY>
</HTML>
```

Notice that the only visible content is an image surrounded by a standard link. The <BODY> tag contains no background color or art. A single script statement is located in the Head. A <META> tag is also in the Head to automate navigation for some users. To see how a variety of browsers respond to this page, here are what three different classes of browser do with Listing 13-3:

A JavaScript-enabled browser. Although the entire page may load momentarily (at most, flashing the company logo for a brief moment), the browser executes the script statement that loads `home1.html` into the window. In the meantime, the image is preloaded into the browser's memory cache. This image should be reused in `home1.html` so the download time isn't wasted on a one-time image. If your pages require a specific browser brand or minimum version number, this is the place to filter out browsers that don't meet the criteria (which may include the installation of a particular plug-in). Use the properties of the `navigator` object (Chapter 28) to write a *browser sniffer script* that allows only those browsers meeting your design minimum to navigate to the scripted home page. All other browsers fall through to the next execution possibility.

A modern browser with JavaScript turned off or missing. Several modern browsers recognize the special format of the <META> tag as one that loads a URL into the current window after a stated number of seconds. In Listing 13-3, that interval is zero seconds. The <META> tag is executed only if the browser ignores the <SCRIPT> tag. Therefore, any scriptable browser that has JavaScript turned off or any browser that knows <META> tags but no scripting follows the refresh command for the <META> tag. If you utilize this tag, be very careful to observe the tricky formatting of the `CONTENT` attribute value. A semicolon and the subattribute `URL` follow the number of seconds. A complete URL for your nonscriptable home page version is required for this subattribute. Importantly, the entire `CONTENT` attribute value is inside one set of quotes.

Older graphical browsers, PDA browsers, and Lynx. The last category includes graphical browsers some call "brain-dead," as well as intentionally stripped down browsers. Lynx is designed to work in a text-only VT-100 terminal screen; personal digital assistants (PDAs) such as the Palm handheld computer have browsers optimized for usage through slow modems and viewing on small screens. If such browsers do not understand the `<META>` tag for refreshing content, they land at this page with no further automatic processing. But by creating an image that acts as a link, the user will likely click (or tap) on it to continue. The link then leads to the nonscriptable home page. Also note that the `ALT` attribute for the image is supplied. This takes care of Lynx and PDA browsers (with image loading off) because these browsers show the `ALT` attribute text in lieu of the image. Users click or tap on the text to navigate to the URL referenced in the link tag.

I have a good reason to keep the background of the branching index page plain. For those whose browsers automatically lead them to a content-filled home page, the browser window flashes from a set background color to the browser's default background color before the new home page and its background color appear. By keeping the initial content to only the company logo, less screen flashing and obvious navigation are visible to the user.

One link — alternate destinations

Another filtering technique is available directly from links. With the exceptions of NN2 and IE3, a link can navigate to one destination via a link's `onClick` event handler and to another via the `HREF` attribute if the browser is not scriptable.

The trick is to include an extra `return false` statement in the `onClick` event handler. This statement cancels the link action of the `HREF` attribute. For example, if a nonscriptable browser should go to one version of a page at the click of a link and the scriptable browser should go to another, the link tag is as follows:

```
<A HREF="nonJSCatalog.html" onClick="location.href='JSCatalog.html';return
false">Product Catalog</A>
```

Only nonscriptable browsers, NN2, and IE3 go to the `nonJSCatalog.html` page; all others go to the `JSCatalog.html` page.

Multiple-level scripts

Each new JavaScript level brings more functionality to the language. You can use the `LANGUAGE` attribute of the `<SCRIPT>` tag to provide road maps for the execution of functions according to the power available in the browser. For example, consider a button whose event handler invokes a function. You can write that function in such a way that users of each JavaScript version get special treatment with regard to unique features of that version. To make sure all scriptable browsers handle the event handler gracefully, you can create multiple versions of the function, each wrapped inside its own `<SCRIPT>` tag and specifying a particular language version.

Listing 13-4 shows the outline of a page that presents different versions of the same event handler. For this technique to work properly, you must lay out the `<SCRIPT>` tags in ascending order of JavaScript version. In other words, the last function that the browser knows how to read (according to the `LANGUAGE` version) is the one that gets executed. In Listing 13-4, for instance, NN3 (whose JavaScript version is 1.1) gets only as far as the middle version and executes only that one.

Listing 13-4: **Multiple Script Versions**

```
<HTML>
<HEAD>
    <SCRIPT LANGUAGE="JavaScript">
    <!--
    function doIt() {
        // statements for JavaScript 1.0 browsers
    }
    //-->
    </SCRIPT>

    <SCRIPT LANGUAGE="JavaScript1.1">
    <!--
    function doIt() {
        // statements for JavaScript 1.1 browsers
    }
    //-->
    </SCRIPT>

    <SCRIPT LANGUAGE="JavaScript1.2">
    <!--
    function doIt() {
        // statements for JavaScript 1.2 browsers
    }
    //-->
    </SCRIPT>
</HEAD>
<BODY>
<FORM>
    <INPUT TYPE=button VALUE="Click Me" onClick="doIt()">
</FORM>
</BODY>
</HTML>
```

If you use this technique, you must define an event handler for the lowest common version to catch the oldest browsers. For example, failure to include a version for JavaScript 1.0 in Listing 13-4 results in a script error for users of NN2 and IE3. If you don't want an older browser to execute a function (because the browser doesn't support the functionality required for the action), include a *dummy function* (a function definition with no nested script statements) in the lower-version `<SCRIPT>` tag to catch the event handlers of less-capable browsers.

Scripting event handlers as object properties

Along the same lines of Listing 13-4, you can define event handlers for objects within separate language versions. This works for NN3+ and IE4+ because in those browsers you can assign event handlers as properties of an object instead of by way of tag attribute event handlers. For example, in Listing 13-5, a button is assigned an event handler within the context of a JavaScript 1.1-level script. NN2 and IE3 users don't have their button's event handler set because the HTML tag doesn't have an event handler. Even though the doIt() function is not restricted to any JavaScript version, it is invoked only in browsers capable of JavaScript version 1.1 or later.

Listing 13-5: **Event Handler Assignments**

```
<<HTML>
<HEAD>
    <SCRIPT LANGUAGE="JavaScript">
    <!--
    function doIt() {
        // statements
    }
    //-->
    </SCRIPT>
</HEAD>
<BODY>
<FORM>
    <INPUT TYPE=button NAME=janeButton VALUE="Click Me">
    <SCRIPT LANGUAGE="JavaScript1.1">
    <!--
        document.forms[0].janeButton.onclick=doIt
    //-->
    </SCRIPT>
</FORM>
</BODY>
</HTML>
```

Object detection

The final methodology for implementing browser version branching is known as *object detection*. The principle is simple: If an object type exists in the browser's object model, then it is safe to execute script statements that work with that object.

Perhaps the best example of object detection is the way scripts can swap images on a page in newer browsers without tripping up on older browsers that don't implement images as objects. In a typical image swap, onMouseOver and onMouseOut event handlers (assigned to a link surrounding an image, to be backward compatible) invoke functions that change the src property of the desired image. Each of those functions is invoked for all scriptable browsers, but you want them to run their statements only when images can be treated as objects.

Object models that implement images always include an array of image objects belonging to the document object. The document.images array always exists, even with a length of zero when no images are on the page. Therefore, if you wrap the image swapping statements inside an if construction that lets browsers pass only if the document.images array exists, older browsers simply skip over the statements:

```
function imageSwap(imgName, url) {
    if (document.images) {
        document.images[imgName].src = url
    }
}
```

Object detection works best when you know for sure how all browsers implement the object. In the case of `document.images`, the implementation across browsers is identical, so it is a very safe branching condition. That's not always the case, and you should use this feature cautiously. For example, IE4 introduced a `document` object array called `document.all`, which is used very frequently in building references to HTML element objects. NN4, however, did not implement that array, but instead had a document-level array object called `layers`, which was not implemented in IE4. Unfortunately, many scripters used the existence of these array objects as determinants for browser version. They set global variables signifying a minimum version of IE4 and NN4 based on the existence of these array objects. This is most dangerous because there is no way of knowing if a future version of a browser may adopt the object of the other browser brand. What happens, for instance, if the W3C DOM in a future version should adopt the `document.all` array? If a future version of Navigator implements that array, the browser sniffing code from the old page will treat Navigator as if it were Internet Explorer, and scripts will likely break left and right.

This is why I recommend object detection not for browser version sniffing but for object availability branching, as shown previously for images. Moreover, it is safest to implement object detection only when all major browser brands (and the W3C DOM recommendation) have adopted the object so that behavior is predictable wherever your page loads in the future.

Techniques for object detection include testing for the availability of an object's method. A reference to an object's method returns a value, so such a reference can be used in a conditional statement. For example, the following code fragment demonstrates how a function can receive an argument containing the string ID of an element and convert the string to a valid object reference for three different document object models:

```
function myFunc(elemID) {
    var obj
    if (document.all) {
        obj = document.all(elemID)
    } else if (document.getElementById) {
        obj = document.getElementById(elemID)
    } else if (document.layers) {
        obj = document.layers[elemID]
    }
    if (obj) {
        // statements that work on the object
    }
}
```

It no longer matters which browser brand, operating system, and version supports a particular way of changing an element ID to an object reference. Whichever of the three `document` object properties or method is supported by the browser (or the first one, if the browser supports more than one), that is the property or method used to accomplish the conversion. If the browser supports none of them, then no further statements execute.

If your script wants to check for the existence of an object's property or method, you may also have to check for the existence of the object beforehand if that object is not part of all browers' object models. An attempt to reference a property of a non-existent object in a conditional expression generates a script error. To avoid the error, you can cascade the conditional tests with the help of the && operator. The following fragment tests for the existence of both the document.body object and the document.body.style property:

```
if (document.body && document.body.style) {
    // statements that work on the body's style property
}
```

If the test for document.body fails, JavaScript bypasses the second test.

One potential "gotcha" to using conditional expressions to test for the existence of an object's property is that even if the property exists but its value is zero or an empty string, the conditional test reports that the property does not exist. To workaround this potential problem, the conditional expression can examine the data type of the value to ensure that the property genuinely exists. A non-existent property for an object reports a data type of undefined. Use the typeof operator (Chapter 40) to test for a valid property:

```
if (document.body && typeof document.body.scroll != "undefined") {
     // statements that work on the body's scroll property
}
```

Object detection is the wave of the future, and I wholeheartedly recommend designing your scripts to take advantage of it in lieu of branching on particular browser name strings and version numbers. Scriptable features are gradually finding their way into browsers embedded in a wide range of non-traditional computing devices. These browsers may not go by the same names and numbering systems that we know today, yet such browsers may be able to interpret your scripts. By testing for browser functionality, your scripts will likely require less maintenance in the future. You can see more object detection at work in Chapters 47 and 56.

Designing for Compatibility

Each new major release of a browser brings compatibility problems for page authors. It's not so much that old scripts break in the new versions (well-written scripts rarely break in new versions with the rare exception of the jump from NN4 to NN6). No, the problems center on the new features that attract designers when the designers forget to accommodate visitors who have not advanced to the latest and greatest browser version yet or who don't share your browser brand preference.

Adding to these problems are numerous bugs, particularly in first-generation browsers from both Netscape and Microsoft. Worse still, some of these bugs affect only one operating system platform among the many supported by the browser. Even if you have access to all the browsers for testing, the process of finding the errors, tracking down the bugs, and implementing workarounds that won't break later browsers can be quite frustrating — even when you've scripted pages from the earliest days and have a long memory for ancient bug reports.

Catering only to the lowest common denominator can more than double your development time due to the expanded testing matrix necessary to ensure a good working page in all operating systems and on all versions. Decide how important the scripted functionality you employ in a page is for every user. If you want some functionality that works only in a later browser, then you may have to be a bit autocratic in defining the minimum browser for scripted access to your page — any lesser browser gets shunted to a simpler presentation of your site's data.

Another possibility is to make a portion of the site accessible to most, if not all, browsers, and restrict the scripting to only the occasional enhancement that non-scriptable browser users won't miss. Once the application reaches a certain point in the navigation flow, then the user needs a more capable browser to get to the really good stuff. This kind of design is a carefully planned strategy that lets the site welcome all users up to a point, but then enables the application to shine for users of, say, W3C DOM-compatible browsers.

The ideal page is one that displays useful content on any browser, but whose scripting enhances the experience of the page visitor — perhaps by offering more efficient site navigation or interactivity with the page's content. That is certainly a worthy goal to aspire to. But even if you can achieve this ideal on only some pages, you will reduce the need for defining entirely separate, difficult-to-maintain paths for browsers of varying capabilities.

Dealing with beta browsers

If you have crafted a skillfully scripted Web page or site, you may be concerned when a prerelease (or *beta*) version of a browser available to the public causes script errors or other compatibility problems to appear on your page. Do yourself a favor — don't overreact to bugs and errors that occur in prerelease browser versions. If your code is well written, it should work with any new generation of browser. If the code doesn't work correctly, consider the browser to be buggy. Report the bug (preferably with a simplified test case script sample) to the browser maker.

The exception to the "it's a beta bug" rule arose in the transition from NN4 to NN6. As you learn in Chapter 14, a conscious effort to eliminate a proprietary NN4 feature (the `<LAYER>` tag and corresponding scriptable object) caused many NN4 scripts to break on NN6 betas (and final release). Had scripters gone to report the problem to the new browsers' developer (Mozilla), they would have learned of the policy change, and planned for the new implementation. It is extremely rare for a browser to eliminate a popular feature so quickly, but it can happen.

It is often difficult to prevent yourself from getting caught up in browser makers' enthusiasm for a new release. But remember that a prerelease version is not a shipping version. Users who visit your page with prerelease browsers should know that there may be bugs in the browser. That your code does not work with a prerelease version is not a sin, nor is it worth losing sleep over. Just be sure to connect with the browser's maker either to find out if the problem will continue in the final release or to report the bug so the problem doesn't make it into the release version.

The Evaluator Sr.

In Chapter 6, you were introduced to a slimmed-down version of The Evaluator Jr., which provides an interactive workbench to experiment with expression evaluation and object inspection. At this point, you should meet The Evaluator Sr., a tool you will use in many succeeding chapters to help you learn both core JavaScript and DOM terminology.

IE Browser Version Headaches

As described more fully in the discussion of the `navigator` object in Chapter 28, your scripts can easily determine which browser is the one running the script. However, the properties that reveal the version don't always tell the whole story about Internet Explorer. For one thing, the Windows and Macintosh versions of the same major browser version (3.0*x*) implement slightly different object models. The Mac version includes the ever-popular `image` object for mouse rollover image swapping; the Windows version does not, and any attempt to use such code in the Windows version results in script errors.

Next, the first release of Internet Explorer 3 for the Macintosh was not scriptable at all — the JavaScript interpreter was left out. Macintosh version 3.01 was the first scriptable Mac version. Even among minor generation releases of Internet Explorer 3 for Windows, Microsoft implemented some new features here and there.

Probably the most troublesome problem is that an improved JavaScript interpreter (in the `JScript.dll` file) underwent substantial improvements between version 1 and version 2 for Windows. Many copies of browser version 3.02 for Windows shipped with version 1 of the `.dll`. Some users updated their browsers if they knew to download the new `.dll` from Microsoft. Unfortunately, the interpreter version is not reflected in any `navigator` object property. A nasty Catch-22 in this regard is that version 2 of the interpreter includes a new property that enables you to examine the interpreter version, but testing for that property in a browser that has version 1 of the interpreter installed results in an error message.

Due to the insecurity of knowing exactly what will and won't work in a browser that identifies itself as Internet Explorer 3.0*x*, you might decide to redirect all users of Internet Explorer 3 to pages in your application that include no scripting. But before you think I'm bashing Internet Explorer 3, you should also consider doing the same redirection for Navigator 2 users due to the number of platform-specific bugs that littered that first round of JavaScript. Object model and core language implementations in NN3+ and IE4+ are much more stable and reliable platforms on which to build scriptable applications (and you get genuine array objects!). If you have an opportunity to study the access logs of your Web site, analyze the proportion of different browser versions over several days before deciding where you set your lowest common denominator for scripted access.

Even with IE5, browser detection remains a challenge. As you can see in detail in Chapter 28, the `navigator.appVersion` property for IE5 for Windows reports version 4 (the same as IE4). You can still "sniff" for version 5 (you can find the designation `MSIE 5` in the `navigator.userAgent` property), but the process is not as straightforward as it could be — especially if you need to look for any version greater than or equal to 5. The best advice is to be vigilant when new browsers come on the scene or adopt object detection techniques in your scripts.

Figure 13-1 shows the top part of the page. Two important features differentiate this full version from the Jr. version in Chapter 6.

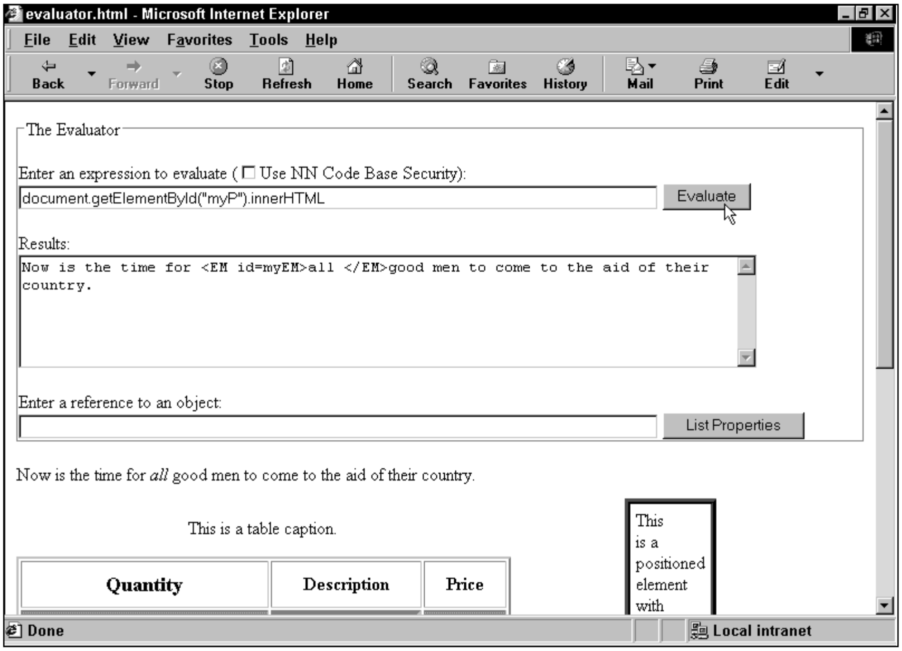

Figure 13-1: The Evaluator Sr.

First, you can try some Netscape secure features if you have Code Base Principles turned on for your browser (Chapter 46) and you check the Use Code Base Security checkbox (NN4+ only). Second, the page has several HTML elements preinstalled, which you can use to explore DOM properties and methods. As with the smaller version, a set of 26 one-letter global variables (`a` through `z`) are initialized and ready for you to assign values for extended evaluation sequences.

You should copy the file `evaluator.html` from the companion CD-ROM to a local hard disk and set a bookmark for it in all of your test browsers. Feel free to add your own elements to the bottom of the page to explore other objects. I describe a version of The Evaluator for embedding in your projects as a debugging tool in Chapter 45.

Compatibility ratings in reference chapters

With the proliferation of scriptable browser versions since Navigator 2, it is important to know up front whether a particular language or object model object, property, method, or event handler is supported in the lowest common denominator for which you are designing. Therefore, beginning with Chapter 15 of this reference part of the book, I include frequent compatibility charts, such as the following example:

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	(✓)	✓	✓	✓	✓

The first four columns represent Navigator versions 2, 3, 4, and 6, respectively (there was no release numbered 5). For Internet Explorer, two columns appear for version 3. One, marked IE3/J1, represents the combination of Internet Explorer 3 and JScript.dll version 1; IE3/J2 represents Internet Explorer 3 and JScript.dll version 2. Internet Explorer 4 and later come with their own JScript.dll versions, so there is no sub-version listed. A checkmark means the feature is compatible with the designated browser. You will also occasionally see one or more of the checkmarks surrounded in parentheses. This means some bug or partial implementation for that browser is explained in the body text. Look to the feature's text if there are version issues related to operating system, especially for items that are new with IE4 or later, where many features operate only in Windows.

I also recommend that you print the JavaScript and Browser Objects Quick Reference file shown in Appendix A. The file is on the companion CD-ROM in Adobe Acrobat format. This quick reference clearly shows each object's properties, methods, and event handlers, along with keys to the browser version in which each language item is supported. You should find the printout to be valuable as a day-to-day resource.

Language Essentials for Experienced Programmers

In this section, experienced programmers can read the highlights about the core JavaScript language in terms that may not make complete sense to those with limited or no scripting experience. This section is especially for you if you found the tutorial of Part II rudimentary. Here, then, is the quick tour of the essential issues surrounding the core JavaScript language.

JavaScript is a scripting language. The language is intended for use in an existing *host environment* (for example, a Web browser) that exposes objects whose properties and behaviors are controllable via statements written in the language. Scripts execute within the context of the host environment. The host environment controls what, if any, external environmental objects may be addressed by language statements running in the host environment. For security and privacy reasons, Web browsers generally afford little or no direct access via JavaScript to browser preferences, the operating system, or other programs beyond the scope of the browser. The exception to this rule is that modern browsers allow deeper client access (with the user's permission) through trust mechanisms such as signed scripts (Netscape) or trusted ActiveX controls (Microsoft).

JavaScript is object-based. Although JavaScript exhibits many syntactic parallels with the Java language, JavaScript is not as pervasively object-oriented as Java. The core language includes several built-in static objects from which working objects are generated. Objects are created via a call to a constructor function for any of the built-in objects plus the `new` operator. For example, the following expression generates a `String` object and returns a reference to that object:

```
new String("Hello")
```

Table 13-1 lists the built-in objects with which scripters come in contact.

Table 13-1 JavaScript Built-in Objects

`Array`[1]	`Boolean`	`Date`	`Error`[2]
`EvalError`[2]	`Function`[1]	`Math`	`Number`[1]
`Object`[1]	`RangeError`[2]	`ReferenceError`[2]	`RegExp`[3]
`String`[1]	`SyntaxError`[2]	`TypeError`[2]	`URIError`[2]

[1]Although defined in ECMA Level 1, was first available in NN3 and IE3/J2

[2]Defined in ECMA Level 3; implemented in NN6

[3]Defined in ECMA Level 3; implemented fully in NN4, partially in IE4

JavaScript is loosely typed. Variables, arrays, and function return values are not defined to be of any particular data type. In fact, an initialized variable can hold different data type values in subsequent script statements (obviously not good practice, but possible nonetheless). Similarly, an array may contain values of multiple types. The range of built-in data types is intentionally limited:

Boolean (`true` or `false`)

Null

Number (double-precision 64-bit format IEEE 734 value)

Object (encompassing the `Array` object)

String

Undefined

The host environment defines global scope. Web browsers traditionally define a browser window or frame to be the global context for script statements. When a document unloads, all global variables defined by that document are destroyed.

JavaScript variables have either global or local scope. A global variable in a Web browser is typically initialized in `var` statements that execute as the document loads. All statements in that document can read or write that global variable. A local variable is initialized inside a function (also with the `var` operator). Only statements inside that function may access that local variable.

Scripts sometimes access JavaScript static object properties and methods. Some static objects encourage direct access to their properties or methods. For example, all properties of the `Math` object act as constant values (for example, `Math.PI`).

You can add properties or methods to working objects at will. To add a property to an object, simply assign a value of any type to it. For example, to add an `author` property to a string object named `myText`, use:

```
myText.author = "Jane"
```

Assign a function reference to an object property to give that object a new method:

```
// function definition
function doSpecial(arg1) {
    // statements
}
// assign function reference to method name
myObj.handleSpecial = doSpecial
...
// invoke method
myObj.handleSpecial(argValue)
```

Inside the function definition, the `this` keyword refers to the object that owns the method.

JavaScript objects employ prototype-based inheritance. All object constructors create working objects whose properties and methods inherit the properties and methods defined for the *prototype* of that object. Starting with NN3 and IE3/J2, scripts can add and delete custom properties and/or methods associated with the static object's prototype so that new working objects inherit the current state of the prototype. Scripts can freely override prototype property values or assign different functions to prototype methods in a working object if desired without affecting the static object prototype. But if inherited properties or methods are not modified in the current working object, any changes to the static object's prototype are reflected in the working object. (The mechanism is that a reference to an object's property works its way up the prototype inheritance chain to find a match to the property name.)

JavaScript includes a large set of operators. You can find most operators that you are accustomed to working with in other languages.

JavaScript provides typical control structures. All versions of JavaScript offer `if`, `if-else`, `for`, and `while` constructions. JavaScript 1.3 (NN4+ and IE4+) also add `do-while` and `switch` constructions. Iteration constructions provide `break` and `continue` statements to modify control structure execution.

JavaScript functions may or may not return a value. There is only one kind of JavaScript function. A value is returned only if the function includes a `return` keyword followed by the value to be returned. Return values can be of any data type.

JavaScript functions cannot be overloaded. A JavaScript function accepts zero or more arguments, regardless of the number of parameter variables defined for the function. All arguments are automatically assigned to the `arguments` array, which is a property of a function object. Parameter variable data types are not predefined.

Values are passed "by reference" and "by value." An object passed to a function is actually a reference to that object, offering full read/write access to properties and methods of that object. But other types of values (including object properties) are passed by value, with no reference chain to the original object. Thus, the following nonsense fragment empties the text box when the onChange event fires:

```
function emptyMe(arg1) {
    arg1.value = ""
}
...
<INPUT TYPE="text" VALUE="Howdy" onChange="emptyMe(this)">
```

But in the following version, nothing happens to the text box:

```
function emptyMe(arg1) {
    arg1 = ""
}
...
<INPUT TYPE="text" VALUE="Howdy" onChange="emptyMe(this.value)">
```

The local variable (arg1) simply changes from "Howdy" to an empty string.

Error trapping techniques depend on JavaScript version. There is no error trapping in NN2 or IE3. Error trapping in NN3, NN4, and IE4 is event-driven in the Web browser object model. JavaScript, as implemented in IE5 and NN6, supports try-catch and throw statements, as well as built-in error objects that are not dependent on the host environment.

Memory management is not under script control. The host environment manages memory allocation, including garbage collection. Different browsers may handle memory in different ways.

White space (other than a line terminator) is insignificant. Space and tab characters may separate lexical units (for example, keywords, identifiers, and so on).

A line terminator is usually treated as a statement delimiter. Except in very rare constructions, JavaScript parsers automatically insert the semicolon statement delimiter whenever they encounter one or more line terminators (for example, carriage returns or line feeds). A semicolon delimiter is required between two statements on the same physical line of source code. Moreover, string literals may not have carriage returns in their source code (but an escaped newline character (\n) may be a part of the string).

Onward to Object Models

The core language is only a small part of what you work with while scripting Web pages. The bulk of your job entails understanding the ins and outs of document object models as implemented in several generations of browsers. That's where the next chapter picks up the "essentials" story.

✦ ✦ ✦

CHAPTER 14

Document Object Model Essentials

✦ ✦ ✦ ✦

In This Chapter

Object models versus browser versions

Proprietary model extensions

Structure of the W3C DOM

Mixing object models in a single document

✦ ✦ ✦ ✦

Without question, the biggest challenge facing client-side Web scripters is the sometimes-baffling array of document object models that have competed for our attention throughout the short history of scriptable browsers. Netscape got the ball rolling in Navigator 2 with the first object model. By the time the version 4 browsers came around, the original object model had gained not only some useful cross-browser features, but also a host of features that were unique to only Navigator or Internet Explorer. The object models were diverging, causing no end of headaches for page authors whose scripts had to run on as many browsers as possible. A ray of hope emerged from the standards process of the World Wide Web Consortium (W3C) in the form of a document object model (DOM) recommendation. The new DOM brings forward much of the original object model, plus new ways of addressing every object in a document. The goal of this chapter is to put each of the object models into perspective and help you select the model(s) you intend to support in your Web applications. But before we get to those specifics, let's examine the role of the object model in designing scripted applications.

The Object Model Hierarchy

In the tutorial chapters of Part II, you were introduced to the fundamental ideas behind a document object hierarchy in scriptable browsers. In other object-oriented environments, object hierarchy plays a much greater role than it does in JavaScript-able browsers. (In JavaScript, you don't have to worry about related terms, such as classes, inheritance, and instances.) Even so, you cannot ignore the hierarchy concept because much of your code relies on your ability to write references to objects that depend on their positions within the hierarchy.

Calling these objects "JavaScript objects" is not entirely correct. These are really browser document objects: you just happen to use the JavaScript language to bring them to life. Some scripters of Microsoft Internet Explorer use the VBScript language to script the very same document objects. Technically speaking, JavaScript objects apply to data types and other core language objects separate from the document. The more you can keep document and core language objects separate in your head, the more quickly you can deal with browser brand compatibility issues.

Hierarchy as road map

For the programmer, the primary role of the document object hierarchy is to provide scripts with a way to reference a particular object among all the objects that a browser window can contain. The hierarchy acts as a road map the script can use to know precisely which object to address.

Consider, for a moment, a scene in which you and your friend Tony are in a high school classroom. It's getting hot and stuffy as the afternoon sun pours in through the wall of windows on the west side of the room. You say to Tony, "Would you please open a window?" and motion your head toward a particular window in the room. In programming terms, you've issued a command to an object (whether or not Tony appreciates the comparison). This human interaction has many advantages over anything you can do in programming. First, by making eye contact with Tony before you speak, he knows that he is the intended recipient of the command. Second, your body language passes along some parameters with that command, pointing ever so subtly to a particular window on a particular wall.

If, instead, you are in the principal's office using the public address system, and you broadcast the same command, "Would you please open a window?," no one knows what you mean. Issuing a command without directing it to an object is a waste of time because every object thinks, "That can't be meant for me." To accomplish the same goal as your one-on-one command, the broadcast command has to be something like, "Would Tony Jeffries in Room 312 please open the middle window on the west wall?"

Let's convert this last command to JavaScript *dot syntax* form (see Chapter 4). Recall from the tutorial that a reference to an object starts with the most global point of view and narrows to the most specific point of view. From the point of view of the principal's office, the location hierarchy of the target object is

```
room312.Jeffries.Tony
```

You can also say that Tony's knowledge about how to open a window is one of Tony's methods. The complete reference to Tony and his method then becomes

```
room312.Jeffries.Tony.openWindow()
```

Your job isn't complete yet. The method requires a parameter detailing which window to open. In this case, the window you want is the middle window of the west wall of Room 312. Or, from the hierarchical point of view of the principal's office, it becomes

```
room312.westWall.middleWindow
```

This object road map is the parameter for Tony's `openWindow()` method. Therefore, the entire command that comes over the PA system is

```
room312.Jeffries.Tony.openWindow(room312.westWall.middleWindow)
```

If, instead of barking out orders while sitting in the principal's office, you attempt the same task via radio from an orbiting space shuttle to all the inhabitants on Earth, imagine how laborious your object hierarchy is. The complete reference to Tony's `openWindow()` method and the window that you want opened has to be mighty long to distinguish the desired objects from the billions of objects within the space shuttle's view.

The point is that the smaller the scope of the object-oriented world you're programming, the more you can assume about the location of objects. For client-side JavaScript, the scope is no wider than the browser itself. In other words, every object that a JavaScript script can work with resides within the browser application. With few exceptions, a script does not access anything about your computer hardware, operating system, other applications, desktop, or any other stuff beyond the browser program.

The browser document object road map

Figure 14-1 shows the lowest common denominator document object hierarchy that is implemented in all scriptable browsers. Notice that the `window` object is the topmost object in the entire scheme. Everything you script in JavaScript is in the browser's window.

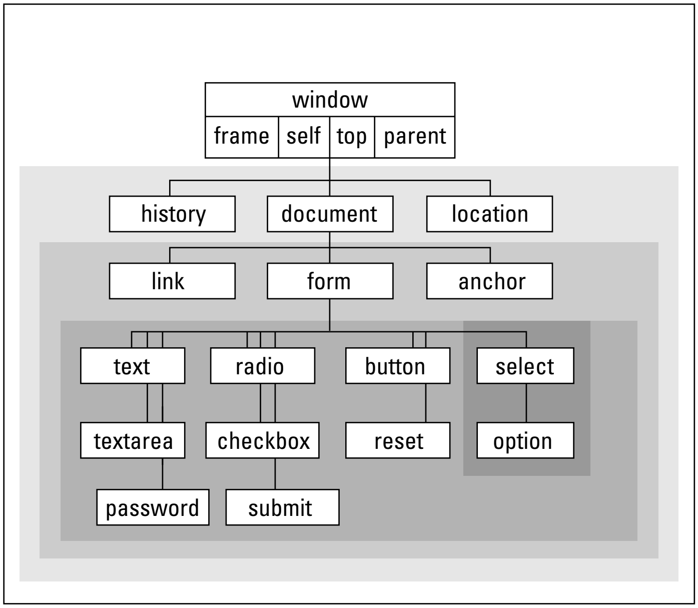

Figure 14-1: The lowest common denominator browser document object hierarchy

Pay attention to the shading of the concentric rectangles. Every object in the same shaded area is at the same level relative to the `window` object. When a line from an object extends to the next darker shaded rectangle, that object contains all the objects in darker areas. There exists, at most, one of these lines between levels. The `window` object contains the `document` object; the `document` object contains a form object; a form object contains many different kinds of form elements.

Study Figure 14-1 to establish a mental model for the basic scriptable elements of a Web page. Models of more recent browsers have more objects in their hierarchies, but the fundamental organization remains. After you script these objects several times, the object hierarchy will become second nature to you — even if you don't necessarily remember every detail (property, method, and event handler) of every object. At least you know where to look for information.

How Document Objects Are Born

Most of the objects that a browser creates for you are established when an HTML document loads into the browser. The same kind of HTML code you use to create links, anchors, and input elements tells a JavaScript-enhanced browser to create those objects in memory. The objects are there whether or not your scripts call them into action.

The only visible differences to the HTML code for defining those objects are the one or more optional attributes specifically dedicated to JavaScript. By and large, these attributes specify the event you want the user interface element to react to and what JavaScript should do when the user takes that action. By relying on the document's HTML code to perform the object generation, you can spend more time figuring out how to do things with those objects or have them do things for you.

Bear in mind that objects are created in their load order. And if you create a multiframe environment, a script in one frame cannot communicate with another frame's objects until both frames load. This trips up a lot of scripters who create multiframe and multiwindow sites (more in Chapter 16).

Object Properties

A property generally defines a particular current setting of an object. The setting may reflect a visible attribute of an object, such as the state of a checkbox (checked or not); it may also contain information that is not so obvious, such as the action and method of a submitted form.

Document objects have most of their initial properties assigned by the attribute settings of the HTML tags that generate the objects. Thus, a property may be a word (for example, a name) or a number (for example, a size). A property can also be an array, such as an array of images contained by a document. If the HTML does not include all attributes, the browser usually fills in a default value for both the attribute and the corresponding JavaScript property.

When used in script statements, property names are case-sensitive. Therefore, if you see a property name listed as `bgColor`, you must use it in a script statement with that exact combination of lowercase and uppercase letters. But when you set an initial value of a property by way of an HTML attribute, the attribute name (like all of HTML) is not case-sensitive. Thus, `<BODY BGCOLOR="white">` and `<body bgcolor="white">` both set the same `bgColor` property value.

Each property determines its own read/write status. Some properties are read-only, whereas you can change others on the fly by assigning a new value to them. For example, to put some new text into a text box object, you assign a string to the object's `value` property:

```
document.forms[0].phone.value = "555-1212"
```

A Note to Experienced Object-Oriented Programmers

Although the basic object model hierarchy appears to have a class/subclass relationship, many of the traditional aspects of a true, object-oriented environment don't apply to the model. The original JavaScript document object hierarchy is a *containment hierarchy*, not an *inheritance hierarchy*. No object inherits properties or methods of an object higher up the chain. Nor is there any automatic message passing from object to object in any direction. Therefore, you cannot invoke a window's method by sending a message to it via the `document` or a form object. All object references must be explicit.

Predefined document objects are generated only when the HTML code containing their definitions loads into the browser. You cannot modify many properties, methods, and event handlers in early object models once you load the document into the browser. In Chapter 41, you learn how to create your own objects, but those objects do not present new visual elements on the page that go beyond what HTML, Java applets, and plug-ins can portray.

Inheritance *does* play a role, as you will see later in this chapter, in the object model defined by the W3C. The new hierarchy is of a more general nature to accommodate requirements of XML as well as HTML. But the containment hierarchy for HTML objects, as described in this section, is still valid in W3C DOM-compatible browsers.

Once an object contained by the document exists (that is, its HTML is loaded into the document), you can also add one or more custom properties to that object. This can be helpful if you wish to associate some additional data with an object for later retrieval. To add such a property, simply specify it in the same statement that assigns a value to it:

```
document.forms[0].phone.delimiter = "-"
```

Any property you set survives as long as the document remains loaded in the window and scripts do not overwrite the object. Be aware, however, that reloading the page usually destroys custom properties.

Object Methods

An object's method is a command that a script can give to that object. Some methods return values, but that is not a prerequisite for a method. Also, not every object has methods defined for it. In a majority of cases, invoking a method from a script causes some action to take place. The resulting action may be obvious (such as resizing a window) or something more subtle (such as sorting an array in memory).

All methods have parentheses after them, and they always appear at the end of an object's reference. When a method accepts or requires parameters, the parameter values go inside the parentheses (with multiple parameters separated by commas).

While an object has its methods predefined by the object model, you can also assign one or more additional methods to an object that already exists (that is, after its HTML is loaded into the document). To do this, a script in the document (or in another window or frame accessible by the document) must define a JavaScript function and then assign that function to a new property name of the object. In the following example written to take advantage of Version 4 or later browser features, the `fullScreen()` function invokes one `window` object method and adjusts two `window` object properties. By assigning the function reference to the new `window.maximize` property, I define a `maximize()` method for the `window` object. Thus, a button's event handler can call that method directly.

```
// define the function
function fullScreen() {
    this.moveTo(0,0)
    this.outerWidth = screen.availWidth
    this.outerHeight = screen.availHeight
}
// assign the function to a custom property
window.maximize = fullScreen
...
<!-- invoke the custom method -->
<INPUT TYPE="button" VALUE="Maximize Window" onClick="window.maximize()">
```

Object Event Handlers

An *event handler* specifies how an object reacts to an event that is triggered by a user action (for example, a button click) or a browser action (for example, the completion of a document load). Going back to the earliest JavaScript-enabled browser, event handlers were defined inside HTML tags as extra attributes. They included the name of the attribute, followed by an equal sign (working as an assignment operator) and a string containing the script statement(s) or function(s) to execute when the event occurs (see Chapter 5). Event handlers also have other forms. In NN3+ and IE4+, event handlers have corresponding methods for their objects and every event handler is a property of its object.

Event handlers as methods

Consider a button object whose sole event handler is `onClick`. This means whenever the button receives a click event, the button triggers the JavaScript expression or function call assigned to that event handler in the button's HTML definition:

```
<INPUT TYPE="button" NAME="clicker" VALUE="Click Me" onClick="doIt()">
```

Normally, that click event is the result of a user physically clicking the button in the page. In NN3+ and IE4+, you can also trigger the event handler with a script by calling the event handler as if it were a method of the object:

```
document.formName.clicker.onclick()
```

Notice that when summoning an event handler as a method, the method name is all lowercase regardless of the case used in the event handler attribute within the original HTML tag. This lowercase reference is a requirement.

Invoking an event handler this way is different from using a method to simulate the physical action denoted by the event. For example, imagine a page containing three simple text fields. One of those fields has an `onFocus` event handler defined for it. Physically tabbing to or clicking in that field brings focus to the field and thereby triggers its `onFocus` event handler. If the field does not have focus, a button can invoke that field's `onFocus` event handler by referencing it as a method:

```
document.formName.fieldName.onfocus()
```

This scripted action does not bring physical focus to the field. The field's own `focus()` method, however, does that under script control.

A byproduct of an event handler's capability to act like a method is that you can define the action of an event handler by defining a function with the event handler's name. For example, instead of specifying an `onLoad` event handler in a document's `<BODY>` tag, you can define a function like this:

```
function onload() {
    statements
}
```

This capability is particularly helpful if you want event handler actions confined to a script running in NN3, IE4, or later. Your scripts don't require special traps for Navigator 2 or Internet Explorer 3.

Event handlers as properties

Although event handlers are commonly defined in an object's HTML tag, you also have the power in NN3+ and IE4+ to assign or change an event handler just like you assign or change the property of an object. The value of an event handler property looks like a function definition. For example, given this HTML definition:

```
<INPUT TYPE="text" NAME="entry" onFocus="doIt()">
```

the value of the object's `onfocus` (all lowercase) property is

```
function onfocus() {
    doIt()
}
```

You can, however, assign an entirely different function to an event handler by assigning a function reference to the property. Such references don't include the parentheses that are part of the function's definition. (You see this again much later in Chapter 41 when you assign functions to object properties.)

Using the same text field definition you just looked at, you can assign a different function to the event handler because based on user input elsewhere in the document you want the field to behave differently when it receives the focus. If you define a function like this

```
function doSomethingElse() {
    statements
}
```

you can then assign the function to the field with this assignment statement:

```
document.formName.entry.onfocus = doSomethingElse
```

Because the new function reference is written in JavaScript, you must observe case for the function name. Although NN4 accepts interCap versions of the event handler names, you are best served across all browsers by sticking with all lowercase event handler names as properties.

Caution

Be aware, however, that as with several settable object properties that don't manifest themselves visually, any change you make to an event handler property disappears with a document reload. Therefore, I advise you not to make such changes except as part of a script that also invokes the event handler like a method: Any gap in time leaves room for users to reload the page accidentally or intentionally.

Because every event handler operates as both property and method, I don't list these properties and methods as part of each object's definition in the next chapters. You can be assured this feature works for every JavaScript object that has an event handler starting with Navigator 3 and Internet Explorer 4.

Object Model Smorgasbord

A survey of the entire evolution of scriptable browsers from NN2 and IE3 through IE5.5 and NN6 reveals six (yes, six!) distinct document object model families. Even if your job entails developing content for just one current browser version, you may be surprised that family members from more than one document object model inhabit your authoring space.

Studying the evolution of the object model is extremely valuable for newcomers to scripting. It is too easy to learn the latest object model gadgets in your current browser, only to discover that your heroic scripting efforts are lost on earlier browsers accessing your pages. Therefore, take a look at the six major object model types and how they came into being. Table 14-1 lists the object model families (in chronological order of their release) and the browser versions that support them. Later in this chapter are some guidelines you can follow to help you choose the object model(s) that best suit your users' "appetites."

Table 14-1 **Object Model Families**

Model	*Browser Support*
Basic Object Model	NN2, NN3, IE3/J1, IE3/J2, NN4, IE4, IE5, NN6, IE5.5
Basic Plus Images	NN3, IE3.01 (Mac only), NN4, IE4, IE5, NN6, IE5.5
NN4 Extensions	NN4
IE4 Extensions	IE4, IE5, IE5.5 (some features in all versions require Win32 OS)
IE5 Extension	IE5, IE5.5 (some features in all versions require Win32 OS)
W3C DOM (I and II)	IE5 (partial), IE5.5 (partial), NN6 (most)

Basic Object Model

The first scriptable browser, Netscape Navigator 2, implemented a very basic document object model. Figure 14-1 provides a visual guide to the objects that were exposed to scripting. The hierarchical structure starts with the window and drills inward toward the document, forms, and form elements. A document is a largely immutable page on the screen. Only elements that are by nature interactive — links and form elements such as text fields, buttons, and so on — are treated as objects with properties, methods, and event handlers.

The heavy emphasis on form elements opened up numerous possibilities that were radical ideas at the time. Because a script could inspect the values of form elements, forms could be pre-validated on the client. If the page included a script that performed some calculations, data entry and calculated results were displayed via editable text fields.

Additional objects that exist outside of the document — window, history, and location objects — provide scriptable access to simple yet practical properties of the browser that loads the page. The most global view of the environment is the navigator object, which includes properties about the browser brand and version.

When Internet Explorer 3 arrived on the scene, the short life of Navigator 2 was nearing its end. Even though NN3 was already widely available in prerelease form, IE3 implemented the basic object model from NN2 (plus one window object property from NN3). Therefore, despite the browser version number discrepancy, NN2 and IE3 are essentially the same with respect to their document object models. For a brief moment in Internet Time, there was nearly complete harmony between Microsoft and Netscape document object models — albeit at a very simple level.

Basic Object Model Plus Images

A very short time after IE3 was released, Netscape released Navigator 3 with an object model that built upon the original version. A handful of existing objects — especially the window object — gained new properties, methods, and/or event handlers. Scripts could also communicate with Java applets as objects. But the biggest new object on the scene was the Image object and the array of image objects exposed to the document object.

Most of the properties for an NN3 image object gave read-only access to values typically assigned to attributes in the <IMG> tag. But you could modify one property — the src property — after the page loaded. Scripts could swap out images within the fixed image rectangle. Although these new image objects didn't have mouse-related event handlers, nesting an image inside a link (which had onMouseOver and new onMouseOut event handlers) let scripts implement "image rollovers" to liven up a page.

As more new scripters investigated the possibilities of adding JavaScript to their pages, frustration ensued when the image swapping they implemented for NN3 failed to work in IE3. Although you could easily script around the lack of an image object to prevent script errors in IE3 (see Chapter 12), the lack of this "cool" page feature disappointed many. Had they also taken into account the installed base of NN2 in the world, they would have been disappointed there, too. To confuse matters even more, the Macintosh version of IE 3.01 (the second release of the IE3/Mac browser) implemented scriptable image objects.

Despite these rumblings of compatibility problems to come, the object model implemented in Navigator 3 eventually became the baseline reference for future document object models. With few exceptions, code written for this object model runs on all browsers from NN3 and IE4 through the latest versions of both brands. Exceptions primarily involve Java applet object support in non-Windows versions of IE4+.

Navigator 4–Only Extensions

The next browser released to the world was Netscape Navigator 4. Numerous additions to the existing objects put more power into the hands of scripters. You could move and resize browser windows within the context of script-detectable screen object properties (for example, how big the user's monitor screen was). Two concepts that represented new thinking about the object model were an enhanced event model and the layer object.

Event Capture Model

Navigator 4 added many new events to the repertoire. Keyboard events and more mouse events (`onMouseDown` and `onMouseUp`) allowed scripts to react to more user actions on form elements and links. All of these events worked as they did in previous object models in which event handlers were typically assigned as attributes to an element's tag (although you could also assign event handlers as properties in script statements). To facilitate some of the Dynamic HTML potential in the rest of the Navigator 4 object model, the event model was substantially enhanced.

At the root of the system is the idea that when a user performs some physical action on an event-aware object (for example, clicking a form button), the event reaches that button from top down through the document object hierarchy. If you have multiple objects that share the same event handler, it may be more convenient to capture that event in just one place — the `window` or `document` object level — rather than assigning the same event handler to all the elements. The default behavior of Navigator 4 allowed the event to reach the target object, just as it had in earlier browsers. But you could also turn on *event capture* in the `window`, `document`, or layer object. Once captured, the event could be handled at the upper level, preprocessed before being passed onto its original target, or redirected to another object altogether.

To engage event capture in NN4, scripts must invoke the `captureEvents()` method of the `window`, `document`, or layer object and pass as parameters constant values that denote the specific events to be captured (constants of the `Event` object). If you no longer need to capture an event, you can turn off event capture via the `releaseEvents()` method.

Whether or not you capture events, the Navigator 4 event model produces an event object (lowercase "e" to distinguish from the static `Event` object) for each event. That object contains properties that reveal more information about the specific event, such as the keyboard character pressed for a keyboard event or the position of a click event on the page. Any event handler can inspect event object properties to learn more about the event and process the event accordingly.

Layers

Perhaps the most radical addition to the NN4 object model was a new object that reflected an entirely new HTML element, the LAYER element. A *layer* is a container that is capable of holding its own HTML document, yet it exists in a plane in front of the main document. You can move, size, and hide a layer under script control. This new element allowed, for the first time, overlapping elements in an HTML page.

To accommodate the layer object in the document object hierarchy, Netscape defined a nesting hierarchy such that a layer was contained by a document. As the result, the `document` object acquired a property (`document.layers`) that was an array of layer objects in the document. This array exposed only the first level of layer(s) in the current `document` object. References to a layer in the main document started with any one of the following:

```
document.layerName
document.layers[n]
document.layers[layerName]
```

Each layer had its own `document` object because each layer could load an external HTML document if desired. Thus, if a script needed access to, say, a form element inside a layer, the reference would begin:

```
document.layerName.document.forms[0]....
```

If a layer contained yet another layer, the reference grew even longer:

```
document.outerLayerName.document.innerLayerName.document.forms[0]...
```

As a positionable element, a layer object had numerous properties and methods that allowed scripts to move, hide, show, and change its stacking order.

Unfortunately for Netscape, the W3C did not agree to make the `<LAYER>` tag a part of the HTML 4.0 specification. As such, it is an orphan element that exists only in Navigator 4 (not implemented in NN6 or later). The same goes for the scripting of the layer object and its nested references. Navigator 4 does, however, implement a little bit of the HTML 4.0 and CSS specifications for positionable elements because you can assign CSS style sheets (with the position and related attributes) to `DIV` and `SPAN` elements in NN4. Navigator treats positioned `DIV` or `SPAN` elements as near equivalents of layer objects for scripting purposes. This means, however, that even if you can get the HTML to work the same across browsers (not always guaranteed due to occasionally different rendering characteristics of positioned `DIV` elements in NN4 and IE4), the scripting for NN4 must adhere to the layer syntax, which differs from the IE4 CSS syntax.

Internet Explorer 4+ Extensions

Microsoft broke important new ground with the release of IE4, which came several months after the release of NN4. The main improvements were in the exposure of all HTML elements, scripted support of CSS, and a new event model. Some other additions were available only on Windows 32-bit operating system platforms.

HTML element objects

The biggest change to the object model world was that every HTML element became a scriptable object, while still supporting the original object model. Microsoft invented the `document.all` array (also called a *collection*). This array contains references to every element in the document, regardless of element nesting. If you assign an identifier (name) to the `ID` attribute of an element, you can reference the element by the following syntax:

```
document.all.elementID
```

In most cases, you can also drop the `document.all.` part of the reference and begin with only the element ID.

Every element object has an entirely new set of properties and methods that give scripters a level of control over document content unlike anything seen before. Table 14-2 shows the properties and methods that all HTML element objects have in common in IE4 (properties followed by brackets are arrays).

Table 14-2 IE4 HTML Element Features in Common

Properties	*Methods*
`all[]`	`click()`
`children[]`	`contains()`
`className`	`getAttribute()`
`document`	`insertAdjacentHTML()`
`filters[]`	`insertAdjacentText()`
`id`	`removeAttribute()`
`innerHTML`	`scrollIntoView()`
`innerText`	`setAttribute()`
`isTextEdit`	
`lang`	
`language`	
`offsetHeight`	
`offsetLeft`	
`offsetParent`	
`offsetTop`	
`offsetWidth`	
`outerHTML`	
`outerText`	
`parentElement`	
`parentTextEdit`	
`sourceIndex`	
`style`	
`tagName`	
`title`	

You can find details for all of the items from Table 15-1 in Chapter 15. But several groups of properties deserve special mention here.

Four properties (`innerHTML`, `innerText`, `outerHTML`, and `outerText`) provide read/write access to the actual content within the body of a document. This means that you no longer must use text boxes to display calculated output from scripts. You can modify content inside paragraphs, table cells, or anywhere on the fly. The browser's rendering engine immediately reflows a document when the dimensions of an element's content change. That feature puts the "Dynamic" in "Dynamic HTML." To those of us who scripted the static pages of earlier browsers, this feature — now taken for granted — was nothing short of a revelation.

The series of "offset" properties are related to the position of an element on the page. These properties are distinct from the kind of positioning performed by CSS. Therefore, you can get the dimensions and location of any element on the page, making it easier to move positionable content atop elements that are part of the document and may appear in various locations due to the browser window's current size.

Finally, the `style` property is the gateway to CSS specifications defined for the element. Importantly, the script can modify the numerous properties of the `style` object. Therefore, you can modify font specifications, colors, borders, and the positioning properties after the page loads. The dynamic reflow of the page takes care of any layout changes that the alteration requires (for example, adjusting to a bigger font size).

Element containment hierarchy

While IE4 still recognizes the element hierarchy of the original object model (Figure 14-1), the document object model for IE4 does not extend this kind of hierarchy fully into other elements. If it did, it would mean that TD elements inside a table might have to be addressed via its next outer TR or TABLE element (just as a form control element must be addressed via its containing FORM element). See in Figure 14-2 how all HTML elements are grouped together under the `document` object. The `document.all` array flattens the containment hierarchy as far as referencing object goes. A reference to the most deeply nested TD element is still `document.all.`*`cellID`*. The highlighted pathway from the `window` object is the predominant reference path used when working with the IE4 document object hierarchy.

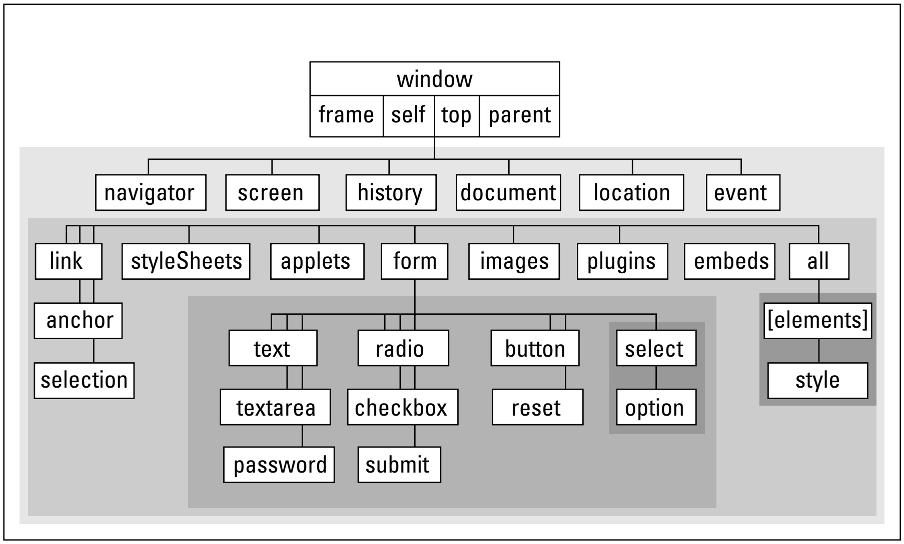

Figure 14-2: The IE4 document object hierarchy

Element containment in IE4, however, is important for other reasons. Because an element can inherit some style sheet attributes from an element that contains it, you should devise a document's HTML by embedding every piece of content inside a container. Paragraph elements are text containers (with start and end tags), not tall line breaks between text chunks. IE4 introduces the notion of a parent-child relationship between a container and elements nested within it. Also, the position of an element may be calculated relative to the position of its next outermost positioning context.

The bottom line here is that element containment doesn't have anything to do with object references (like the original object model). It has everything to do with the *context* of an element relative to the rest of the page's content.

Cascading Style Sheets

By arriving a bit later to market with its version 4 browser than Netscape, Microsoft benefited from having the CSS Level 1 specification more fully developed before the browser's release. Therefore, the implementation is far more complete than that of NN4 (but it is not 100% compatible with the standard).

I should point out that the scriptability of style sheet properties is a bit at odds with the first-generation CSS specification, which seemed to ignore the potential of scripting styles with JavaScript. Many CSS attribute names are hyphenated words (for example, `text-align`, `z-index`). But hyphens are not allowed in identifier names in JavaScript. This necessitated conversion of the multiword CSS attribute names to interCap JavaScript property names. Therefore, `text-align` becomes `textAlign` and `z-index` becomes `zIndex`. You can access all of these properties through an element's `style` property:

```
document.all.elementID.style.stylePropertyName
```

One byproduct of the scriptability of style sheets in IE4 and later is what some might call the *phantom page syndrome*. This occurs when the layout of a page is handled after the primary HTML for the page has downloaded to the browser. As the page loads, not all content may be visible, or it may be in a visual jumble. An `onLoad` event handler in the page then triggers scripts to set styles and/or content for the page. Elements jump around to get to their final resting places. This may be disconcerting to some users who at first see a link to click; but by the time the cursor reaches the click location, the page has reflowed, thereby moving the link to somewhere else on the page.

Event bubbling

Just as Netscape invented an event model for NN4, so, too, did Microsoft invent one for IE4. Unfortunately for cross-browser scripters, the two event models are quite different. Instead of events trickling down the hierarchy to the target element, an IE event starts at the target element and, unless instructed otherwise, "bubbles up" through the element containment hierarchy to eventually reach the `window` object. At any object along the way, an event handler can perform additional processing on that event if desired. Therefore, if you want a single event handler to process all click events for the page, assign the event handler to the `body` or `window` object so the events reach those objects (provided the event bubbling isn't cancelled by some other object along the containment hierarchy).

IE also has an `event` object (a property of the `window` object) that contains details about the event, such as the keyboard key pressed for a keyboard event and the location of a mouse event. Names for these properties are entirely different from the event object properties of NN4.

Despite what seems like incompatible, if not completely opposite, event models in NN4 and IE4, you can make a single set of scripts handle events in both browsers (see Chapters 29 and 56 for examples). In fact, the two event models are made to work together in the W3C DOM Level 2 specification, described later in this chapter.

Event binding of scripts

IE4 introduced an additional way of binding events to objects via a `<SCRIPT>` tag that has two additional, non-W3C attributes: `FOR` and `EVENT` (see a syntax example in Chapter 13). The value assigned to the `FOR` attribute is the ID of an element object for which the script is intended; the value of the `EVENT` attribute is the name of the event handler (for example, `onclick`) by which the script statements within the tag are to be triggered.

Inside the tags are straight script statements, but when the browser sees the special attributes, execution is deferred until the event fires for the designated object. The instant the event fires for the object, the script statements inside the tag execute. This special form of script tag takes the place of a function definition assigned to the event handler by other means. This technique appears to have been a "dry run" for what eventually became DHTML behaviors in IE5/Windows (see the following section).

You can use this binding method only if you run the page inside IE4+. All other browsers, including IE3, ignore the special attributes and treat the statements inside the tags as statements to execute as the page loads.

Win32 features

For Internet Explorer users with 32-bit Windows operating systems, IE4 includes some extra features in the object model that can enhance presentations. *Filters* are style sheet additives that offer a variety of visual effects on body text. For example, you can add a drop shadow or a glowing effect to text by simply applying filter styles to the text. Although filters follow the CSS syntax, they are not a part of the W3C specification.

Two special filters provide animation for transitions between hidden and visible content. For example, you can create the equivalent of a slide presentation by placing the content of each slide in a positioned DIV element. As you hide one DIV and show the other (under script control), the transition filter can perform a transition such as a wipe or an expanding circle—very much like the transitions you specify in PowerPoint or other presentation programs.

Internet Explorer 5+ Extensions

With the release of IE5, Microsoft built more onto the proprietary object model it launched in IE4. Although the range of objects remained pretty much the same, the number of properties, methods, and event handlers for the objects increased dramatically. Some of those additions were added to meet some of the specifications of the W3C DOM (discussed in the next section), occasionally causing a bit of incompatibility with IE4. But Microsoft also pushed ahead with efforts for Windows users only that may not necessarily become industry standards: DHTML behaviors and HTML applications.

A *DHTML behavior* is a chunk of script — saved as an external file — that defines some action (usually a change of one or more style properties) that you can apply to any kind of element. The goal is to create a reusable component that you can load into any document whose elements require that behavior. The behavior file is known as an *HTML component*, and the file has an `.htc` extension. Components are XML documents whose XML tags specify events and event-handling routines for whatever element is assigned that behavior. Script statements in `.htc` documents are written inside `<SCRIPT>` tag sets just as in regular, scriptable HTML documents. As an example of a DHTML behavior, you can define a behavior that turns an element's text to red whenever the cursor rolls atop it and reverts to black when the cursor rolls out. When you assign the behavior to an element in the document (via CSS-like rule syntax), the element picks up that behavior and responds to the user accordingly. You can apply that same behavior to any element(s) you like in the document. (Microsoft has submitted behaviors to the W3C for possible inclusion into CSS Level 3.) You can see an example of a DHTML behavior in Chapter 15's description of the `addBehavior()` method and read an extended discussion in Chapter 47.

HTML applications (*HTAs* in Microsoft parlance) are HTML files that include an XML element known as the `HTA:APPLICATION` element. You can download an HTA to IE5 from the server as if it were a Web page (although its file extension is `.hta` rather than `.htm` or `.html`). A user can also install an HTA on a client machine so it behaves very much like an application with a Desktop icon and significant control over the look of the window. HTAs are granted greater security privileges on the client so that this "application" can behave more like a regular program. In fact, you can elect to turn off the system menu bar and use DHTML techniques to build your own menu bar for the application. Implementation details of HTAs are beyond the scope of this book, but you should be aware of their existence. More information is available at `http://msdn.microsoft.com`.

The W3C DOM

Conflicting browser object models from Netscape and Microsoft made life difficult for developers. Scripters craved a standard that would serve as a common denominator much like HTML and CSS standards did for content and styles. The W3C took up the challenge of creating a document object model standard, the W3C DOM.

The charter of the W3C DOM working group was to create a document object model that could be applied to both HTML and XML documents. Because an XML document can have tags of virtually any name (as defined by the Document Type Definition), it has no intrinsic structure or fixed vocabulary of elements like an HTML document does. As a result, the DOM specification had to accommodate the known structure of HTML (as defined in the HTML 4.0 specification) as well as the unknown structure of an XML document.

To make this work effectively, the working group divided the DOM specification into two sections. The first, called the *Core DOM*, defines specifications for the basic document structure that both HTML and XML documents share. This includes notions of a document containing elements that have tag names and attributes; an element is capable of containing zero or more other elements. The second part of the DOM specification addresses the elements and other characteristics that apply only to HTML. The HTML portion "inherits" all the features of the Core DOM, while providing a measure of backward compatibility to object models already implemented in legacy browsers and providing a framework for new features.

It is important for veteran scripters to recognize that the W3C DOM does not specify all features from existing browser object models. Many features of the Internet Explorer 4 (and later) object model are not part of the W3C DOM specification. This means that if you are comfortable in the IE environment and wish to shift your focus to writing for the W3C DOM spec, you have to change some practices as highlighted in this chapter. Navigator 4 page authors lose the `<LAYER>` tag (which is not part of HTML 4.0 and likely will never see the light of day in a standard) as well as the layer object. In many respects, especially with regard to Dynamic HTML applications, the W3C DOM is an entirely new DOM with new concepts that you must grasp before you can successfully script in the environment.

By the same token, you should be aware that whereas NN6 goes to great lengths to implement all of DOM Level 1 and most of Level 2, Microsoft (for whatever reason) features only a partial implementation of the W3C DOM through IE5.5. This is true even though Microsoft participated in the W3C DOM working group and had more than ample time to put more of the W3C DOM into IE version 5.5.

DOM levels

Like most W3C specifications, one version is rarely enough. The job of the DOM working group was too large to be swallowed whole in one sitting. Therefore, the DOM is a continually evolving specification. The timeline of specification releases rarely coincides with browser releases. Therefore, it is very common for any given browser release to include only some of the most recent W3C version.

The first formal specification, DOM Level 1, was released well after NN4 and IE4 shipped. The HTML portion of Level 1 includes DOM Level 0. This is essentially the object model as implemented in Navigator 3 (and for the most part in Internet Explorer 3 plug image objects). Perhaps the most significant omission from Level 1 is an event model (it ignores even the simple event model implemented in NN2 and IE3).

DOM Level 2 builds on the work of Level 1. In addition to several enhancements of both the Core and HTML portions of Level 1, Level 2 adds significant new sections on the event model, ways of inspecting a document's hierarchy, XML namespaces, text ranges, style sheets, and style properties.

What stays the same

By adopting DOM Level 0 as the starting point of the HTML portion of the DOM, the W3C provided a way for a lot of existing script code to work even in a W3C DOM-compatible browser. Every object you see in the original object model starting with the `document` object (Figure 14-1) plus the image object are in DOM Level 0. Almost all of the same object properties and methods are also available.

More importantly, when you consider the changes to referencing other elements in the W3C DOM (discussed in the next section), we're lucky that the old ways of referencing object such as forms, form elements, and images still work. Had the working group been planning from a clean slate, it is unlikely that the `document` object would have been given properties consisting of arrays of forms, links, and images.

The only potential problems you could encounter with your existing code have to do with a handful of properties that used to belong to the `document` object. In the new DOM, four style-related properties of the `document` object (`alinkColor`, `bgColor`, `linkColor`, and `vlinkColor`) become properties of the `body` object (referenced as `document.body`). In addition, the three link color properties pick up new names in the process (`aLink`, `link`, `vLink`). It appears, however, that for now, IE5.*x* and NN6 maintain backward compatibility with the older document object color properties.

Also, note that the DOM specification concerns itself only with the document and its content. Objects such as `window`, `navigator`, and `screen` are not part of the DOM specification through Level 2. Scripters are still at the mercy of browser makers for compatibility in these areas, but the `window` object likely will be added to the W3C DOM in the future.

What isn't available

As mentioned earlier, the W3C DOM is not simply a restatement of existing browser specifications. Many convenience features of the IE and NN object models do not appear in the W3C DOM. If you develop Dynamic HTML content in IE4+ or NN4, you have to learn how to get along without some of these conveniences.

Navigator 4's experiment with the `<LAYER>` tag was not successful in the W3C process. As a result, both the tag and the scripting conventions surrounding it do not exist in the W3C DOM. To some scripters' relief, the `document.layerName` referencing scenario (even more complex with nested layers) disappears from the object model entirely. A positioned element is treated as just another element that has some special style sheet attributes that enable you to move it anywhere on the page, stack it amid other positioned elements, and hide it from view.

Among popular IE4+ features missing from the W3C DOM are the `document.all` collection of HTML elements and four element properties that facilitate dynamic content: `innerHTML`, `innerText`, `outerHTML`, and `outerText`. A new W3C way provides for acquiring an array of all elements in a document, but generating HTML content to replace existing content or be inserted in a document requires a tedious sequence of statements (see the section "New DOM concepts" later in this chapter). Netscape, however, has implemented the `innerHTML` property for HTML element objects in NN6. If you have a lot of legacy IE4 code that uses the other missing properties that you want to use for NN6, see the section "Simulating IE4 Syntax in NN6" later in this chapter.

"New" HTML practices

Exploitation of Dynamic HTML possibilities in both IE4+ and the W3C DOM relies on some HTML practices that may be new to long-time HTML authors. At the core of these practices (espoused by the HTML 4.0 specification) is making sure that all content is within an HTML container of some kind. Therefore, instead of using the `<P>` tag as a separator between blocks of running text, surround each paragraph of the running text with a `<P>...</P>` tag set. If you don't do it, the browser treats each `<P>` tag as the beginning of a paragraph and ends the paragraph element just before the next `<P>` tag or other block-level element.

While recent browsers continue to accept the omission of certain end tags (for TD, TR, and LI elements, for instance), it is best to get in the habit of supplying these end tags. If for no other reason, they help you visualize where an element's sphere of influence truly begins and ends.

Any element that you intend to script — whether to change its content or its style — should have an identifier assigned to the element's `ID` attribute. Form control elements still require `NAME` attributes if you submit the form content to a server. But you can freely assign a different identifier to a control's `ID` attribute. Scripts can use either the `ID` or the `document.`*`formReference`*`.`*`elementName`* reference to reach a control object. Identifiers are essentially the same as the values you assign to the `NAME` attributes of form and form input elements. Following the same rules for the `NAME` attribute value, an `ID` identifier must be a single word (no white space), it cannot begin with a numeral (to avoid conflicts in JavaScript), and it should avoid punctuation symbols except for the underscore. While an element can be accessed by numeric index within the context of some surrounding element (such as the BODY), this is a risky practice when content is under construction. Unique identifiers make it much easier for scripts to reference objects and are not affected by changes in content order.

New DOM concepts

With the W3C DOM come several concepts that may be entirely new to you unless you have worked extensively with the terminology of tree hierarchies. Concepts that have the most impact on your scripting are new ways of referencing elements and nodes.

Element referencing

Script references to objects in the DOM Level 0 are observed in the W3C DOM for backward compatibility. Therefore, a form input element whose `NAME` attribute is assigned the value `userName` is addressed just like it always is:

```
document.forms[0].userName
```

or

```
document.formName.userName
```

But because all elements of a document are exposed to the `document` object, you can use the new `document` object method to access any element whose ID is assigned. The method is `document.getElementById()`, and the sole parameter is a string version of the identifier of the object whose reference you wish to get. To help put this in context with what you may have used with the IE4 object model, consider the following HTML paragraph tag:

```
<P ID="myParagraph">...</P>
```

In IE4+, you can reference this element with

```
var elem = document.all.myParagraph
```

IE4+ also enables you to omit the `document.all.` portion of the reference — although for the sake of script readability (especially by others who want to study the script), I recommend that you use the `document.all.` prefix.

Although the document.all collection is not implemented in the W3C DOM, use the new document object method (available in IE5+ and NN6+) that enables you to access any element by its ID:

```
var elem = document.getElementById("myParagraph")
```

Unfortunately for scripters, this method is difficult to type (it is case-sensitive — watch out for that ending lowercase "d"). But the W3C DOM includes another document object method that enables you to simulate the document.all convenience collection. See the section, "Simulating IE4 Syntax in NN6" later in this chapter.

A hierarchy of nodes

The issue surrounding containers (described earlier) comes into play for the underlying architecture of the W3C DOM. Every element or freestanding chunk of text in an HTML (or XML) document is an object that is contained by its next outermost container. Let's look at a simple HTML document to see how this system works. Listing 14-1 is formatted to show the containment hierarchy of elements and string chunks.

Listing 14-1: A Simple HTML Document

```
<HTML>
    <HEAD>
        <TITLE>
            A Simple Page
        </TITLE>
    </HEAD>
    <BODY>
        <P ID="paragraph1">
            This is the
            <EM ID="emphasis1">
                one and only
            </EM>
            paragraph on the page.
        </P>
    </BODY>
</HTML>
```

What you don't see in the listing is a representation of the document object. The document object exists automatically when this page loads into a browser. Importantly, the document object encompasses everything you see in Listing 14-1. Therefore, the document object has a single nested element: the HTML element. The HTML element, in turn, has two nested elements: HEAD and BODY. The HEAD element contains the TITLE element, while the TITLE element contains a chunk of text. Down in the BODY element, the P element contains three pieces: a string chunk, the EM element, and another string chunk.

According to W3C DOM terminology, each container, standalone element (such as a BR element), or text chunk is known as a *node* — a fundamental building block of the W3C DOM. Nodes have parent-child relationships when one container holds another. As in real life, parent-child relationships extend only between adjacent generations, so a node can have zero or more children. However, the number of third-generation nodes further nested within the family tree does not influence the number of children associated with a parent. Therefore, in Listing 14-1, the HTML node has two child nodes, HEAD and BODY, which are *siblings* that share the same parent. The BODY element has one child (P) even though that child contains three children (two text nodes and an EM element node).

If you draw a hierarchical tree diagram of the document in Listing 14-1, it should look like the illustration in Figure 14-3.

```
document
+--<HTML>
    +--<HEAD>
    |   +--<TITLE>
    |       +--"A Simple Page"
    +--<BODY>
        +--<P ID="paragraph1">
            +--"This is the "
            +--<EM ID="emphasis1">
            |   +--"one and only"
            +--" paragraph on the page."
```

Figure 14-3: Tree diagram of nodes for the document in Listing 14-1

Note

If the document's source code contains a Document Type Definition (DTD) above the `<HTML>` tag, the browser treats that DTD node as a sibling of the HTML element node. In that case, the root document node contains two child nodes.

The W3C DOM (through Level 2) defines 12 different types of nodes, seven of which have direct application in HTML documents. These seven types of nodes appear in Table 14-3 (the rest apply to XML). Of the 12 types, the three most common are the document, element, and text fragment types. The latter two are implemented in both IE5+ and NN6 (all are implemented in NN6).

Table 14-3 W3C DOM HTML-Related Node Types

Type	*Number*	*nodeName*	*nodeValue*	*Description*	*IE5+*	*NN6*
Element	1	*tag name*	`null`	Any HTML or XML tagged element	Yes	Yes
Attribute	2	*attribute name*	*attribute value*	A name-value attribute pair in an element	No	Yes
Text	3	`#text`	*text content*	A text fragment contained by an element	Yes	Yes
Comment	8	`#comment`	*comment text*	HTML comment	No	Yes
Document	9	`#document`	`null`	Root `document` object	No	Yes
DocumentType	10	`DOCTYPE`	`null`	DTD specification	No	Yes
Fragment	11	`#document-fragment`	`null`	Series of one or more nodes outside of the document	No	Yes

Applying the node types of Table 14-3 to the node diagram in Figure 14-3, you can see that the simple page consists of one document node, six element nodes, and four text nodes.

Node properties

A node has many properties, most of which are references to other nodes related to the current node. Table 14-4 lists all properties shared by all node types in DOM Level 2.

Table 14-4 Node Object Properties (W3C DOM Level 2)

Property	*Value*	*Description*	*IE5/Win*	*IE5/Mac*	*NN6*
`nodeName`	String	Varies with node type (see Table 14-3)	Yes	Yes	Yes
`nodeValue`	String	Varies with node type (see Table 14-3)	Yes	Yes	Yes
`nodeType`	Integer	Constant representing each type	Some	Yes	Yes

Property	Value	Description	IE5/Win	IE5/Mac	NN6
`parentNode`	Object	Reference to next outermost container	Yes	Yes	Yes
`childNodes`	Array	All child nodes in source order	Yes	Yes	Yes
`firstChild`	Object	Reference to first child node	Yes	Yes	Yes
`lastChild`	Object	Reference to last child node	Yes	Yes	Yes
`previous-Sibling`	Object	Reference to sibling node up in source order	Yes	Yes	Yes
`nextSibling`	Object	Reference to sibling node next in source order	Yes	Yes	Yes
`attributes`	NodeMap	Array of attribute nodes	No	Yes	Yes
`ownerDocument`	Object	Containing document object	No	Yes	Yes
`namespaceURI`	String	URI to namespace definition (element and attribute nodes only)	No	No	Yes
`prefix`	String	Namespace prefix (element and attribute nodes only)	No	No	Yes
`localName`	String	Applicable to namespace-affected nodes	No	No	Yes

Note

You can find all of the properties shown in Table 14-4 that also show themselves to be implemented in IE5 or NN6 in Chapter 15's listing of properties that all HTML element objects have in common. That's because an HTML element, as a type of node, inherits all of the properties of the prototypical node.

To help you see the meanings of the key node properties, Table 14-5 shows the property values of several nodes in the simple page shown in Listing 14-1. For each node column, find the node in Figure 14-3 and then follow the list of property values for that node, comparing the values against the actual node structure in Figure 14-3.

Table 14-5 Properties of Selected Nodes for a Simple HTML Document

Properties	*Nodes*			
	document	HTML	P	"one and only"
nodeType	9	1	1	3
nodeName	#document	HTML	P	#text
nodeValue	null	null	null	"one and only"
parentNode	null	document	BODY	EM
previousSibling	null	null	null	null
nextSibling	null	null	null	null
childNodes	HTML	HEAD	"This is the "	(none)
		BODY	EM	
			" paragraph on the page."	
firstChild	HTML	HEAD	"This is the "	null
lastChild	HTML	BODY	" paragraph on the page."	null

The nodeType property is an integer that is helpful in scripts that iterate through an unknown collection of nodes. Most content in an HTML document is of type 1 (HTML element) or 3 (text fragment), with the outermost container, the document, of type 9. A node's nodeName property is either the name of the node's tag (for an HTML element) or a constant value (preceded by a # [hash mark] as shown in Table 14-3). And, what may surprise some, the nodeValue property is null except for the text fragment node type, in which case the value is the actual string of text of the node. In other words, for HTML elements, the W3C DOM does not expose a container's HTML as a string.

It is doubtful that you will use all of the relationship-oriented properties of a node, primarily because there is some overlap in how you can reach a particular node from any other. The parentNode property is important because it is a reference to the current node's immediate container. While the firstChild and lastChild properties point directly to the first and last children inside a container, most scripts generally use the childNodes property with array notation inside a for loop to iterate through child nodes. If there are no child nodes, then the childNodes array has a length of zero.

The Object-Oriented W3C DOM

If you are familiar with concepts of object-oriented (OO) programming, you will appreciate the OO tendencies in the way the W3C defines the DOM. The `Node` object includes sets of properties (Table 14-4) and methods (Table 14-6) that are inherited by every object based on the `Node`. Most of the objects that inherit the `Node`'s behavior have their own properties and/or methods that define their specific behaviors. The following figure shows (in W3C DOM terminology) the inheritance tree from the `Node` root object. Most items are defined in the Core DOM, while items shown in boldface are from the HTML DOM portion.

```
Node
+--Document
|  +--HTMLDocument
+--CharacterData
|  +--Text
|  |  +--CDATASection
|  +--Comment
+--Attr
+--Element
|  +--HTMLElement
|       +--  (Each specific HTML element)
+--DocumentType
+--DocumentFragment
+--Notation
+--Entity
+--Entity Reference
+--ProcessingInstruction
```

W3C DOM Node object inheritance tree

You can see from the preceding figure that individual HTML elements inherit properties and methods from the generic HTML element, which inherits from the Core `Element` object, which, in turn, inherits from the basic `Node`.

It isn't important to know the `Node` object inheritance to script the DOM. But it does help explain the ECMA Script Language Binding appendix of the W3C DOM recommendation, as well as explain how a simple element object winds up with so many properties and methods associated with it.

Note

The IE5/Windows incomplete implementation of the W3C DOM does not treat the `document` object as a node in the true sense. It has no `nodeType` property defined for it, nor does the document node appear as the parent node of the HTML node of a page. Even so, the `document` object remains the root of all references in a page's scripts.

Node methods

Actions that modify the HTML content of a node in the W3C DOM world primarily involve the methods defined for the prototype `Node`. Table 14-6 shows the methods and their support in the W3C DOM-capable browsers.

Table 14-6 Node Object Methods (W3C DOM Level 2)

Method	*Description*	*IE5*	*NN6*
`appendChild(`*newChild*`)`	Adds child node to end of current node	Yes	Yes
`cloneNode(`*deep*`)`	Grabs a copy of the current node (optionally) with children	Yes	Yes
`hasChildNodes()`	Determines whether current node has children (Boolean)	Yes	Yes
`insertBefore(`*new*`, `*ref*`)`	Inserts new child in front of another child	Yes	Yes
`removeChild(`*old*`)`	Deletes one child	Yes	Yes
`replaceChild(`*new*`, `*old*`)`	Replaces an old child with a new one	Yes	Yes
`supports(`*feature*`, `*version*`)`	Determines whether the node supports a particular feature	No	Yes

The important methods for modifying content are `appendChild()`, `insertBefore()`, `removeChild()`, and `replaceChild()`. Notice, however, that all of these methods assume that the point of view for the action is from the parent of the nodes being affected by the methods. For example, to delete an element (using `removeChild()`), you don't invoke that method on the element being removed, but rather on its parent element. This leaves open the possibility for creating a library of utility functions that obviate having to know too much about the precise containment hierarchy of an element. A simple function that lets a script appear to delete an element actually does so from its parent:

```
function removeElement(elemID) {
    var elem = document.getElementById(elemID)
    elem.parentNode.removeChild(elem)
}
```

If this seems like a long way to go to accomplish the same result as setting the `outerHTML` property of an IE4+ object to empty, you are right. While some of this convolution makes sense for XML, unfortunately the W3C working group doesn't seem to have HTML scripters' best interests in mind. All is not lost, however, as you see later in this chapter.

Generating new node content

The final point about the node structure of the W3C DOM focuses on the similarly gnarled way scripters must go about generating content they want to add or replace on a page. For text-only changes (for example, the text inside a table cell), there is both an easy and hard way to perform the task. For HTML changes, there is only the hard way (plus a couple of handy workarounds discussed later). Let's look at the hard way first and then pick up the easy way for text changes.

To generate a new node in the DOM, you look to the variety of methods that are defined for the Core DOM's `document` object (and are therefore inherited by the HTML `document` object). A node creation method is defined for nearly every node type in the DOM. The two important ones for HTML documents are `createElement()` and `createTextNode()`. The first generates an element with whatever tag name (string) you pass as a parameter; the second generates a text node with whatever text you pass.

When you first create a new element, it exists only in the browser's memory and not as part of the document containment hierarchy. Moreover, the result of the `createElement()` method is a reference to an empty element except for the name of the tag. For example, to create a new P element, use

```
var newElem = document.createElement("P")
```

The new element has no ID, attributes, or any content. To assign some attributes to that element, you can use the `setAttribute()` method (a method of every element object) or assign a value to the object's corresponding property. For example, to assign an identifier to the new element, use either

```
newElem.setAttribute("id", "newP")
```

or

```
newElem.id = "newP"
```

Both ways are perfectly legal. Even though the element has an ID at this point, it is not yet part of the document so you cannot retrieve it via the `document.getElementById()` method.

To add some content to the paragraph, you next generate a text node as a separate object:

```
var newText = document.createTextNode("This is the second paragraph.")
```

Again, this node is just sitting around in memory waiting for you to apply it as a child of some other node. To make this text the content of the new paragraph, you can append the node as a child of the paragraph element that is still in memory:

```
newElem.appendChild(newText)
```

If you were able to inspect the HTML that represents the new paragraph element, it would look like the following:

```
<P ID="newP">This is the second paragraph.</P>
```

The new paragraph element is ready for insertion into a document. Using the document shown in Listing 14-1, you can append it as a child of the BODY element:

```
document.body.appendChild(newElem)
```

At last, the new element is part of the document containment hierarchy. You can now reference it just like any other element in the document.

Replacing node content

The addition of the paragraph shown in the last section requires a change to a portion of the text in the original paragraph (the first paragraph is no longer the "one and only" paragraph on the page). As mentioned earlier, you can perform text changes either via the `replaceChild()` method or by assigning new text to a text node's `nodeValue` property. Let's see how each approach works to change the text of the first paragraph's EM element from "one and only" to "first."

To use `replaceChild()`, a script must first generate a valid text node with the new text:

```
var newText = document.createTextNode("first ")
```

Because strings are dumb (in other words, they don't know about words and spaces), the new text node includes a space to accommodate the existing space layout of the original text. The next step is to use the `replaceChild()` method. But recall that the point of view for this method is the parent of the child being replaced. The child here is the text node inside the EM element, so you must invoke the `replaceChild()` method on the EM element. Also, the `replaceChild()` method requires two parameters: the first is the new node; the second is a reference to the node to be replaced. Because the script statements get pretty long with the `getElementById()` method, an intermediate step grabs a reference to the text node inside the EM element:

```
var oldChild = document.getElementById("emphasis1").childNodes[0]
```

Now the script is ready to invoke the `replaceChild()` method on the EM element, swapping the old text node with the new:

```
document.getElementById("emphasis1").replaceChild(newText, oldChild)
```

If you want to capture the old node before it disappears entirely, be aware that the `replaceChild()` method returns a reference to the replaced node (which is only in memory at this point, and not part of the document node hierarchy). You can assign the method statement to a variable and use that old node somewhere else, if needed.

This may seem like a long way to go; it is, especially if the HTML you are generating is complex. Fortunately, you can take a simpler approach for replacing text nodes. All it requires is a reference to the text node being replaced. You can assign that node's `nodeValue` property its new string value:

```
document.getElementById("emphasis1").childNodes[0].nodeValue = "first "
```

When an element's content is entirely text (for example, a table cell that already has a text node in it), this is the most streamlined way to swap text on the fly using W3C DOM syntax. This doesn't work for the creation of the second paragraph text earlier in this chapter because the text node did not exist yet. The `createTextNode()` method had to explicitly create it.

Also remember that a text node does not have any inherent style associated with it. The style of the containing HTML element governs the style of the text. If you want to change not only the text node's text but also how it looks, you have to modify the `style` property of the text node's parent element. Browsers that perform these kinds of content swaps and style changes automatically reflow the page to accommodate changes in the size of the content.

To summarize, Listing 14-2 is a live version of the modifications made to the original document shown in Listing 14-1. The new version includes a button and script that makes the changes described throughout this discussion of nodes. Reload the page to start over.

Listing 14-2: Adding/Replacing DOM Content

```
<HTML>
<HEAD>
<TITLE>A Simple Page</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function modify() {
    var newElem = document.createElement("P")
    newElem.id = "newP"
    var newText = document.createTextNode("This is the second paragraph.")
    newElem.appendChild(newText)
    document.body.appendChild(newElem)
    document.getElementById("emphasis1").childNodes[0].nodeValue = "first "
}
</SCRIPT>
</HEAD>
<BODY>
<BUTTON onClick="modify()">Add/Replace Text</BUTTON>
<P ID="paragraph1">This is the <EM ID="emphasis1">one and only </EM>paragraph on
the page.</P>
</BODY>
</HTML>
```

Chapter 15 details node properties and methods that are inherited by all HTML elements. Most are implemented in both IE5 and NN6. Also look to the reference material for the `document` object in Chapter 18 for other valuable W3C DOM methods.

Although not part of the W3C DOM, the `innerHTML` property (originally devised by Microsoft for IE4) is available in NN6 for the sake of convenience. To speed the conversion of legacy IE4 dynamic content code that uses other popular IE conveniences to run in NN6, see the section "Simulating IE4 Syntax in NN6" later in this chapter.

Static W3C DOM HTML objects

The NN6 DOM (but unfortunately not IE5.*x*) adheres to the core JavaScript notion of prototype inheritance with respect to the object model. When a page loads into NN6, the browser creates HTML objects based on the prototypes of each object defined by the W3C DOM. For example, if you use The Evaluator (Chapter 13) to see what kind of object the `myP` paragraph object is (enter `document.getElementById("myP")` into the top text box and click the Evaluate button), it reports that the object is based on the `HTMLParagraphElement` object of the DOM. Every "instance" of a P element object in the page inherits its default properties and methods from `HTMLParagraphElement` (which, in turn, inherits from `HTMLElement`, `Element`, and `Node` objects — all detailed in the JavaScript binding appendix of the W3C DOM specification).

You can use scripting to add properties to the prototypes of some of these static objects. To do so, you must use new features added to NN6. Two new methods — `__defineGetter__()` and `__defineSetter__()` — enable you to assign functions to a custom property of an object.

Note

These methods are Netscape-specific. To prevent their possible collision with standardized implementations of these features in future implementations of ECMAScript, the underscore characters on either side of the method name are pairs of underscore characters.

The functions execute whenever the property is read (the function assigned via the `__defineGetter__()` method) or modified (the function assigned via the `__defineSetter__()` method). The common way to define these functions is in the form of an anonymous function (Chapter 41). The formats for the two statements that assign these behaviors to an object prototype are as follows:

```
object.prototype.__defineGetter__("propName", function([param1[,...[,paramN]]])
{
    // statements
    return returnValue
})
object.prototype.__defineSetter__("propName", function([param1[,...[,paramN]]])
{
    // statements
    return returnValue
})
```

The example in Listing 14-3 demonstrates how to add a read-only property to every HTML element object in the current document. The property, called `childNodeDetail`, returns an object; the object has two properties, one for the number of element child nodes and one for the number of text child nodes. Note that the script is wrapped inside a script tag that specifies JavaScript 1.5. Also note that the `this` keyword in the function definition is a reference to the object for which the property is calculated. And because the function runs each time a script statement reads the property, any scripted changes to the content after the page loads are reflected in the returned property value.

Listing 14-3: **Adding a Read-Only Prototype Property to All HTML Element Objects**

```
<SCRIPT LANGUAGE="JavaScript1.5">
if (HTMLElement) {
    HTMLElement.prototype.__defineGetter__("childNodeDetail", function() {
        var result = {elementNodes:0, textNodes:0}
        for (var i = 0; i < this.childNodes.length; i++) {
            switch (this.childNodes[i].nodeType) {
                case 1:
                    result.elementNodes++
                    break
                case 3:
                    result.textNodes++
                    break
```

```
            }
        }
        return result
    })
}
</SCRIPT>
```

To access the property, use it like any other property of the object. For example:

```
var BodyNodeDetail = document.body.childNodeDetail
```

The returned value in this example is an object, so you use regular JavaScript syntax to access one of the property values:

```
var BodyElemNodesCount = document.body.childNodeDetail.elementNodes
```

Bidirectional event model

Despite the seemingly conflicting event models of NN4 (trickle down) and IE4 (bubble up), the W3C DOM event model (defined in Level 2) manages to employ both models. This gives the scripter the choice of where along an event's propagation path the event gets processed. To prevent conflicts with existing event model terminology, the W3C model invents many new terms for properties and methods for events. Some coding probably requires W3C DOM-specific handling in a page aimed at multiple object models.

The W3C event model also introduces a new concept called the *event listener*. An event listener is essentially a mechanism that instructs an object to respond to a particular kind of event — very much like the way the event handler attributes of HTML tags respond to events. But the DOM recommendation points out that it prefers use of a more script-oriented way of assigning event listeners: the `addEventListener()` method available for every node in the document hierarchy. Through this method, you advise the browser whether to force an event to bubble up the hierarchy (the default behavior that is also in effect if you use the HTML attribute type of event handler) or to be captured at a higher level.

Functions invoked by the event listener receive a single parameter consisting of the event object whose properties contain contextual details about the event (details such as the position of a mouse click, character code of a keyboard key, or a reference to the target object). For example, if a form includes a button whose job is to invoke a calculation function, the W3C DOM prefers the following way of assigning the event handler:

```
document.getElementById("calcButton").addEventListener("click", doCalc, false)
```

The `addEventListener()` method takes three parameters. The first parameter is a string of the event to listen for; the second is a reference to the function to be invoked when that event fires; and the third parameter is a Boolean value. When you set this Boolean value to `true`, it turns on event capture whenever this event is directed to this target. The function then takes its cue from the event object passed as the parameter:

```
function doCalc(evt) {
    // get shortcut reference to input button's form
    var form = evt.target.form
```

```
    var results = 0
    // other statements to do the calculation //
    form.result.value = results
}
```

To modify an event listener, you use the `removeEventListener()` method to get rid of the old listener and then employ `addEventListener()` with different parameters to assign the new one.

Preventing an event from performing its default action is also a different procedure in the W3C event model than in IE. In IE4 (as well as NN3 and NN4), you can cancel the default action by allowing the event handler to evaluate to `return false`. While this still works in IE5, Microsoft includes another property of the `window.event` object, called `returnValue`. Setting that property to `false` anywhere in the function invoked by the event handler also kills the event before it does its normal job. But the W3C event model uses a method of the event object, `preventDefault()`, to keep the event from its normal task. You can invoke this method anywhere in the function that executes when the event fires.

Unfortunately, IE5.*x* does not implement the W3C DOM event syntax, so using the event listener terminology requires code branching for a cross-browser page. But part of the burden is lifted because the HTML 4.0 way of binding events to elements by way of attributes as well as assignment of events as object properties continues to be supported in IE5.*x* and NN6. NN6 treats "old fashioned" event handler syntax the same as adding an event listener.

Mixing Object Models

The more browsers that your audience uses, the more likely you will want to make your pages work on as many browsers as possible. You've seen in this chapter that scripts written for older browsers, such as Navigator 2 and Internet Explorer 3, tend to work in even the latest browsers without modification. But aiming at that compatibility target doesn't let you take advantage of more advanced features, in particular Dynamic HTML. You must balance the effort required to support as many as four classifications of browsers (non-DHTML, NN4, IE4/5, and W3C DOM common denominator in IE5 and NN6) against the requirements of your audience. Moreover, those requirements can easily change over time. For example, the share of the audience using non-DHTML and NN4 browsers will diminish over time, while the installed base of browsers capable of using the Microsoft IE DOM (for IE4+) and the W3C DOM (IE5+ and NN6+) will increase. If the percentage of visitors using NN4 is not significant at this point, you may well decide to not worry about implementing DHTML features for that browser and lump NN4 together with the rest of the non-DHTML browsers.

For any given application or Web site, it is important to develop a strategy to apply to the deployment of scripted features. But be aware that one strategy simply cannot fit all situations. The primary considerations are the breadth of browser versions reaching your site (many for public sites; perhaps only one for a tightly controlled intranet) and the amount of DHTML you intend to implement.

In the rest of this section, you see three scenarios and strategies employed to meet the developer's requirements. Although they are labeled as three different levels of aggressiveness, it is likely that you can apply individual techniques from each of the levels in establishing a strategy of your own.

The conservative approach

In the first scenario, the content requires a modest level of data entry interaction with a user via a form as well as image rollovers. Supported browsers encompass the entire range of nonscriptable and scriptable browsers, with one version of each page to serve all visitors.

If the form gathers information from the user for submission to a server CGI that stores the data in a database or performs a search based on user-supplied criteria, the obvious mode of entry is through traditional form elements. Scriptable browsers can perform pre-submission validations to hasten the correction of any improperly formatted fields. Event handlers attached to the text fields (`onChange` event handlers) and an `onSubmit` event handler for the form itself can do the validation on the client. Nonscriptable browsers ignore the event handlers, and the form is submitted as usual, relying on server-side validation of input data (and the slow back-and-forth processing that this entails when there is an error or missing field data).

For image rollovers, links surround the image elements. The `onMouseOver` and `onMouseOut` event handlers for the links trigger functions that swap images. By wrapping the statements in the event handler functions in `if` constructions that test for the presence of the `document.images` array, first-generation scriptable browsers that don't implement images as objects perform no action:

```
function imageOn(imgName) {
    if (document.images) {
        document.images[imgName].src = onImages[imgName].src
    }
}
```

The same goes for script statements in the Head that precache the swappable images as the page loads:

```
if (document.images) {
    var onImages = new Array()
    onImages["home"] = new Image(50,30)
    onImages["home"].src = "images/homeOn.gif"
    ...
}
```

This scenario can also provide added content on the page for scriptable browser users by embedding scripts within the body that use `document.write()` to generate content as the page loads. For example, the page can begin with a time-sensitive greeting ("Good Morning," "Good Afternoon," and so on), while nonscriptable browser users see a standard greeting inside the `<NOSCRIPT>` tag pair.

Middle ground

The second scenario includes pages that employ style sheets. The goal again is to support all browser users with the same HTML pages, but also provide users of modern browsers with an enhanced experience. Where supported by the browser, styles of objects change in response to user action (for example, links highlight with a special font color and background during rollover). One of the design elements on the page is a form within a table. As users enter values into some text boxes, calculated results appear at the bottom of the table, preferably as regular content within a table cell (otherwise in another text box).

This scenario requires browser version branching in several places to allow for variations in browser treatment of the features and to avoid problems with older scriptable browsers and nonscriptable browsers alike. You can (and should) perform some (if not all) of the branching via object detection, as you will see in a moment. Table 14-7 highlights the major feature requirements for this scenario and describes the browser support for each.

Table 14-7 Features and Support for a Typical "Middle Ground" Scenario

Feature	*Support and Approach*
Dynamic Styles	IE4+ and NN6+ through the `style` property of any HTML element object
Form Calculations	Unless requiring Y2K date compliance or regular expression parsing of input, should work with all scriptable browsers without any branching required
Dynamic Content	IE4+ and NN6+ support Dynamic HTML content within a cell, but MS and W3C object models require different ways of changing a table cell's content. (Or you can use the nonstandard, but convenient, `innerHTML` property of the cell.) For older scriptable browsers, the cell should contain a text box to display the results; for nonscriptable browsers, the cell should contain a button that submits the form to a server CGI to process the calculation and return a new page with the results.

Dynamic styles

For dynamic styles, both the IE4+ and W3C object models provide access to style sheet settings via the `style` property of any HTML element. This simplifies matters because you can wrap modifications to `style` properties inside `if` clauses that check for the existence of the `style` property for the specified object:

```
function hilite(elem) {
    if (elem.style) {
        elem.style.fontWeight = "bold"
    }
}
```

If the event handler that triggers the change can be localized to the affected element (for example, an `onMouseOver` event handler for a SPAN element surrounding some text), then the event doesn't fire in browsers that don't also support the `style` property. (By good fortune, browsers that implement the `style` property also expose all elements to the object model.) To compensate for the differences in object references between the IE4+ and W3C models, you can pass the object as a parameter to event handler functions:

```
<SPAN onMouseOver="hilite(this)" onMouseOut="revert(this)"
onClick="go('...')">...</SPAN>
```

This technique obviates the need to use browser version detection because the functions invoked by the event handlers do not have to build DOM-specific references to the objects to adjust the style.

Branching variables

If, for now, you continue to be more comfortable with browser version detection than object detection, you can apply version detection for this "middle ground" scenario by establishing branches for the IE4+ and W3C object models. Global variables that act as flags elsewhere in your page's scripts are still the primary mechanism. For this scenario, you can initialize two global variables as follows:

```
function getIEVersion() {
    var ua = navigator.userAgent
    var IEoffset = ua.indexOf("MSIE ")
    return parseFloat(ua.substring(IEoffset+5, ua.indexOf(";", Ieoffset)))
}
var isIE4 = ((navigator.appName.indexOf("Microsoft") == 0 &&
   parseInt(getIEVersion()) >= 4))
var isW3C = (document.documentElement) ? true : false
```

Notice how the `getIEVersion()` function digs out the precise IE version from deep within the `navigator.userAgent` property. Both global variables are Boolean values. While each variable conveys valuable information on its own, the combination of the two reveals even more about the browser environment if necessary. Figure 14-4 shows the truth table for using the AND (`&&`) operator in a conditional clause with both values. For example, if you need a branch that works only in IE4, the `if` clause is

```
if (isIE4 && !isW3C) {...}
```

isIE4	isW3C	isIE4 && isW3C
true	true	IE5+
true	false	IE4 Only
false	true	NN6+
false	false	Older browser

Figure 14-4: Truth table for two browser version variables with the AND operator

The overlap between MS and the W3C object models in IE5 means that you need to determine for each branch which model to use when the script is running. This governs the order of nested `if` conditions when they arise. If you trap for the W3C version first, IE5 runs the branch containing the W3C DOM syntax.

Dynamic content

Once you have the branching variables in place, your scripts can use them for executing functions invoked by event handlers as well as for scripts that run while the page loads. The importance of the second type comes when you want a page to display one kind of HTML for one class of browsers and other HTML for other classes (or all of the rest). The design for the current scenario calls for a table cell to display the results of a form's calculation in HTML where capable. In lesser scriptable browsers, the results should appear in a text box in the table. Nonscriptable browsers should display a button to submit the form.

In the Body of the page, a script should take over and use `document.write()` for the TD element that is to show the results. Buggy behavior in early versions of Navigator require that at least the entire TD element be written dynamically, instead of just the cell's content. (In fact, I usually recommend writing the entire table dynamically if a lot of users have older Navigators.) The structure of such a form and table is as follows:

```
...
<FORM NAME="calculator" ACTION="http://xxx/cgi-bin/calculate.pl"
onSubmit="return false">
<TABLE>
...
<TR>
    <TD>...</TD>
    <SCRIPT LANGUAGE="JavaScript">
    if (isIE4 || isW3C) {
        document.write("<TD ID='result'>0</TD>")
    } else {
        document.write("<TD>"
        document.write("<INPUT TYPE='text' NAME='result' SIZE='10' VALUE='0'>")
        document.write("</TD>")
    }
    </SCRIPT>
    <NOSCRIPT>
        <TD>Click 'Submit' for Results</TD>
    </NOSCRIPT>
</TR>
</TABLE>
<NOSCRIPT>
    <INPUT TYPE="submit">
</NOSCRIPT>
</FORM>
...
```

The preceding code assumes that other table cells contain text boxes whose `onChange` event handlers trigger a calculation script. That calculation script must also branch for the two classes of scriptable browser so that results are displayed to fit the browser's object model:

```
function calculate(form) {
    var results
    ...
    // statements here that perform math and stuff answer into 'results'
variable //
    ...
```

```
    if (isIE4) {
        document.all.result.innerText = results
    } else if (isW3C) {
        document.getElementById("result").childNodes[0].nodeValue = results
    } else {
        document.calculator.result.value = results
    }
}
```

Adding dynamic content for NN4 requires a little more planning. The technique usually involves nesting an absolute-positioned DIV inside a relative-positioned SPAN. Scripts can then use `document.write()` to create new content for the deeply nested DIV element. Pulling this off successfully entails pretty complex references through multiple layers and their documents, as described in Chapter 31. But no matter what lengths you go to in an effort to employ dynamic content in NN4, the new content does not automatically resize the table or cell to accommodate larger or smaller chunks of text. Without automatic reflow of the page, as is found in IE4+ and NN6+, writing to an NN4 positioned layer does not force other page content to move.

A radical approach

By "radical," I mean that the page content is designed to employ extensive DHTML features, including positioned (if not flying) elements on the page. Perhaps some clicking and dragging of elements can add some fun to the page while you're at it.

Employing these kinds of features requires some extensive forethought about your audience and the browsers they use. While some aspects of DHTML, such as CSS, degrade gracefully in older browsers (the content is still presented, although not in optimum font display perhaps), positioned elements do not degrade well at all. The problem is that older browsers ignore the CSS attributes that control positioning, stacking order, and visibility. Therefore, when the page loads in a pre-version 4 browser, all content is rendered in source code order. Elements that are supposed to be positioned, hidden, or overlapped are drawn on the page in "old fashioned" rendering.

To use element positioning for the greatest effect, your Web site should preexamine the browser at some earlier page in the navigation sequence to reach the DHTML-equipped page. Only browsers capable of your fancy features should be allowed to pass onto the "cool" pages. All other browsers get diverted to another page or pathway through your application so they can at least get the information they came for, if not in the most lavish presentation. Techniques detailed in Chapter 13 demonstrate how to make a branching index page.

By filtering out non-DHTML-capable browsers, some of your job is easier — but not all. On the plus side, you can ignore a lot of weirdness that accrues to scripting bugs in earlier browsers. But you must still decide which of the three element positioning models to follow: IE4+, NN4, or W3C. Chances are that you will want to support at least two of the three unless you are in the luxurious position of designing for a single browser platform (or have taken a stand that you will support only one DOM).

Of the three models, NN4's DOM is the trickiest one to deal with at the HTML level. While it may be possible that your content design will look the same using positioned DIV and SPAN elements in all DHTML-capable browsers, often the appearance in NN4 is unacceptable. At that point, you will probably have to use scripts in your Body to dynamically generate HTML, specifying the `<LAYER>` tag for NN4 and positioned `<DIV>` elements for the rest.

Note

Although IE4 and IE5.x can use the same basic Microsoft object model, not all DHTML code renders the same on both generations of browsers. Microsoft made some changes here and there to the way some style attributes are rendered so that IE5.x comes into better compliance with the CSS recommendation.

Using script libraries

As long as you plan to use scripts to dynamically generate HTML for the page, you might consider creating separate, external `.js` libraries for each of the object models you want to support for the page. Scripts in each library contain code for both the HTML accumulation (for use with `document.write()` in the main page) and for processing user interaction. Assuming that only DHTML-capable browsers reach the page, branching is required only at the beginning of the document where an object model-specific library is loaded:

```
var isIE4 = ((navigator.appName.indexOf("Microsoft") == 0 &&
    parseInt(navigator.appVersion) == 4))
var isW3C = (document.documentElement) ? true : false
if (isW3C) {
    // give priority to W3C model for IE5.x
    document.write("<SCRIPT LANGUAGE='JavaScript' SRC='page3_W3C.js'><" +
         "\/SCRIPT>")
} else if (isIE4) {
    document.write("<SCRIPT LANGUAGE='JavaScript' SRC='page3_IE4.js'><" +
        "\/SCRIPT>")
} else {
    document.write("<SCRIPT LANGUAGE='JavaScript' SRC='page3_generic.js'><" +
        "\/SCRIPT>")
}
```

Each of the statements that writes the `<SCRIPT>` tag includes a workaround that is required on some browsers (NN4 especially) to facilitate using `document.write()` to write script tags to the page.

Once these libraries are specified for the page, script statements anywhere later in the page can invoke functions defined in each library to generate a particular element or set of elements in the object model HTML optimized for the current browser. Of course, it's not necessary to have one library devoted to each object model. You might find it more convenient for authoring and maintenance to keep all the code in one library that has numerous internal branchings for browser versions. Branches in a library can use the version sniffing global variables defined in the main HTML page's scripts. Better still, a library can be entirely self-contained by using object detection. You can see an example of such a DHTML library in Chapter 48.

Handling events

Thanks to the W3C DOM's event model implementing a similar event bubbling scheme as IE4+, you can apply that event propagation model to IE4+ and W3C DOM browsers. There are differences in the details, however. IE's approach does not pass the event object as a parameter to a function invoked by an event handler. Instead, the IE `event` object is a property of the `window` object. Therefore, your functions have to look for the passed parameter and substitute the `window.event` object in its place for IE:

```
function calculate(evt) {
    evt = (evt) ? evt : window.event
    // more statements to handle the event //
}
```

Additional branching is necessary to inspect many details of the event. For example, IE calls the object receiving the event the `srcElement`, while the W3C DOM calls it the `target`. Canceling the default behavior of the event (for example, preventing a form's submission if it fails client-side validation) is also different for the models (although the "old-fashioned" way of letting HTML-type event handlers evaluate to `return false` still works). You can find more event object details in Chapter 29.

Simulating IE4+ Syntax in NN6

With so much IE4+ DHTML-related JavaScript code already in use, scripters are certainly eager to leverage as much of their old code as possible in W3C DOM browsers such as NN6. While NN6 helps a bit by implementing the IE `innerHTML` property for HTML elements, this section shows you how a simple `.js` library can provide NN6 with a few more common convenience properties of the IE4+ object model. By linking this library into your pages, you can give NN6 the valuable HTML element properties shown in Table 14-8.

Table 14-8 IE4+ HTML Element Property Simulation for NN6

Property	***Read***	***Write***	***Replaces in W3C DOM***
`all`	yes	no	`getElementsByTagName("*")`
`innerText`	yes	yes	`nodeValue` property for text nodes; creating a text fragment node and inserting it into existing node structure
`outerHTML`	no	yes	(No equivalent)

Scripts that make these simulations possible use the prototype inheritance behavior of static objects described earlier in this chapter. Because they require

NN6-specific features in that browser's implementation of JavaScript 1.5, link the .js library with the following tag:

```
<SCRIPT LANGUAGE="JavaScript1.5" TYPE="text/javascript"
SRC="IE4Simulator.js"></SCRIPT>
```

All scripts that follow belong in the .js library. They're divided into two groups to allow for detailed discussion.

The all property simulator

Nearly every HTML element can be a container of other elements (with the exception of a handful of leaf nodes, such as
). The all property in IE returns a collection of references to all element objects nested inside the current object, no matter how deeply nested the containment hierarchy is. That's why the document.all reference is such a convenient way to access any element in the entire document that has an ID attribute.

As illustrated earlier in the sidebar figure, the Node static object is the object from which all elements are derived. That object's prototype is enhanced here because you have to make sure that all nodes, especially the document node, can acquire the all property. Listing 14-4a shows the segment of the library that defines the all property for the Node object prototype.

Listing 14-4a: **Simulator for the all Property**

```
if (!document.all) {
    Node.prototype.__defineGetter__("all", function() {
        if (document.getElementsByTagName("*").length) {
            switch (this.nodeType) {
                case 9:
                    return document.getElementsByTagName("*")
                    break
                case 1:
                    return this.getElementsByTagName("*")
                    break
            }
        }
        return ""
    })
    Node.prototype.__defineSetter__("all", function() {})
}
```

This portion of the library exhibits a rare instance in which using object detection for document.all does the right thing now and in the future. The prototype should not execute if the browser loading the page already has a document.all property.

The anonymous function first establishes a branch in the code only for the object model if it supports the wildcard parameter for the document.getElementsByTagName() method. The function then performs slightly different extractions depending on whether the node is the document (type 9) or an element (type 1). If the all property should be queried for any other kind of node, the returned value is an empty string. Each time the all property is accessed, the anonymous function executes to pick up all elements nested inside the current node. Therefore, the collection returned by the `all` property is always up to date, even if the node structure of the current object changes after the document loads.

While this simulator code provides NN6 scripts with IE4-like syntax for referencing elements, the collection returned by the native `document.all` in IE and calculated `document.all` in NN6 may not always have an identical length — the collections are derived slightly differently. The important thing to know, however, is that by employing this prototype modifier in NN6, you have the ability to reference elements by their IDs in the form `document.all.`*`elementID`*.

The content properties simulators

The remaining code of this library lets NN6 use the same `innerText` and `outerHTML` properties as IE4 for modifying all element objects. Listing 14-4b contains the NN6 JavaScript code that prepares the browser to set an element object's `outerHTML` property, as well as get and set the `innerText` properties. The code again uses anonymous functions assigned to `getter` and `setter` behaviors of prototype properties. Because the properties here apply only to HTML elements, the static object whose prototype is being modified is `HTMLElement`. All specific HTML element objects inherit properties and methods from the `HTMLElement` object. All four prototype adjustment blocks are nested inside a condition that makes sure the static `HTMLElement` object is exposed in the browser's object model (which it is in NN6+).

All functions in Listing 14-4b use the W3C DOM `Range` object (Chapter 19). Two of them use a Netscape-proprietary method of the `Range` object as a shortcut to converting a string into a node hierarchy.

Listing 14-4b: Simulator for the innerText and outerHTML Properties

```
if (HTMLElement) {
    HTMLElement.prototype.__defineSetter__("innerText", function (txt) {
        var rng = document.createRange()
        rng.selectNodeContents(this)
        rng.deleteContents()
        var newText = document.createTextNode(txt)
        this.appendChild(newText)
        return txt
    })
    HTMLElement.prototype.__defineGetter__("innerText", function () {
        var rng = document.createRange()
        rng.selectNode(this)
        return rng.toString()
    })
    HTMLElement.prototype.__defineSetter__("outerHTML", function (html) {
        var rng = document.createRange()
        rng.selectNode(this)
        var newHTML = rng.createContextualFragment(html)
        this.parentNode.replaceChild(newHTML,this)
        return html
    })
    HTMLElement.prototype.__defineGetter__("outerHTML", function() {return ''})
}
```

The getter function for the `innerText` property creates a range whose boundaries encompass the current object. Because a range includes only the text part of a document, the adjustment of the range boundaries to the current node encompasses all text, including text nodes of nested elements. Returning the string version of the range provides a copy of all text inside the current element.

For the setter action, the anonymous function defines one parameter variable, which is the text to replace the text inside an element. With the help, again, of the `Range` object, the range is cinched up to encompass the contents of the current node. Those contents are deleted, and new text node is created out of the value assigned to the property (in other words, passed as a parameter to the anonymous function). With the current object no longer containing any nodes after the deletion, the `appendChild()` method inserts the new text node as a child to the current object.

Setting the `outerHTML` property starts out the same as setting the `innerText`, but the new content—which arrives as a string assigned to the parameter variable—is converted into a fully formed set of nested nodes via the `createContextualFragment()` method. This method is invoked on any range object, but it does not affect the range to which it is attached. The value returned from the method is what's important, containing a node whose content is already set up as genuine DOM nodes. That's why the returned value can be passed to the `replaceChild()` method to replace the new content as HTML rather than plain text. But because the `outerHTML` property applies to the entire current element, it must use the roundabout way of replacing itself as a child of its parent. This prevents the accidental modification of any siblings in the process.

Where to Go from Here

These past two chapters provided an overview of the core language and object model issues that anyone designing pages that use JavaScript must confront. The goal here is to stimulate your own thinking about how to embrace or discard levels of compatibility with your pages as you balance your desire to generate "cool" pages and serve your audience. From here on, the difficult choices are up to you.

To help you choose the objects, properties, methods, and event handlers that best suit your requirements, the rest of the chapters in Part III and all of Part IV provide in-depth references to the document object model and core JavaScript language features. Observe the compatibility ratings for each language term very carefully to help you determine which features best suit your audience's browsers. Most example listings are complete HTML pages that you can load in various browsers to see how they work. Many others invite you to explore how things work via The Evaluator (Chapter 13). Play around with the files, making modifications to build your own applications or expanding your working knowledge of JavaScript in the browser environment.

The language and object models have grown in the handful of years they have been in existence. The amount of language vocabulary has increased astronomically. It takes time to drink it all in and feel comfortable that you are aware of the powers available to you. Don't worry about memorizing the vocabulary. It's more important to acquaint yourself with the features, and then come back later when you need the implementation details.

Be patient. Be persistent. The reward will come.

✦ ✦ ✦

CHAPTER 15

Generic HTML Element Objects

✦ ✦ ✦ ✦

In This Chapter

Working with HTML element objects

Common properties and methods

Event handlers of all element objects

✦ ✦ ✦ ✦

The object model specifications implemented in Internet Explorer 4+ and Netscape Navigator 6 both feature a large set of scriptable objects that represent what we often call "generic" HTML elements. Generic elements can be divided into two groups. One group, such as the B and STRIKE elements, define font styles to be applied to enclosed sequences of text. The need for these elements (and the objects that represent them) is receding as more browsers accommodate style sheets. The second group of elements assigns context to content within their start and end tags. Examples of contextual elements include H1, BLOCKQUOTE, and the ubiquitous P element. While browsers sometimes have consistent visual ways of rendering contextual elements by default (for example, the large, bold font of an `<H1>` tag), the specific rendering is not the intended purpose of the tags. No formal standard dictates that text within an EM element must be italicized: the style simply has become the custom since the very early days of browsers.

All of these generic elements share a large number of scriptable properties, methods, and event handlers. The sharing extends not only among generic elements, but also among virtually every renderable element — even if it has additional, element-specific properties, methods, and/or event handlers that I cover in depth in other chapters of this reference. Rather than repeat the details of these shared properties, methods, and event handlers for each object throughout this reference, I describe them in detail only in this chapter (unless there is a special behavior, bug, or trick associated with the item in some object described elsewhere). In succeeding reference chapters, each object description includes a list of the object's properties, methods, and event handlers, but I do not list shared items over and over (making it hard to find items that are unique to a particular element). Instead, you see a pointer back to this chapter for the items in common with generic HTML element objects. A dark tab at the bottom of this chapter's pages should make it easy to find this chapter in a hurry.

Generic Objects

Table 15-1 lists all of the objects that I treat in this reference as "generic" objects. All of these objects share the properties, methods, and event handlers described in succeeding sections and have no special items that require additional coverage elsewhere in this book.

Table 15-1 Generic HTML Element Objects

Formatting Objects	*Contextual Objects*
B	ACRONYM
BIG	ADDRESS
CENTER	CITE
I	CODE
NOBR	DFN
RT	DEL
RUBY	DIV
S	EM
SMALL	INS
STRIKE	KBD
SUB	LISTING
SUP	P
TT	PLAINTEXT
U	PRE
WBR	SAMP
	SPAN
	STRONG
	VAR
	XMP

Properties	*Methods*	*Event Handlers*
`accessKey`	`addBehavior()`	`onActivate`
`all`	`addEventListener()`	`onBeforeCopy`
`attributes`	`appendChild()`	`onBeforeCut`

Properties	***Methods***	***Event Handlers***
behaviorUrns	applyElement()	onBeforeDeactivate
canHaveChildren	attachEvent()	onBeforeEditFocus
canHaveHTML	blur()	onBeforePaste
childNodes	clearAttributes()	onBlur
children	click()	onClick
className	cloneNode()	onContextMenu
clientHeight	componentFromPoint()	onControlSelect
clientLeft	contains()	onCopy
clientTop	detachEvent()	onCut
clientWidth	dispatchEvent()	onDblClick
contentEditable	fireEvent()	onDeactivate
currentStyle	focus()	onDrag
dataFld	getAdjacentText()	onDragEnd
dataFormatAs	getAttribute()	onDragEnter
dataSrc	getAttributeNode()	onDragLeave
dir	getBoundingClientRect()	onDragOver
disabled	getClientRects()	onDragStart
document	getElementsByTagName()	onDrop
filters	getExpression()	onFilterChange
firstChild	hasChildNodes()	onFocus
height	insertAdjacentElement()	onHelp
hideFocus	insertAdjacentHTML()	onKeyDown
id	insertAdjacentText()	onKeyPress
innerHTML	insertBefore()	onKeyUp
innerText	item()	onLoseCapture
isContentEditable	mergeAttributes()	onMouseDown
isDisabled	normalize()	onMouseEnter
isMultiLine	releaseCapture()	onMouseLeave
isTextEdit	removeAttribute()	onMouseMove
lang	removeAttributeNode()	onMouseOut

Continued

Table 15-1 *(continued)*

Properties	***Methods***	***Event Handlers***
language	removeBehavior()	onMouseOver
lastChild	removeChild()	onMouseUp
length	removeEventListener()	onPaste
localName	removeExpression()	onPropertyChange
namespaceURI	removeNode()	onReadyStateChange
nextSibling	replaceAdjacentText()	onResize
nodeName	replaceChild()	onResizeEnd
nodeType	replaceNode()	onResizeStart
nodeValue	scrollIntoView()	onSelectStart
offsetHeight	setActive()	
offsetLeft	setAttribute()	
offsetParent	setAttributeNode()	
offsetTop	setCapture()	
offsetWidth	setExpression()	
outerHTML	supports()	
outerText	swapNode()	
ownerDocument	tags()	
parentElement	urns()	
parentNode		
parentTextEdit		
prefix		
previousSibling		
readyState		
recordNumber		
runtimeStyle		
scopeName		
scrollHeight		
scrollLeft		
scrollTop		
scrollWidth		

Properties	Methods	Event Handlers
sourceIndex		
style		
tabIndex		
tagName		
tagUrn		
title		
uniqueID		

Syntax

To access element properties or methods, use this:

```
(IE4+)        [document.all.]objectID.property | method([parameters])
(IE5+/NN6)     document.getElementById(objectID).property | method([parameters])
```

About these objects

All objects listed in Table 15-1 are DOM representations of HTML elements that influence either the font style or the context of some HTML content. The large set of properties, methods, and event handlers associated with these objects also applies to virtually every other DOM object that represents an HTML element. Discussions about object details in this chapter apply to dozens of other objects described in succeeding chapters of this reference section.

Properties

accessKey

Value: One-Character String   Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

For many elements, you can specify a keyboard character (letter, numeral, or punctuation symbol) that, when typed as an Alt+key combination (on the Win32 OS platform) or Ctrl+key combination (on the MacOS), brings focus to that element. An element that has focus is the one that is set to respond to keyboard activity. If the newly focused element is out of view in the document's current scroll position, the document is scrolled to bring that focused element into view (also see the `scrollIntoView()` method). The character you specify can be an uppercase or lowercase value, but these values are not case-sensitive. If you assign the same letter to more than one element, the user can cycle through all elements associated with that `accessKey` value.

For IE4, not all elements can receive focus in a meaningful way. For that browser version, you should limit this property to elements that can actually receive focus, such as form elements and links. One way to see what elements on a page can receive focus is to repeatedly press the Tab key while the document is visible. In the Windows platforms, either a dotted line around the element or a text insertion pointer flashing inside a text entry element indicates the focus. Not all operating system platforms provide focus to the same set of elements. IE4 for the Macintosh, for example, does not give focus to button elements. For IE5.5, however, any element can receive focus — even if no visible outline explicitly indicates this state.

Internet Explorer gives some added powers to the `accessKey` property in some cases. For example, if you assign an `accessKey` value to a LABEL element object, the focus is handed to the form element associated with that label. Also, when elements such as buttons have focus, pressing the spacebar acts the same as clicking the element with a mouse.

Exercise some judgement in selecting characters for `accessKey` values. If you assign a letter that is normally used to access one of the Windows version browser's built-in menus (for example, Alt+F for the File menu), that `accessKey` setting overrides the browser's normal behavior. To users who rely on keyboard access to menus, your control over that key combination can be disconcerting.

On the CD-ROM

Example (with Listing 15-1) on the CD-ROM

Related Item: `srcollIntoView()` method.

`all`

Value: Array of nested element objects. Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `all` property is a collection (array) of every HTML element and (in IE5+) XML tag within the scope of the current object. Items in this array appear in source-code order, and the array is oblivious to element containment among the items. For HTML element containers, the source-code order is dependent on the position of the start tag for the element — end tags are not counted. But for XML tags, end tags appear as separate entries in the array.

Every `document.all` collection contains objects for the HTML, HEAD, TITLE, and BODY element objects even if the actual HTML source code omits the tags. The object model creates these objects for every document that is loaded into a window or frame. While the `document.all` reference may be the most common usage, the `all` property is available for any container element. For example, `document.forms[0].all` exposes all elements defined within the first form of a page.

You can access any element that has an identifier assigned to its `ID` attribute by that identifier in string form (as well as by index integer). Rather than use the performance-costly `eval()` function to convert a string to an object reference, use the string value of the name as an array index value:

```
var paragraph = document.all["myP"]
```

Internet Explorer enables you to use either square brackets or parentheses for single collection index values. Thus, the following two examples evaluate identically:

```
var paragraph = document.all["myP"]
var paragraph = document.all("myP")
```

In the rare case that more than one element within the `all` collection has the same ID, the syntax for the string index value returns a collection of just those identically named elements. But you can use a second argument (in parentheses) to signify the integer of the initial collection and thus single out a specific instance of that named element:

```
var secondRadio = document.all("group0",1)
```

As a more readable alternative, you can use the `item()` method (described later in this chapter) to access the same kinds of items within a collection:

```
var secondRadio = document.all.item("group0",1)
```

Also see the `tags()` method (later in this chapter) as a way to extract a set of elements from an `all` collection that matches a specific tag name.

You can simulate the behavior of IE's `all` property in NN6. See Chapter 14 for the code you need to add to make that happen.

On the CD-ROM

Example on the CD-ROM

Related Items: `item(), tags()` methods.

attributes

Value: Array of attribute object references. Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `attributes` property consists of an array of attributes specified for an element. In IE5, the `attributes` array contains an entry for every possible property that the browser has defined for its elements — even if the attribute is not set explicitly in the HTML tag. Also, any attributes that you add later via script facilities such as the `setAttribute()` method are not reflected in the `attributes` array. In other words, the IE5 `attributes` array is fixed, using default values for all properties except those that you explicitly set as attributes in the HTML tag.

NN6's `attributes` property returns an array that is a named node map (in W3C DOM terminology). NN6 does not implement all W3C DOM Level 2 methods for a named node map, but you can use the `getNamedItem(`*`attrName`*`)` and `item(`*`index`*`)` methods on the array returned from the `attributes` property to access individual attribute objects via W3C DOM syntax.

IE5 and NN6 have different ideas about what an attribute object should be. Table 15-2 shows the variety of properties of an attribute object as defined by the two object models. The larger set of properties in NN6 reveals its dependence on the W3C DOM node inheritance model discussed in Chapter 14.

Table 15-2 Attribute Object Properties

Property	*IE5.x*	*NN6*	*Description*
`attributes`	No	Yes	Array of nested attribute objects (null)
`childNodes`	No	Yes	Child node array
`firstChild`	No	Yes	First child node
`lastChild`	No	Yes	Last child node
`localName`	No	Yes	Name within current namespace
`name`	No	Yes	Attribute name
`nameSpaceURI`	No	Yes	XML namespace URI
`nextSibling`	No	Yes	Next sibling node
`nodeName`	Yes	Yes	Attribute name
`nodeType`	No	Yes	Node type (2)
`nodeValue`	Yes	Yes	Value assigned to attribute
`ownerDocument`	No	Yes	`document` object reference
`ownerElement`	No	Yes	Element node reference
`parentNode`	No	Yes	Parent node reference
`prefix`	No	Yes	XML namespace prefix
`previousSibling`	No	Yes	Previous sibling node
`specified`	Yes	Yes	Whether attribute is explicitly specified (Boolean)
`value`	No	Yes	Value assigned to attribute

The most helpful property of an attribute object is the Boolean `specified` property. In IE, this lets you know whether the attribute is explicitly specified in the element's tag. Because NN6 returns only explicitly specified attributes in the `attributes` array, the value in NN6 is always `true`.

On the CD-ROM

Example on the CD-ROM

Related Items: `mergeAttributes()`, `removeAttribute()`, `setAttribute()` methods.

behaviorUrns

Value: Array of behavior URN strings Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `behaviorUrns` property is designed to provide a list of addresses, in the form of *URNs (Uniform Resource Names),* of all behaviors assigned to the current object. If there are no behaviors, the array has a length of zero. In practice, however, IE5 always returns an array of empty strings. Perhaps the potential exposure of URNs by script was deemed to be a privacy risk.

On the CD-ROM

Example on the CD-ROM

Related Item: `urns()` method.

canHaveChildren

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Useful in some dynamic content situations, the `canHaveChildren` property (not implemented in IE5/Mac) reveals whether a particular element is capable of containing a child (nested) element. Most elements that have start and end tags (particularly the generic elements covered in this chapter) can contain nested elements. In modern object models, a nested element is referred to as a child of its parent container.

On the CD-ROM

Example (with Listing 15-2) on the CD-ROM

Related Items: `childNodes`, `firstChild`, `lastChild`, `parentElement`, `parentNode` properties; `appendChild()`, `hasChildNodes()`, `removeChild()` methods.

canHaveHTML

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

While most HTML elements are containers of HTML content, not all are. The `canHaveHTML` property lets scripts find out whether a particular object can accept HTML content, such as for insertion or replacement by object methods. The value for a P element, for example, is `true`. The value for a BR element is `false`.

On the CD-ROM

Example on the CD-ROM

Related Items: `appendChild()`, `insertAdjacentHTML()`, `insertBefore()` methods.

childNodes

Value: Array of node objects. Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	

The `childNodes` property consists of an array of node objects contained by the current object. Note that child nodes consist of both element objects and text nodes. Therefore, depending on the content of the current object, the number of `childNodes` and children collections may differ.

Caution

If you use the childNodes array in a for loop that iterates through a sequence of HTML (or XML) elements, watch out for the possibility that the browser treats source code whitespace (blank lines between elements and even simple carriage returns between elements) as text nodes. This potential problem affects IE5/Mac and NN6 (although later versions may repair the problem). If present, these extra text nodes occur primarily surrounding block elements.

Most looping activity through the `childNodes` array aims to examine, count, or modify element nodes within the collection. If that is your script's goal, then test each node returned by the `childNodes` array, and verify that the `nodeType` property is `1` (element) before processing that node. Otherwise, skip over the node. The skeletal structure of such a loop follows:

```
for (var i = 0; i < myElem.childNodes.length; i++) {
    if (myElem.childNodes[i].nodeType == 1) {
        statements to work on element node i
    }
}
```

The presence of these "phantom" text nodes also impacts the nodes referenced by the firstChild and lastChild properties, described later in this chapter.

On the CD-ROM

Example (with Listing 15-3) on the CD-ROM

Related Items: `nodeName`, `nodeType`, `nodeValue`, `parentNode` properties; `cloneNode()`, `hasChildNodes()`, `removeNode()`, `replaceNode()`, `swapNode()` methods.

children

Value: Array of element objects. Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `children` property consists of an array of element objects contained by the current object. Unlike the `childNodes` property, `children` does not take into account text nodes but rather focuses strictly on the HTML (and XML) element containment hierarchy from the point of view of the current object. Children exposed to the current object are immediate children only. If you want to get all element objects nested within the current object (regardless of how deeply nested they are), use the `all` collection instead.

On the CD-ROM

Example (with Listing 15-4) on the CD-ROM

Related Items: `canHaveChildren`, `firstChild`, `lastChild`, `parentElement` properties; `appendChild()`, `removeChild()`, `replaceChild()` methods.

className

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A *class name* is an identifier that is assigned to the `CLASS` attribute of an element. To associate a CSS rule with several elements in a document, assign the same identifier to the `CLASS` attributes of those elements, and use that identifier (preceded by a period) as the CSS rule's selector. An element's `className` property enables the application of different CSS rules to that element under script control.

On the CD-ROM

Example (with Listing 15-5) on the CD-ROM

Related Items: `rule`, `stylesheet` objects (Chapter 30); `id` property.

clientHeight
clientWidth

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These two properties by and large reveal the pixel height and width of the content with an element whose style sheet rule includes height and width settings. In theory, these measures do not take into account any margins, borders, or padding that you add to an element by way of style sheets. In practice, however, different combinations of borders, margins, and padding influence these values in unexpected ways. One of the more reliable applications of the `clientHeight` property enables you to discover, for example, where the text of an overflowing element ends.

For the `document.body` object, the `clientHeight` and `clientWidth` properties return the inside height and width of the window or frame (plus or minus a couple of pixels). These take the place of desirable, but nonexistent, window properties in IE.

Internet Explorer 5 expands the number of objects that employ these properties to include virtually all objects that represent HTML elements. For IE4, these properties apply only to the following objects: BODY, BUTTON, CAPTION, DIV, EMBED, FIELDSET, LEGEND, MARQUEE, TABLE, TD, TEXTAREA, TH, and TR.

On the CD-ROM

Example (with Listing 15-6) on the CD-ROM

Related Items: `offsetHeight, offsetWidth` properties.

clientLeft
clientTop

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The purpose and names of the `clientLeft` and `clientTop` properties are confusing at best. Unlike the `clientHeight` and `clientWidth` properties, which apply to the content of an element, the `clientLeft` and `clientTop` properties return essentially no more information than the thickness of a border around an element — provided the element is positioned. If you do not specify a border or do not position the element, the values are zero (although the `document.body` object can show a couple of pixels in each direction without explicit settings). If you are trying to read the left and top coordinate positions of an element, the `offsetLeft` and `offsetTop` properties are more valuable in IE/Windows; as shown in Listing 15-6, however, the `clientTop` property returns a suitable value in IE/Mac. Virtually all elements have the `clientLeft` and `clientTop` properties in IE5+; in IE4, the properties apply only to the BODY, BUTTON, CAPTION, EMBED, FIELDSET, LEGEND, MARQUEE, and TEXTAREA objects.

Related Items: `offsetLeft, offsetTop` properties.

contentEditable

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

IE5.5 introduces the concept of editable HTML content on a page. Element tags can include a `CONTENTEDITABLE` attribute, whose value is echoed via the `contentEditable` property of the element. The default value for this property is `inherit`, which means that the property inherits whatever setting this property has in the hierarchy of HTML containers outward to the body. If you set the `contentEditable` property to `true`, then that element and all nested elements set to inherit the value become editable; conversely, a setting of `false` turns off the option to edit the content.

On the CD-ROM

Example (with Listing 15-7) on the CD-ROM

Related Item: `isContentEditable` property.

currentStyle

Value: `style` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Every element has style attributes applied to it, even if those attributes are the browser's default settings. Because an element's `style` object reflects only those properties whose corresponding attributes are explicitly set via CSS statements, you cannot use the `style` property of an `element` object to view default style settings applied to an element. That's where the `currentStyle` property comes in.

This property returns a read-only `style` object that contains values for every possible `style` property applicable to the element. If a `style` property is explicitly set via CSS statement or script adjustment, the current reading for that property is also available here. Thus, a script can inquire about any property to determine if it should change to meet some scripted design goal. For example, if you surround some text with an `<EM>` tag, the browser by default turns that text into an italic font style. This setting is not reflected in the element's `style` object (`fontStyle` property) because the italic setting was not set via CSS; in contrast, the `element` object's `currentStyle.fontStyle` property reveals the true, current `fontStyle` property of the element as italic.

To change a `style` property setting, access it via the element's `style` object.

On the CD-ROM

Example on the CD-ROM

Related Items: `runtimeStyle, style` objects (Chapter 30).

dataFld
dataFormatAs
dataSrc

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `dataFld`, `dataFormatAs`, and `dataSrc` properties (along with more element-specific properties such as `dataPageSize` and `recordNumber`) are part of the Internet Explorer data-binding facilities based on ActiveX controls. The Win32 versions of IE4 and later have several ActiveX objects built into the browsers that facilitate the direct communication between a Web page and a data source. Data sources include text files, XML data, HTML data, and external databases. Data binding is a very large topic, much of which extends more to discussions about Microsoft Data Source Objects (DSOs), ODBC, and JDBC — subjects well beyond the scope of this book. But data binding is a powerful tool and can be of use even if you are not a database guru. Therefore, this discussion of the three primary properties — `dataFld`, `dataFormatAs`, and `dataSrc` — briefly covers data binding through Microsoft's *Tabular Data Control DSO*. This allows any page to access, sort, display, and filter (but not update) data downloaded into a Web page from an external text file (commonly comma- or tab-delimited data).

You can load data from an external text file into a document with the help of the Tabular Data Control (TDC). You retrieve the data by specifying the TDC object within an `<OBJECT>` tag set and specifying additional parameters such as the URL of the text file and field delimiter characters. The OBJECT element can go anywhere within the BODY of your document. (I tend to put it at the bottom of the code so that all normal page rendering happens before the control loads.) Retrieving the data simply brings it into the browser and does not, on its own, render the data on the page.

If you haven't worked with embedded objects in IE, the `CLASSID` attribute value might seem a bit strange. The most perplexing part to some is the long value of numeric data signifying the Globally Unique Identifier (GUID) for the object. You must enter this value exactly as shown in the following example for the proper ActiveX TDC to run. The HTML syntax for this object is as follows:

```
<OBJECT ID="objName" CLASSID="clsid:333C7BC4-460F-11D0-BC04-0080C7055A83">
    <PARAM NAME="DataURL" VALUE="URL">
    [additional optional parameters]
</OBJECT>
```

Table 15-3 lists the parameters available for the TDC. Only the `DataURL` parameter is required; others — such as `FieldDelim`, `UseHeader`, `RowDelim`, and `EscapeChar` — may be helpful depending on the nature of the data source.

Table 15-3 **Tabular Data Control Parameters**

Parameter	*Description*
`CharSet`	Character set of the data source file. Default is `latin1`.
`DataURL`	URL of data source file (relative or absolute).
`EscapeChar`	Character used to "escape" delimiter characters that are part of the data. Default is empty. A common value is `"\"`.
`FieldDelim`	Delimiter character between fields within a record. Default is comma (`,`). For a Tab character, use a value of ` `.
`Language`	ISO language code of source data. Default is `en-us`.
`TextQualifier`	Optional character surrounding a field's data. Default is empty.
`RowDelim`	Delimiter character between records. Default is newline (`NL`).
`UseHeader`	Set to `true` if the first row of data in the file contains field names. Default is `false`.

The value you assign to the OBJECT element's `ID` attribute is the identifier that your scripts use to communicate with the data after the page and data completely load. You can therefore have as many uniquely named TDCs loaded in your page as there are data source files you want to access at once.

The initial binding of the data to HTML elements usually comes when you assign values to the `DATASRC` and `DATAFLD` attributes of the elements. The `DATASRC` attribute points to the `DSO` identifier (matching the `ID` attribute of the OBJECT element, preceded with a hash symbol), while the `DATAFLD` attribute points to the name of the field whose data should be extracted. When you use data binding with an interactive element such as a table, multiple records are displayed in consecutive rows of the table (more about this in a moment).

Adjust the `dataSrc` and `dataFld` properties if you want the same HTML element (other than a table) to change the data that it displays. These properties apply to a subset of HTML elements that can be associated with external data: A, APPLET, BODY, BUTTON, DIV, FRAME, IFRAME, IMG, INPUT (most types), LABEL, MARQUEE, OBJECT, PARAM, SELECT, SPAN, and TEXTAREA objects.

In some cases, your data source may store chunks of HTML-formatted text for rendering inside an element. Unless directed otherwise, the browser renders a data source field as plain text — even if the content contains HTML formatting tags. But if you want the HTML to be observed during rendering, you can set the `dataFormatAs` property (or, more likely, the `DATAFORMATAS` attribute of the tag) to `HTML`. The default value is `text`.

On the CD-ROM

Example (with Listings 15-8 and 15-9) on the CD-ROM

Related Items: `recordNumber`, `TABLE.dataPageSize` properties.

dir

Value: `"ltr" | "rtl"` Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `dir` property (based on the `DIR` attribute of virtually every text-oriented HTML element) controls whether an element's text is rendered left-to-right (the default) or right-to-left. Depending on the default language and character set of the IE5 browser running a page, selecting a value other than the default may require the user to install Microsoft's Uniscribe add-in component. By and large, this property (and HTML attribute) is necessary only when you need to override the default directionality of a language's character set as defined by the Unicode standard.

On the CD-ROM

Example on the CD-ROM

Related Item: `lang` property.

disabled

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)			✓	✓	✓

While some elements have a `disabled` property in IE4, IE5, and NN6, this property is associated with every HTML element in IE5.5. Disabling an HTML element (like form elements) usually gives the element a "dimmed" look, indicating that it is not active. A disabled element does not receive any events. It also cannot receive focus, either manually or by script (although disabled text fields in IE4/Mac errantly manage to receive focus). But a user can still select and copy a disabled body text element.

Note

If you disable a form control element, the element's data is not submitted to the server with the rest of the form elements. If you need to keep a form control "locked down," but still submit it to the server, use the FORM element's onSubmit event handler to enable the form control right before the form is submitted.

Example on the CD-ROM

Related Item: `isDisabled` property.

document

Value: `document` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In the context of HTML element objects as exposed in IE4+, the `document` property is a reference to the document that contains the object. While it is unlikely that you will need to use this property, `document` may come in handy for complex scripts and script libraries that handle objects in a generic fashion and do not know the reference path to the document containing a particular object. You might need a reference to the document to inspect it for related objects. The W3C version of this property (implemented in IE5/Mac but not in IE5.5/Windows) is `ownerDocument`.

Example on the CD-ROM

Related Item: `ownerDocument` property.

filters

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Filters are IE-specific style sheet add-ons that offer a greater variety of font rendering (such as drop shadows) and transitions between hidden and visible elements. Each filter specification is a `filter` object. The `filters` property contains an array of `filter` objects defined for the current element. You can apply filters to the following set of elements: BODY, BUTTON, IMG, INPUT, LI, MARQUEE, OL, TABLE, TD, TEXTAREA, TH, UL, and positioned DIV and SPAN elements. See Chapter 30 for details about style sheet filters.

Related Item: `filter` object.

firstChild
lastChild

Value: Node object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

W3C DOM-based document object models are built around an architecture known as a *node map*. Each object defined by HTML is a node in the map. A node has relationships with other nodes in the document — relationships described in family terms of parents, siblings, and children.

A *child node* is an element that is contained by another element. The container is the parent of such a child. Just as an HTML element can contain any number of child elements, so can a parent object have zero or more children. A list of those children (returned as an array) can be read from an object by way of its `childNodes` property:

```
var nodeArray = document.getElementById("elementID").childNodes
```

While you can use this array (and its `length` property) to get a reference to the first or last child node, the `firstChild` and `lastChild` properties offer shortcuts to those positions. These are helpful when you wish to insert a new child before or after all of the others and you need a reference point for the IE `insertAdjacentElement()` method or other method that adds elements to the document's node list.

Caution See the discussion of the `childNodes` property earlier in this chapter about the presence of "phantom" nodes in some browser versions. The problem may influence your use of the `firstChild` and `lastChild` properties.

On the CD-ROM Example (with Listing 15-10) on the CD-ROM

Related Items: `nextSibling`, `parentElement`, `parentNode`, `previousSibling` properties; `appendChild()`, `hasChildNodes()`, `removeChild()`, `removeNode()`, `replaceChild()`, `replaceNode()` methods.

height
width

Value: Integer or Percentage String Read/Write and Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `height` and `width` properties described here are not the identically named properties that belong to an element's style. Rather, these properties reflect the values normally assigned to `HEIGHT` and `WIDTH` attributes of elements such as IMG, APPLET, and TABLE, and so on. As such, these properties are accessed directly from the object (for example, `document.all.myTable.width` in IE4+) rather than through the `style` object (for example, `document.all.myDIV.style.width`). Only elements for which the HTML 4.*x* standard provides `HEIGHT` and `WIDTH` attributes have the corresponding properties.

Values for these properties are either integer pixel values (numbers or strings) or percentage values (strings only). If you need to perform some math on an existing percentage value, use the `parseInt()` function to extract the numeric value for use with math calculations. If an element's `HEIGHT` and `WIDTH` attributes are set as percentage values, you can use the `clientHeight` and `clientWidth` properties in IE4+ to get the rendered pixel dimensions.

Property values are read/write for the `image` object in most recent browser versions because you can resize an `image` object in IE4+ and NN6 after the page loads. Properties are read/write for some other objects (such as the TABLE object) — but not necessarily all others that support these properties.

Support for these properties in NN4 is limited to the IMAGE object. In that browser, both properties are read-only.

In general, you cannot set the value of these properties to something less than is required to render the element. This is particularly true of a table. If you attempt to set the `height` value to less than the amount of pixels required to display the table as defined by its style settings, your changes have no effect (even though the property value retains its artificially low value). For other objects, however, you can set the size to anything you like and the browser scales the content accordingly (images, for example). If you want to see only a segment of an element (in other words, to crop the element), use a style sheet to set the element's clipping region.

On the CD-ROM

Example on the CD-ROM

Related Items: `clientHeight`, `clientWidth` properties; `style.height`, `style.width` properties.

hideFocus

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

In IE for Windows, button types of form controls and links display a dotted rectangle around some part of the element whenever that element has focus. If you set the `TABINDEX` attribute or `tabIndex` property of any other kinds of elements in IE5+, they, too, display that dotted line when given focus. You can still let an element receive focus, but hide that dotted line, by setting the `hideFocus` property of the element object to `true` (default value is `false`).

Hiding focus does not disable the element. In fact, if the element about to receive focus is scrolled out of view, the page scrolls to bring the element into view. Form controls that respond to keyboard action (for example, pressing the spacebar to check or uncheck a checkbox control) also continue to work as normal. For some designers, the focus rectangle harms the design goals of the page. The `hideFocus` property gives them more control over the appearance while maintaining consistency of operation with other pages. There is no corresponding HTML attribute for a tag, so you can use an `onLoad` event handler in the page to set the `hideFocus` property of desired objects after the page loads.

On the CD-ROM

Example on the CD-ROM

Related Items: `tabIndex` property; `srcollIntoView()` method.

id

Value: String (See text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `id` property returns the identifier assigned to an element's `ID` attribute in the HTML code. A script cannot modify the ID of an existing element nor assign an ID to an element that lacks one. But if a script creates a new element object, an identifier may be assigned to it by way of the `id` property.

On the CD-ROM

Example on the CD-ROM

Related Item: `className` property.

innerHTML
innerText

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)			✓	✓	✓

One way that Internet Explorer exposes the contents of an element is through the `innerHTML` and `innerText` properties. (Navigator 6 offers only the `innerHTML` property.) All content defined by these "inner" properties consists of document data that is contained by an element's start and end tags, but not including the tags themselves (see `outerText` and `outerHTML` properties). Setting these inner properties is a common way to modify a portion of a page's content after the page loads.

The `innerHTML` property contains not only the text content for an element as seen on the page, but also every bit of HTML tagging that is associated with that content. (If there are no tags in the content, the text is rendered as is.) For example, consider the following bit of HTML source code:

```
<P ID="paragraph1">"How <EM>are</EM> you?" he asked.</P>
```

The value of the paragraph object's `innerHTML` property (`document.all.paragraph1.innerHTML`) is:

```
"How <EM>are</EM> you?" he asked.
```

The browser interprets any HTML tags that you include in a string you assign to an element's `innerHTML` property as tags. This also means that you can introduce entirely new nested elements (or child nodes in the modern terminology) by assigning a slew of HTML content to an element's `innerHTML` property. The document's object model adjusts itself to the newly inserted content.

In contrast, the `innerText` property knows only about the text content of an element container. In the example you just saw, the value of the paragraph's `innerText` property (`document.all.paragraph1.innerText`) is:

```
"How are you?" he asked.
```

It's important to remember that if you assign a string to the `innerText` property of an element and that string contains HTML tags, the tags and their angle brackets appear in the rendered page and are not interpreted as live tags.

Do not modify the `innerHTML` property to adjust the HTML for `FRAMESET`, `HTML`, `HEAD`, `TITLE`, or table-related objects. You should modify table constructions through the various table-related methods that create or delete rows, columns, and cells (see Chapter 27). It is safe, however, to modify the contents of a cell by setting its `innerHTML` or `innerText` properties.

When the HTML you insert includes a `<SCRIPT>` tag, be sure to include the `DEFER` attribute to the opening tag. This even goes for scripts that contain function definitions, which you might consider to be deferred automatically.

If your audience includes Internet Explorer 4 for the Macintosh, know that several elements do not support these properties. Be sure to test your page thoroughly on this platform combination. Also, if you want to have the convenience of the `innerText` property in Navigator 6, see Chapter 14 for instructions on how to add that property to all elements. Alternatively, you can use the NN6-compatible `innerHTML` property to assign new text content to an element, even though the content contains no HTML tags.

On the CD-ROM

Example (with Listing 15-11) on the CD-ROM

Related Items: `outerHTML`, `outerText` properties; `replaceNode()` method.

isContentEditable

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `isContentEditable` property returns a Boolean value indicating whether a particular element object is set to be editable (see the preceding discussion of the `contentEditable` property). This property is helpful because if a parent element's `contentEditable` property is set to `true`, a nested element's `contentEditable` property likely is set to its default value `inherit`. But because its parent is editable, the `isContentEditable` property of the nested element returns `true`.

On the CD-ROM

Example on the CD-ROM

Related Item: `contentEditable` property.

isDisabled

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `isDisabled` property returns a Boolean value that indicates whether a particular element object is set to be disabled (see the preceding discussion of the `disabled` property). This property is helpful; if a parent element's `disabled` property is set to `true`, then a nested element's `disabled` property likely is set to its default value of `false`. But because its parent is disabled, the `isDisabled` property of the nested element returns `true`. In other words, the `isDisabled` property returns the actual disabled status of an element regardless of its `disabled` property.

Example on the CD-ROM

Related Item: `disabled` property.

isMultiLine

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `isMultiLine` property returns a Boolean value that reveals whether the element object is capable of occupying or displaying more than one line of text. Importantly, this value does not reveal whether the element actually occupies multiple lines; rather, it indicates the potential of doing so. For example, a text INPUT element cannot wrap to multiple lines, so its `isMultiLine` property is `false`. However, a BUTTON element can display multiple lines of text for its label, so it reports `true` for the `isMultiLine` property.

Example on the CD-ROM

isTextEdit

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `isTextEdit` property reveals whether an object can have an IE/Windows `TextRange` object created with its content. (See the `TextRange` object in Chapter 19.) You can create `TextRange` objects only from a limited selection of objects in IE4+ for Windows: BODY, BUTTON, certain form elements (text, password, hidden, button, reset, and submit types), and TEXTAREA. This property always returns `false` in IE5/Mac.

On the CD-ROM Example on the CD-ROM

Related Items: `createRange()` method; `TextRange` object (Chapter 19).

lang

Value: ISO language code string Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `lang` property governs the written language system used to render an element's text content when overriding the default browser's language system. The default value for this property is an empty string unless the corresponding `LANG` attribute is assigned a value in the element's tag. Modifying the property value by script control does not appear to have any effect in the current browser implementations.

On the CD-ROM Example on the CD-ROM

language

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+'s architecture allows for multiple scripting engines to work with the browser. Two engines are included with the basic Windows version browser: JScript (compatible with JavaScript) and Visual Basic Scripting Edition (VBScript). The default scripting engine is JScript. But if you wish to use VBScript or some other scripting language in statements that are embedded within event handler attributes of a tag, you can specifically direct the browser to apply the desired scripting engine to those script statements by way of the `LANGUAGE` attribute of the tag. The `language` property provides scripted access to that property. Unless you intend to modify the event handler HTML code and replace it with a statement in VBScript (or any other non-JScript-compatible language installed with your browser), you do not need to modify this property (or read it, for that matter).

Valid values include JScript, javascript, vbscript, and vbs. Third-party scripting engines have their own identifier for use with this value. Because the LANGUAGE attribute is also used in the <SCRIPT> tag, Internet Explorer 5 observes LANGUAGE="XML" as well.

On the CD-ROM

Example on the CD-ROM

Related Item: SCRIPT element object.

lastChild

(See firstchild)

length

Value: Integer Read-Only and Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The length property returns the number of items in an array or collection of objects. Its most common application is as a boundary condition in a for loop. While arrays and collections commonly use integer values as index values (always starting with zero), the length value is the actual number of items in the group. Therefore, to iterate through all items of the group, the condition expression should include a less-than (<) symbol rather than a less-than-or-equal (<=) symbol, as in the following:

```
for (var i = 0; i < someArray.length; i++) {...}
```

For decrementing through an array (in other words, starting from the last item in the array and working toward the first), the initial expression must initialize the counting variable as the length minus one:

```
for (var i = someArray.length - 1; i >= 0; i--) {...}
```

For most arrays and collections, the length property is read-only and governed solely by the number of items in the group. But in more recent versions of the browsers, you can assign values to some object arrays (areas, options, and the SELECT object) to create placeholders for data assignments. See discussions of the AREA, SELECT, and OPTION element objects for details. A plain JavaScript array can also have its length property value modified by script to either trim items from the end of the array or reserve space for additional assignments. See Chapter 37 for more about the Array object.

On the CD-ROM

Example on the CD-ROM

Related Items: AREA, SELECT, OPTION, and `Array` objects.

localName
namespaceURI
prefix

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The three properties, `localName`, `namespaceURI`, and `prefix`, apply to any node in an XML document that associates a Namespace URI with an XML tag. Although NN6 exposes all three properties for all element (and node) objects, the properties do not return the desired values. Future versions of NN6 should remedy the situation. In the meantime, this description provides a preview of what values these three properties will represent.

Consider the following XML content:

```
<x xmlns:bk='http://bigbooks.org/schema'>
    <bk:title>To Kill a Mockingbird</bk:title>
</x>
```

The element whose tag is `<bk:title>` is associated with the Namespace URI defined for the block, and the element's `namespaceURI` property would return the string `http://bigbooks.org/schema`. The tag name consists of a prefix (before the colon) and the local name (after the colon). In the above example, the `prefix` property for the element defined by the `<bk:title>` tag would be `bk`, while the `localName` property would return `title`. The `localName` property of any node returns the same value as its `nodeName` property value, such as `#text` for a text node.

For more information about XML Namespaces, visit `http://www.w3.org/TR/REC-xml-names`.

Related Items: `scopeName`, `tagUrn` properties.

nextSibling
previousSibling

Value: Object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

A *sibling element* is one that is at the same nested level as another element. For example, the following P element has two child nodes (the EM and SPAN elements). Those two child nodes are siblings of each other.

```
<P>MegaCorp is <EM>the</EM> source of the <SPAN CLASS="hot">hottest</SPAN>
gizmos.</P>
```

Sibling order is determined solely by the source code order of the elements. Therefore, in the previous example, the EM element has no `previousSibling` property. Meanwhile, the SPAN element has no `nextSibling` property (meaning that these properties return `null`). These properties provide another way to iterate through all elements at the same level.

On the CD-ROM

Example on the CD-ROM

Related Items: `firstChild`, `lastChild`, `childNodes` properties; `hasChildNodes()`, `insertAdjacentElement()` methods.

nodeName

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

For HTML and XML elements, the name of a node is the same as the tag name. The `nodeName` property is provided for the sake of consistency with the node architecture specified by the formal W3C DOM standard. The value, just like the `tagName` property, is an all-uppercase string of the tag name (even if the HTML source code is written with lowercase tags).

Some nodes, such as the text content of an element, do not have a tag. The `nodeName` property for such a node is a special value: `#text`. Another kind of node is an attribute of an element. For an attribute, the `nodeName` is the name of the attribute. See Chapter 14 for more about `Node` object properties.

On the CD-ROM

Example on the CD-ROM

Related Item: `tagName` property.

nodeType

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The W3C DOM specification identifies a series of constant values that denote categories of nodes. Not all of these values are implemented in the W3C DOM-capable browsers, although NN6 includes more than the two supplied by IE5. Table 15-4 lists the `nodeType` values implemented in recent browsers.

Table 15-4 nodeType Property Values

Value	*Description*	*IE5/5.5*	*Nav6 & IE5/Mac*
1	Element node	✓	✓
2	Attribute node		✓
3	Text (`#text`) node	✓	✓
8	Comment node		✓
9	Document node		✓

The `nodeType` value is automatically assigned to an element, whether the element exists in the document's HTML source code or it is generated on the fly via a script. For example, if you create a new element through any of the ways available by script (for example, by assigning a string encased in HTML tags to the `innerHTML` property or by explicitly invoking the `document.createElement()` method), the new element assumes a `nodeType` of `1`.

NN6 goes one step further in supporting the W3C DOM specification by implementing a set of `Node` object property constants for each of the `nodeType` values. Table 15-5 lists the entire set as defined in the DOM Level 2 specification (not all of which are implemented in NN6). Substituting these constants for `nodeType` integers can improve readability of a script. For example, instead of

```
if (myElem.nodeType == 1) {...}
```

it is much easier to see what's going on with

```
if (myElem.nodeType == Node.ELEMENT_NODE) {...}
```

Table 15-5 W3C DOM nodeType Constants

Reference	*nodeType Value*
`Node.ELEMENT_NODE`	1
`Node.ATTRIBUTE_NODE`	2
`Node.TEXT_NODE`	3
`Node.CDATA_SECTION_NODE`	4
`Node.ENTITY_REFERENCE_NODE`	5
`Node.ENTITY_NODE`	6
`Node.PROCESSING_INSTRUCTION_NODE`	7
`Node.COMMENT_NODE`	8
`Node.DOCUMENT_NODE`	9
`Node.DOCUMENT_TYPE_NODE`	10
`Node.DOCUMENT_FRAGMENT_NODE`	11
`Node.NOTATION_NODE`	12

On the CD-ROM

Example on the CD-ROM

Related Item: `nodeName` property.

nodeValue

Value: Number, string, or null Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Of the node types implemented in the W3C DOM-capable browsers, only the text and attribute types have readable values. An element's node value returns a `null` value.

For a text node, the `nodeValue` property consists of the actual text for that node. Such a node cannot contain any further nested elements, so the `nodeValue` property offers another way of reading and modifying what Internet Explorer implements as an element's `innerText` property.

For an attribute node, the `nodeValue` property consists of the value assigned to that attribute. According to the W3C DOM standard, attribute values should be reflected as strings. IE5/Windows, however, returns values of type `Number` when the value is all numeric characters. Even if you assign a string version of a number to such a `nodeValue` property, it is converted to a `Number` type internally. NN6 and IE5/Mac return `nodeValue` values as strings in all cases (and convert numeric assignments to strings).

Example on the CD-ROM

Related Items: `attributes`, `innerText`, `nodeType` properties.

offsetHeight
offsetWidth

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

It is nearly impossible to reconcile the actual behavior of these properties with the descriptions provided by Microsoft for Internet Explorer. The genuine complexity comes when an element has one or more of the following style features attached: borders, margins, and padding. The property values, especially `offsetWidth`, are heavily influenced by the `height` and `width` attributes assigned to an element's style sheet rule. The permutations of elements and their styles plus the vastly roving range of resulting values make it difficult to recommend the `offsetHeight` and `offsetWidth` properties unless you manage to find the magic combination that works for your page layout. Differences abound in these properties' treatment across operating system versions of IE.

One advantage that `offsetHeight` and `offsetWidth` have over `clientHeight` and `clientWidth` is that the offset properties have values even when you do not set dimensions for the element in the HTML tag attributes. That's because these values are set in relation to the element's parent element — most often the BODY element.

Be aware that for a normal element whose height and width are not specified, the `offsetHeight` is determined by the actual height of the content after all text flows. But the `offsetWidth` always extends the full width (plus or minus borders, margins, and padding) of the containing element. Therefore, the `offsetWidth` property does not reveal the rendered width of text content that is narrower than the full parent element width. (Through IE5, no property reveals this information.) To find out the actual width of text within a full-width, block-level element, wrap the text within an inline element (such as a SPAN) and inspect the `offsetWidth` property of the SPAN.

Although the `offsetHeight` and `offsetWidth` properties are not part of the W3C DOM specification, Netscape has implemented these properties in NN6 because they are convenient for some scriptable Dynamic HTML tasks. Through these two properties, a script can read the height and width of any block-level or inline element. As with IE, the NN6 `offsetWidth` of a text-oriented block-level element is the width of the element's container. For example, a P element consisting of only a few words may report an `offsetWidth` of many hundreds of pixels because the paragraph's block extends the full width of the BODY element that represents the containing parent of the P element.

On the CD-ROM

Example on the CD-ROM

Related Items: `clientHeight`, `clientWidth` properties.

offsetLeft
offsetTop

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `offsetLeft` and `offsetTop` properties can suffer from the same version vagaries that afflict `offsetHeight` and `offsetWidth` properties when borders, margins, and padding are associated with an element. However, the `offsetLeft` and `offsetTop` properties are valuable in providing pixel coordinates of an element within the positioning context of the parent element — even when the elements are not positioned explicitly.

Note

The `offsetLeft` and `offsetTop` properties for positioned elements in IE/Macintosh do not return the same values as the `style.left` and `style.top` properties of the same element. See Listing 31-17 for an example of how to correct these discrepancies without having to hard-wire the precise pixel differences in your code.

The element used as a coordinate context for these properties is whatever element the `offsetParent` property returns. This means that to determine the precise position of any element, you may have to add some code that iterates through the `offsetParent` hierarchy until that property returns `null`.

Although the `offsetLeft` and `offsetTop` properties are not part of the W3C DOM specification, Netscape has implemented these properties in NN6 because they are convenient for some scriptable Dynamic HTML tasks. Through these two properties, a script can read the pixel coordinates of any block-level or inline element. Measurements are made relative to the BODY element, but this may change in the future. See the discussion later in this chapter about the `offsetParent` property.

Example on the CD-ROM

Related Items: `clientLeft`, `clientTop`, `offsetParent` properties.

offsetParent

Value: Object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `offsetParent` property returns a reference to the object that acts as a positioning context for the current element. Values for the `offsetLeft` and `offsetTop` properties are measured relative to the top-left corner of the `offsetParent` object.

The returned object is usually, but not always, the next outermost block-level container. For most document elements, the `offsetParent` object is the `document.body` object (with exceptions for some elements in some browsers).

Table cells, for example, have different `offsetParent` elements in different browsers:

Browser	***TD offsetParent***
IE4/Windows	TR
IE5+/Windows	TABLE
IE/Mac	TABLE
NN6	BODY

Positioned elements also have different results among browsers. In IE, a first-level positioned element's `offsetParent` element is the BODY; the `offsetParent` of a nested positioned element (for example, one absolute-positioned DIV inside another) is the next outer container (in other words, the positioning context of the inner element).

The situation for NN6, however, is not as straightforward as it could be. The `offsetParent` for any unpositioned element on the page is the BODY element. But the `offsetParent` property for a positioned element (or any element nested inside a positioned element) returns `null`. Even so, the `offsetLeft` and `offsetTop` properties of a positioned element (and its contents) treat the BODY element as the positioning context. This approach complicates the calculation of the position of an element inside a positioned element relative to its container. Future versions of NN6 will likely bring the behavior of the `offsetParent` property in line with the IE behavior. See Chapter 31 for more details on browser-specific treatment of positionable elements.

Example (with Listing 15-12) on the CD-ROM

Related Items: `offsetLeft`, `offsetTop`, `offsetHeight`, `offsetWidth` properties.

outerHTML
outerText

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

One way that Internet Explorer exposes an entire element to scripting is by way of the `outerHTML` and `outerText` properties. The primary distinction between these two properties is that `outerHTML` includes the element's start and end tags whereas `outerText` includes only rendered text that belongs to the element (including text from any nested elements).

The `outerHTML` property contains not only the text content for an element as seen on the page, but also every bit of HTML tagging associated with that content. For example, consider the following bit of HTML source code:

```
<P ID="paragraph1">"How <EM>are</EM> you?" he asked.</P>
```

The value of the P object's `outerHTML` property (`document.all.paragraph1.outerHTML`) is exactly the same as that of the source code.

The browser interprets any HTML tags in a string that you assign to an element's `outerHTML` property. This means that you can delete (set the property to an empty string) or replace an entire tag with this property. The document's object model adjusts itself to whatever adjustments you make to the HTML in this manner.

In contrast, the `outerText` property knows only about the text content of an element container. In the preceding example, the value of the paragraph's `outerText` property (`document.all.paragraph1.innerText`) is:

```
"How are you?" he asked.
```

If this looks familiar, it's because in most cases the `innerText` and `outerText` properties of an existing element return the exact same strings.

If your audience includes Internet Explorer 4 for the Macintosh, be aware that several elements do not support these properties. In addition, IE5/Mac is downright buggy when you try to assign new content to either property. Be sure to test your page thoroughly on these platform combinations. Also see Chapter 14 for some code to add to a page that simulates the `outerHTML` property for writing in NN6.

Example (with Listing 15-13) on the CD-ROM

Related Items: `innerHTML`, `innerText` properties; `replaceNode()` method.

ownerDocument

Value: `document` object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `ownerDocument` property belongs to any element or node in the W3C and NN6 DOM. The property's value is a reference to the document node that ultimately contains the element or node. If a script encounters a reference to an element or node (perhaps it has been passed as a parameter to a function), the object's `ownerDocument` property provides a way to build references to other objects in the same document or to access properties and methods of the document objects. IE's version of this property is simply `document`.

On the CD-ROM

Example on the CD-ROM

Related Item: `document` object.

parentElement

Value: Element object reference or `null` Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `parentElement` property returns a reference to the next outermost HTML element from the current element. This parent–child relationship of elements is often, but not always, the same as a parent–child node relationship (see `parentNode` property later in this chapter). The difference is that the `parentElement` property deals only with HTML elements as reflected as document objects, whereas a node is not necessarily an HTML element (for example, an attribute or text chunk).

There is also a distinction between `parentElement` and `offsetParent` properties. The latter returns an element that may be many generations removed from a given element but is the immediate parent with regard to positioning context. For example, a TD element's `parentElement` property is most likely its enclosing `TR` element, but (in IE5 at least) a TD element's `offsetParent` property is its TABLE element.

A script can "walk" the element hierarchy outward from an element with the help of the `parentElement` property. The top of the parent chain is the HTML element. Its `parentElement` property returns `null`.

On the CD-ROM

Example on the CD-ROM

Related Items: `offsetParent`, `parentNode` properties.

parentNode

Value: Node object reference or `null` Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `parentNode` property returns a reference to the next outermost node that is reflected as an object belonging to the document. For a standard element object, the `parentNode` property is the same as IE's `parentElement` because both objects happen to have a direct parent–child node relationship as well as a parent–child element relationship.

Other kinds of content, however, can be nodes. This includes text fragments within an element. A text fragment's `parentNode` property is the next outermost node or element that encompasses that fragment. A text node object in IE does not have a `parentElement` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `childNodes`, `nodeName`, `nodeType`, `nodeValue`, `parentElement` properties.

parentTextEdit

Value: Element object reference or `null` Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Only a handful of objects in IE's object model are capable of creating text ranges (see the `TextRange` object in Chapter 19). To find an object's next outermost container capable of generating a text range, use the `parentTextEdit` property. If an element is in the hierarchy, that element's object reference is returned. Otherwise (for example, `document.body.parentTextEdit`), the value is `null`. IE5/Mac through version 5 does not implement text ranges or associated properties and methods.

On the CD-ROM

Example (with Listing 15-14) on the CD-ROM

Related Items: `isTextEdit` property; `TextRange` object (Chapter 19).

previousSibling

(See `nextSibling`)

readyState

Value: String (integer for OBJECT object) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

A script can query an element to find out if it has loaded all ancillary data (for example, external image files or other media files) before other statements act on that object or its data. The `readyState` property lets you know the loading status of an element.

Table 15-6 lists the possible values and their meanings.

Table 15-6 readyState Property Values

HTML Value	*OBJECT Value*	*Description*
`complete`	4	Element and data fully loaded
`interactive`	3	Data may not be loaded fully, but user can interact with element
`loaded`	2	Data is loaded, but object may be starting up
`loading`	1	Data is loading
`uninitialized`	0	Object has not started loading data yet

For most HTML elements, this property always returns `complete`. Most of the other states are used by elements such as IMG, EMBED, and OBJECT, which load external data and even start other processes (such as ActiveX controls) to work.

In IE4, the `readyState` property was limited to the following objects: `document`, EMBED, IMG, LINK, OBJECT, SCRIPT, and STYLE. For IE5+, this property is available to essentially every element.

One word of caution: Do not expect the `readyState` property to reveal if an object exists yet in the document (for example, `uninitialized`). If the object does not exist, it cannot have a `readyState` property—the result is a script error for an undefined object. If you want to run a script only after every element and its data are fully loaded, trigger the function by way of the `onLoad` event handler for the BODY element or the `onReadyStateChange` event handler for the object (and check that the `readyState` property is `complete`).

On the CD-ROM

Example on the CD-ROM

Related Items: `onReadyStateChange` event handler.

recordNumber

Value: Integer or `null` Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Virtually every object has a `recordNumber` property, but it applies only to elements used in Internet Explorer (for Windows) data binding to represent repeated data. For example, if you display 30 records from an external data store in a table, the TR element in the table is represented only once in the HTML. However, the browser repeats the table row (and its component cells) to accommodate all 30 rows of data. If you click a row, you can use the `recordNumber` property of the TR object to see which record was clicked. A common application of this facility is in data binding situations that allow for updating records. For example, script a table so that clicking on an uneditable row of data displays that record's data in editable text boxes elsewhere on the page. If an object is not bound to a data source, or it is a non-repeating object bound to a data source, the `recordNumber` property is `null`.

On the CD-ROM

Example (with Listing 15-15) on the CD-ROM

Related Items: `dataFld`, `dataSrc` properties; TABLE, TR objects (Chapter 27).

runtimeStyle

Value: `style` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

You can determine the browser default settings for style sheet attributes with the help of the `runtimeStyle` property. The `style` object that this property returns contains all style attributes and the default settings at the time the page loads. This property does not reflect values assigned to elements by style sheets in the document or by scripts. The default values returned by this property differ from the values returned by the `currentStyle` property. The latter includes data about values that are not assigned explicitly by style sheets, yet are influenced by the default behavior of the browser's rendering engine. In contrast, the `runtimeStyle` property shows unassigned style values as empty or zero.

To change a style property setting, access it via the element's `style` object.

On the CD-ROM

Example on the CD-ROM

Related Items: `currentStyle` property; `style` object (Chapter 30).

scopeName

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `scopeName` property is associated primarily with XML that is embedded within a document. When you include XML, you can specify one or more XML Namespaces that define the "owner" of a custom tag name, thus aiming toward preventing conflicts of identical custom tags from different sources in a document. (See Chapter 33 for more about XML objects.)

The XML Namespace is assigned (in IE5+) as an attribute of the `<HTML>` tag that surrounds the entire document:

```
<HTML XMLNS:Fred='http://www.someURL.com'>
```

After that, the Namespace value precedes all custom tags linked to that Namespace:

```
<Fred:FIRST_Name ID="fredFirstName"/>
```

To find out the Namespace "owner" of an element, you can read the `scopeName` property of that element. For the preceding example, the `scopeName` returns `Fred`. For regular HTML elements, the returned value is always `HTML`. The `scopeName` property is available only in Win32 and UNIX flavors of IE5. The comparable property in the W3C DOM is `localName`.

On the CD-ROM

Example on the CD-ROM

Related Item: `tagUrn` property.

scrollHeight
scrollWidth

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `scrollHeight` and `scrollWidth` properties contain the pixel measures of an object, regardless of how much of the object is visible on the page. Therefore, if the browser window displays a vertical scrollbar, and the body extends below the bottom of the viewable space in the window, the `scrollHeight` takes into account the entire height of the body as if you were to scroll downward and see the entire element. For most elements that don't have their own scrollbars, the `scrollHeight` and `scrollWidth` properties have the same values as the `clientHeight` and `clientWidth` properties.

A few compatibility cautions are necessary, however. While these properties are available for virtually every element in IE5+, they are available for only the BODY, BUTTON, CAPTION, DIV, FIELDSET, LEGEND, MARQUEE, and TEXTAREA objects in IE4 for Windows. Moreover, IE for the Macintosh yields the viewable height and width of the BODY element, rather than its true scrolling height and width. The values are accurate, however, for other content elements.

On the CD-ROM

Example on the CD-ROM

Related Items: `clientHeight`, `clientWidth` properties; `window.scroll()` method.

scrollLeft
scrollTop

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

If an element is scrollable (in other words, it has its own scrollbars), you can find out how far the element is scrolled in the horizontal and vertical direction via the `scrollLeft` and `scrollTop` properties. These values are pixels. For non-scrollable elements, these values are always zero — even if they are contained by elements that are scrollable. For example, if you scroll a browser window (or frame in a multiframe environment) vertically, the `scrollTop` property of the `body` object is whatever the pixel distance is between the top of the object (now out of view) and the first visible row of pixels of the element. But the `scrollTop` value of a table that is in the document remains at zero.

These properties are available only to the BODY, BUTTON, CAPTION, DIV, FIELDSET, LEGEND, MARQUEE, SPAN, and TEXTAREA objects in IE4. For IE5+, the properties are available to virtually every element.

NN treats scrolling of a BODY element from the point of view of the window. If you want to find out the scrolled offset of the current page in NN4+, use `window.scrollX` and `window.scrollY`.

On the CD-ROM

Example on the CD-ROM

Related Items: `clientLeft`, `clientTop` properties; `window.scroll()` method.

sourceIndex

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `sourceIndex` property returns the numeric index (zero-based) of the object within the `document.all` collection. This property is useful if a script needs to access an adjacent object on a page. For example, the following function receives an object reference as a parameter and returns a reference to the object that is next in the source code object order:

```
function getNextObject(obj) {
    return document.all[(obj.sourceIndex + 1)]
}
```

Or if you know only the ID of an object and want to retrieve a reference to the next object in source code order, you can use the following version:

```
function getNextObject(objName) {
    var index = document.all[objName].sourceIndex
    return document.all[(index + 1)]
}
```

On the CD-ROM

Example on the CD-ROM

Related Item: `item()` method.

style

Value: style object reference Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The style property is the gateway to an element's style sheet settings. The property's value is a style object whose properties enable you to read and write the style sheet settings for the element. While scripts do not usually manipulate the style object as a whole, it is quite common in a Dynamic HTML page for scripts to get or set multiple properties of the style object to effect animation, visibility, and all appearance parameters of the element.

Changing properties of the style object may affect the layout of the page. For example, setting the font size of an element to a larger value forces the paragraph to reflow to accommodate the enlarged text. This page reflow is available in IE4+ and NN6. Because NN4 cannot reflow content, severe limitations are placed on changing content after the page loads.

You can find significant differences in the breadth of properties of the style object in IE compared with NN. See Chapter 30 for more details on the style object.

On the CD-ROM

Example on the CD-ROM

Related Items: currentStyle, runtimeStyle properties; style object (Chapter 30).

tabIndex

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The tabIndex property controls where in the tabbing sequence the current object receives focus. This property obviously applies only to elements that can receive focus. IE5+ permits giving focus to more elements than IE4 or NN6; but for all browsers compatible with this property, the primary elements for which you may want to control focus (namely form input elements) are covered. IE4/Mac does not give focus to elements other than those that accept text input.

The default value of the tabIndex property is 0 (although it is -1 in NN6). A value of 0 (or -1 in NN6) means that elements receive focus in the normal tabbing order on the page, following source code order from the first focusable element. In general, the browsers treat form elements as focusable elements by default. Nonform elements usually don't receive focus unless you specifically set their `tabIndex` properties (or `TABINDEX` tag attributes). If you set the `tabIndex` property of one form element to `1`, then that element is first in the tabbing order. Meanwhile, the rest fall into source code tabbing order on successive presses of the Tab key. If you set two elements to, say, `1`, then the tabbing proceeds in source code order for those two elements and then onto the rest of the elements in source code order starting with the top of the page.

In Internet Explorer, you can remove an element from tabbing order entirely by setting its `tabIndex` property to `-1`. Users can still click those elements to make changes to form element settings, but tabbing bypasses the element.

On the CD-ROM

Example (with Listing 15-16) on the CD-ROM

Related Items: `blur()`, `focus()` methods.

tagName

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `tagName` property returns a string of the HTML or (in IE5+ and NN6) XML tag name belonging to the object. All `tagName` values are returned in all uppercase characters, even if the source code is written in all lowercase or a mixture. This consistency makes it easier to perform string comparisons. For example, you can create a generic function that contains a `switch` statement to execute actions for some tags and not others. The skeleton of such a function looks like the following:

```
function  processObj(objRef) {
    switch (objRef.tagName) {
        case "TR":
            [statements to deal with table row object]
            break
        case "TD":
            [statements to deal with table cell object]
            break
        case "COLGROUP":
            [statements to deal with column group object]
            break
        default:
            [statements to deal with all other object types]
    }
}
```

Example on the CD-ROM

Related Items: `nodeName` property; `getElementsByTagName()` method.

tagUrn

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `tagUrn` property is associated primarily with XML that is embedded within a document. When you include XML, you can specify one or more XML Namespaces that define the "owner" of a custom tag name — thus preventing conflicts of identical custom tags from different sources in a document. (See Chapter 33 for more about XML objects.) A Namespace definition can include a Uniform Resource Name (URN) that lets a page link to a destination on the network that further defines such Namespace aspects as a behavior associated with a custom XML element.

The XML Namespace is assigned (in IE5+) as an attribute of the `<HTML>` tag that surrounds the entire document.

```
<HTML XMLNS:Fred="http://www.giantco.com/xmllib/">
```

After that, the namespace value precedes all custom tags linked to that Namespace:

```
<Fred:FIRST_Name ID="fredFirstName"/>
```

To find out the URN of the namespace "owner" of an element, you can read the `tagUrn` property of that element. For the preceding example, the `tagURN` property returns `www.giantco.com/xmllib`. For regular HTML elements, the returned value is always `null`. The corresponding property in the W3C DOM and NN6 is `namespaceURI`.

Example on the CD-ROM

Related Item: `scopeName` property.

title

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The W3C standard states that you should use the `title` property (and `TITLE` attribute) in an "advisory" role. The main browsers interpret that role as text assigned to tooltips that pop up momentarily while the cursor rests atop an element. The advantage of having this property available for writing is that your scripts can modify an element's tooltip text in response to other user interaction on the page.

A tooltip can provide brief help about the behavior of icons or links on the page. It can also convey a summary of key facts from the destination of a link, thus enabling a visitor to see vital information without having to navigate to the other page. For example, Microsoft's Web authoring documentation online (`http://msdn.microsoft.com`) uses the tooltips in listings of scriptable properties to display a list of elements for which the property is available. While this information also appears on the destination of the link for each property, you can see at a glance, for instance, which instance of the two listings for the same property name apply to the object in which you're interested. The browser governs tooltip font and color characteristics, which are not changeable via scripting.

As with setting the status bar, I don't recommend using tooltips for conveying mission-critical information to the user. Not all users are patient enough to let the pointer pause for the tooltip to appear. On the other hand, a user may be more likely to notice a tooltip once it appears rather than a status bar message (even though the latter appears instantaneously).

On the CD-ROM

Example (with Listing 15-17) on the CD-ROM

Related Item: `window.status` property.

uniqueID

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

You can let the IE5+/Windows browser generate an identifier (`id` property) for a dynamically generated element on the page with the aid of the `uniqueID` property. You should use this feature with care because the ID it generates at any given time may differ from the ID generated the next time the element is created in the page. Therefore, you should use the `uniqueID` property when your scripts require an unknown element to have an `id` property but the algorithms are not expecting any specific identifier.

To guarantee that an element gets only one ID assigned to it while the object exists in memory, assign the value via the `uniqueID` property of that same object — not some other object. Once you retrieve the `uniqueID` property of an object, the property's value stays the same no matter how often you access the property again. In general, you assign the value returned by the `uniqueID` property to the object's `id` property for other kinds of processing. (For example, the parameter of a `getElementById()` method requires the value assigned to the `id` property of an object.)

On the CD-ROM

Example (with Listing 15-18) on the CD-ROM

Related Items: `id` property; `getElementById()` method.

Methods

`addBehavior("`*`URL`*`")`

Returns: Integer ID.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `addBehavior()` method imports an external Internet Explorer behavior and attaches it to the current object, thereby extending the properties and/or methods of that object. See Chapter 48 for details on IE behaviors (new in IE5 for Windows).

The sole parameter of the `addBehavior()` method is a URL pointer to the behavior component's code. This component may be in an external file (with an `.htc` extension), in which case the parameter can be a relative or absolute URL. IE also includes a library of built-in (default) behaviors, whose URLs are in the following format:

```
#default#behaviorName
```

Here, *behaviorName* is one of the default behaviors (see Chapter 48). If the behavior is imported into the document via the `OBJECT` tag, the `addBehavior()` method parameter is the ID of that element in the following format:

```
#objectID
```

When you add a behavior, the loading of the external code occurs asynchronously. This means that even though the method returns a value instantly, the behavior is not necessarily ready to work. Only when the behavior is fully loaded can it respond to events or allow access to its properties and methods. Behaviors loaded from external files observe domain security rules. The behavior component and the HTML page that loads it must come from the same server and domain; they also must load via the same protocol (for example, `http://`, `https://`, and `file://` are mutually exclusive, mismatched protocols).

On the CD-ROM

Example (with Listings 15-19a and 15-19b) on the CD-ROM

Related Items: `readyState` property; `removeBehavior()` method; behaviors (Chapter 48).

addEventListener("*eventType*", *listenerFunc*, *useCapture*)
removeEventListener("*eventType*", *listenerFunc*, *useCapture*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The W3C DOM's event mechanism accommodates both event bubbling and trickling (see Chapter 29). While the new mechanism supports the long-standing notion of binding an event to an element by way of HTML attributes (for example, the old `onClick` event handler), it encourages binding events by registering an event listener with an element. (In browsers that support the W3C event model, other ways of binding events — such as event handler attributes — are internally converted to registered events.)

To tell the DOM that an element should "listen" for a particular kind of event, use the `addEventListener()` method on the element object. The method requires three parameters. The first is a string version of the event type for which the element should listen. Event type strings do not include the well-used "on" prefix of event handlers. Instead, the names consist only of the event and are usually in all lowercase (except for some special system-wide events preceded by DOM). Table 15-7 shows all the events recognized by the W3C DOM specification (although NN6 may not implement them all).

Table 15-7 W3C DOM Event Listener Types

`abort`	`error`
`blur`	`focus`
`change`	`load`
`click`	`mousedown`
`DOMActivate`	`mousemove`

Continued

Table 15-7 (continued)

DOMAttrModified	mouseout
DOMCharacterDataModified	mouseover
DOMFocusIn	mouseup
DOMFocusOut	reset
DOMNodeInserted	resize
DOMNodeInsertedIntoDocument	scroll
DOMNodeRemoved	select
DOMNodeRemovedFromDocument	submit
DOMSubtreeModified	unload

Note that the event types specified in the DOM Level 2 are more limited than the wide range of events defined in IE4+. Also, the W3C temporarily tabled the issue of keyboard events until DOM Level 3. Fortunately, Netscape implements keyboard events in a fashion that likely will appear as part of the W3C DOM.

The second parameter of the `addEventListener()` method is a reference to the JavaScript function to be invoked. This is the same form used to assign a function to an event property of an object (for example, *`objReference`*`.onclick =` *`someFunction`*), and it should *not* be a quoted string. This approach also means that you cannot specify parameters in the function call. Therefore, functions that need to reference forms or form control elements must build their own references (with the help of the event object's property that says which object is the event's target).

By default, the W3C DOM event model has events bubble upward through the element container hierarchy starting with the target object of the event (for example, the button being clicked). However, if you specify `true` for the third parameter of the `addEventListener()` method, event capture is enabled for this particular event type whenever the current object is the event target. This means that any other event type targeted at the current object bubbles upward unless it, too, has an event listener associated with the object and the third parameter is set to `true`.

Caution

NN6 does not always set event capture for an element, even when you specify `true` as the third parameter of `addEventListener()`. For the most part, you can make do with event bubbling by adding an event listener to a container higher up the element hierarchy. Because event capture is a part of the W3C DOM event model, this feature will likely be implemented in a future version of NN.

Using the `addEventListener()` method requires that the object to which it is attached already exist. Therefore, you most likely will use the method inside an initialization function triggered by the `onLoad` event handler for the page. (The `document` object can use `addEventListener()` for the load event immediately because the `document` object exists early in the loading process.)

A script can also eliminate an event listener that was previously added by script. The `removeEventListener()` method takes the same parameters as `addEventListener()`, which means that you can turn off one listener without disturbing others. In fact, because you can add two listeners for the same event and listener function (one set to capture and one not — a rare occurrence, indeed), the three parameters of the `removeEventListener()` enable you to specify precisely which listener to remove from an object.

Unlike the event capture mechanism of NN4, the W3C DOM event model does not have a "global" capture mechanism for an event type regardless of target. And with respect to IE5, the `addEventListener()` method is closely analogous to the IE5 `attachEvent()` method. Also, event capture in IE5 is enabled via the `setCapture()` method. Both the W3C and IE5 event models use their separate syntaxes to bind objects to event handling functions, so the actual functions may be capable of serving both models with browser version branching required only for event binding. See Chapter 29 for more about event handling with these two event models.

On the CD-ROM

Example (with Listing 15-20) on the CD-ROM

Related Items: `attachEvent()`, `detachEvent()`, `dispatchEvent()`, `fireEvent()`, `removeEventListener()` methods.

appendChild(*nodeObject*)

Returns: Node object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Using the W3C DOM parent, node, and child terminology, you can create cross-browser code (for IE5+ and NN6) that modifies HTML content on the page. The `appendChild()` method inserts an element or text node (defined by other code that comes before it) as the new, last child of the current element.

Aside from the more obvious application of adding a new child element to the end of a sequence of child nodes, the `appendChild()` method is also practical for building element objects and their content before appending, replacing, or inserting the element into an existing document. The `document.createElement()` method generates a reference to an element of whatever tag name you assign as that method's parameter. But this does nothing to populate the element's attributes or its content. While IE4+ offers nonstandard `innerText` and `innerHTML` shortcut properties to assign content to an element (and NN6 provides `innerHTML`), the DOM standard recommends adding child nodes to the new element (for more details, see Chapter 14). For example, if you wish to create a B element and its content, you first create the element and then append a text node, as in the following sequence:

```
var newB = document.createElement("B")
newB.appendChild(document.createTextNode("Important!"))
```

At this point, you can append or insert the `newB` element. It appears with its content ready to go.

The `appendChild()` method returns a reference to the appended node object. This reference differs from the object that is passed as the method's parameter because the returned value represents the object as part of the document rather than as a freestanding object in memory.

On the CD-ROM

Example (with Listing 15-21) on the CD-ROM

Related Items: `removeChild()`, `replaceChild()` methods; nodes and children (Chapter 14).

applyElement(*elementObject*[, *type*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `applyElement()` method (not implemented in IE5/Mac) enables you to insert a new element as the parent or child of the current object. An important feature of this method is that the new object is wrapped around the current object (if the new element is to become the parent) or the current object's content (if the new element is to become a child). When the new element becomes a child, all previous children are nested further by one generation to become immediate children of the new element. You can imagine how the resulting action of this method affects the containment hierarchy of the current element, so you must be careful in how you use the `applyElement()` method.

One parameter, a reference to the object to be applied, is required. This object may be generated from constructions such as `document.createElement()` or from one of the child or node methods that returns an object. The second parameter is optional, and it must be one of the following values:

Parameter Value	*Description*
`outside`	New element becomes the parent of the current object
`inside`	New element becomes the immediate child of the current object

If you omit the second parameter, the default value (`outside`) is assumed.

Example (with Listing 15-22) on the CD-ROM

Related Items: `insertBefore()`, `appendChild()`, `insertAdjacentElement()` methods.

attachEvent("*eventName*", *functionRef*)
detachEvent("*eventName*", *functionRef*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `attachEvent()` method is used primarily within code that specifies IE behaviors (see Chapter 48). But you can also use it in regular scripting as yet another way to bind an event handler to an object. The following example characterizes the more typical approach to assigning an event handler:

```
myObject.onmousedown = setHilite
```

The version with `attachEvent()` is as follows:

```
myObject.attachEvent("onmousedown", setHilite)
```

Both parameters are required. The first parameter is a string version (case-insensitive) of the event name. The second is a reference to the function to be invoked when the event fires for this object. A *function reference* is an unquoted, case-sensitive identifier for the function without any parentheses (which also means that you cannot pass parameters in this function call).

There is a subtle benefit to using `attachEvent()` over the event property binding approach. When you use `attachEvent()`, the method returns a Boolean value of `true` if the event binding succeeds. IE triggers a script error if the function reference fails, so don't rely on a returned value of `false` to catch these kinds of errors. Also, there is no validation that the object recognizes the event name.

If you have used `attachEvent()` to bind an event handler to an object's event, you can disconnect that binding with the `detachEvent()` method. The parameters are the same as for `attachEvent()`. The `detachEvent()` method cannot unbind events whose associations are established via tag attributes or event property settings.

The W3C DOM event model provides functionality similar to these IE-only methods: `addEventListener()` and `removeEventListener()`.

Example on the CD-ROM

Related Items: `addEventListener()`, `detachEvent()`, `dispatchEvent()`, `fireEvent()`, `removeEventListener()` methods; Event binding (Chapter 14).

blur()
focus()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `blur()` method removes focus from an element, while the `focus()` method gives focus to an element. Even though the `blur()` and `focus()` methods have been around since the earliest scriptable browsers, not every focusable object has enjoyed these methods since the beginning. Browsers prior to IE4 and NN6 limited these methods primarily to the `window` object and form control elements.

Windows

For window objects, the `blur()` method (NN3+, IE4+) pushes the referenced window to the back of all other open windows. If other browser suite windows (such as e-mail or news reader windows) are open, the window receiving the `blur()` method is placed behind these windows as well.

Caution The `window.blur()` method does not adjust the stacking order of the current window in NN6. But a script in a window can invoke the `focus()` method of another window to bring that other window to the front (provided a scriptable linkage, such as the `window.opener` property, exists between the two windows).

The minute you create another window for a user in your Web site environment, you must pay attention to window layer management. With browser windows so easily activated by the slightest mouse click, a user can lose a smaller window behind a larger one in a snap. Most inexperienced users don't think to check the Windows taskbar or browser menu bar (if the browser is so equipped) to see if a smaller window is still open and then activate it. If that subwindow is important to your site design, then you should present a button or other device in each window that enables users to safely switch among windows. The `window.focus()` method brings the referenced window to the front of all the windows.

Rather than supply a separate button on your page to bring a hidden window forward, you should build your window-opening functions in such a way that if the window is already open, the function automatically brings that window forward (as shown in Listing 15-23). This removes the burden of window management from your visitors.

The key to success with this method is making sure that your references to the desired windows are correct. Therefore, be prepared to use the `window.opener` property to refer to the main window if a subwindow needs to bring the main window back into focus.

Form elements

The `blur()` and `focus()` methods apply primarily to text-oriented form controls: text input, SELECT, and TEXTAREA elements.

Just as a camera lens blurs when it goes out of focus, a text object "blurs" when it loses focus — when someone clicks or tabs out of the field. Under script control, `blur()` deselects whatever may be selected in the field, and the text insertion pointer leaves the field. The pointer does not proceed to the next field in tabbing order, as it does if you perform a blur by tabbing out of the field manually.

For a text object, having focus means that the text insertion pointer is flashing in that text object's field. Giving a field focus is like opening it up for human editing.

Setting the focus of a text field or TEXTAREA does not, by itself, enable you to place the cursor at any specified location in the field. The cursor usually appears at the beginning of the text. To prepare a field for entry to remove the existing text, use both the `focus()` and `select()` methods in series. Be aware, however, that the `focus()` method does not work reliably in Navigator 3 for UNIX clients: While the `select()` method selects the text in the designated field, focus is not handed to the field.

One other caveat about using `focus()` and `select()` together to preselect the content of a text field for immediate editing: Many versions of Internet Explorer fail to achieve the desired results due to an internal timing problem. You can work around this problem (and remain compatible with Navigator) by initiating the focus and selection actions through a `setTimeout()` method. See Chapter 43 on data validation for an example.

A common design requirement is to position the insertion pointer at the end of a text field or TEXTAREA so that a user can begin appending text to existing content immediately. This is possible in IE4+ with the help of the `TextRange` object. The following script fragment moves the text insertion pointer to the end of a TEXTAREA element whose ID is `myTextarea`:

```
var range = document.all.myTextarea.createTextRange()
range.move("textedit")
range.select()
```

You should be very careful in combining `blur()` or `focus()` methods with `onBlur` and `onFocus` event handlers — especially if the event handlers display alert boxes. Many combinations of these events and methods can cause an infinite loop in which it is impossible to dismiss the alert dialog box completely. On the other hand, there is a useful combination for older browsers that don't offer a `disabled` property for text boxes. The following text field event handler can prevent users from entering text in a text field:

```
onFocus = "this.blur()"
```

Some operating systems and browsers enable you to give focus to elements such as buttons (including radio and checkbox buttons) and hypertext links (encompassing both A and AREA elements). Typically, once such an element has focus, you can accomplish the equivalent of a mouse click on the element by pressing the spacebar on the keyboard. This is helpful for accessibility to those who have difficulty using a mouse.

An unfortunate side effect of button focus in Win32 environments is that the focus highlight (a dotted rectangle) remains around the button after a user clicks it and until another object gets focus. You can eliminate this artifact for browsers and objects that implement the `onMouseUp` event handler by including the following event handler in your buttons:

```
onMouseUp = "this.blur()"
```

IE5.5 recognizes the often undesirable effect of that dotted rectangle and lets scripts set the `hideFocus` property of an element to `true` to keep that rectangle hidden while still giving the element focus. It is a tradeoff for the user, however, because there is no visual feedback about which element has focus.

Other elements

For other kinds of elements that support the `focus()` method, you can bring an element into view in lieu of the `scrollIntoView()` method. Link (`A`) and `AREA` elements in Windows versions of IE display the dotted rectangle around them after a user brings focus to them. To eliminate that artifact, use the same

```
onMouseUp = "this.blur()"
```

event handler as (or IE5.5 `hideFocus` property) just described for form controls. Microsoft increased the breadth of objects that support the `blur()` and `focus()` methods in IE5.

On the CD-ROM

Example (with Listing 15-23) on the CD-ROM

Related Items: `window.open()`, `document.`*`formObject`*`.`*`textObject`*`.select()` methods.

clearAttributes()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `clearAttributes()` method removes all attributes from an element except the `NAME` and `ID` values. Thus, styles and event handlers are removed, as are custom attributes assigned in either the HTML source code or later by script. You should know that the `clearAttributes()` method does not alter the length of the element's `attributes` collection because the collection always contains all possible attributes for an element. (See the `attributes` property for elements earlier in this chapter.)

This method is handy if you wish to construct an entirely new set of attributes for an element and prefer to start out with a blank slate. Be aware, however, that unless your scripts immediately assign new attributes to the element, the appearance of the element reverts to its completely unadorned form until you assign new attributes. This means that even positioned elements find their way back to their source code order until you assign a new positioning style. If you simply want to change the value of one or more attributes of an element, it is faster to use the `setAttribute()` method or adjust the corresponding property.

To accomplish a result in NN6 that simulates that of IE5's `clearAttributes()`, you must iterate through all attributes of an element and remove those attributes (via the `removeAttribute()` method) whose names are other than `ID` and `NAME`.

On the CD-ROM

Example on the CD-ROM

Related Items: `attributes` property; `getAttribute()`, `setAttribute()`, `removeAttribute()`, `mergeAttributes()`, and `setAttributeNode()` methods.

click()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `click()` method lets a script perform nearly the same action as clicking an element. While this method was available in one form or another since the beginning of scripting, it was available only on INPUT elements that act as buttons (input type button, reset, submit, radio, and checkbox). Most element objects received the method in IE4 and NN6.

The behavior of the `click()` method has also changed over time. Prior to NN4 and IE4, the `click()` method invoked on a button did not trigger the `onClick` event handler for the object. This has significant impact if you expect the `onClick` event handler of a button to function even if a script performs the "click." For earlier browser versions, you have to invoke the event handler statements directly. Also, just because a script is "clicking" a button, not all buttons in all platforms change their appearance in response. For example, NN4 on the Mac does not change the state of a checkbox when clicked remotely. (Win32 versions of version 4 browsers do change state.)

If you want to script the action of "clicking" a button, you can safely invoke the resulting event handler function directly. And if the element is a radio button or checkbox, handle the change of state directly (for example, set the `checked` property of a checkbox) rather than expect the browser to take care of it for you.

On the CD-ROM

Example on the CD-ROM

Related Item: `onClick` event handler.

cloneNode(*deepBoolean*)

Returns: Node object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `cloneNode()` method makes an exact copy of the current node object. This copy does not have a parent node or other relationship with any element once the copy exists (of course, the original node remains in place). The clone also does not become part of the document's object model unless you explicitly insert or append the node somewhere on the page. The copy includes all element attributes, including the `ID` attribute. Because the value returned by the `cloneNode()` method is a genuine `Node` object, you can operate on it with any `Node` object methods while it is still in the non-document object state.

The Boolean parameter of the `cloneNode()` method controls whether the copy of the node includes all child nodes (`true`) or just the node itself (`false`). For example, if you clone a paragraph element by itself, the clone consists only of the raw element (equivalent of the tag pair, including attributes in the start tag) and none of its content. But including child nodes makes sure that all content within that paragraph element is part of the copy. This parameter is optional in IE5 (defaulting to `false`), but it is required in NN6 and the W3C DOM.

On the CD-ROM

Example on the CD-ROM

Related Items: `Node` object (Chapter 14); `appendChild()`, `removeChild()`, `removeNode()`, `replaceChild()`, and `replaceNode()` methods.

componentFromPoint(*x*,*y*)

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `componentFromPoint()` method assists in some event-related tasks. You can use it for a kind of collision detection (in other words, to determine whether an event occurs inside or outside of a particular element). If the element has scrollbars, the method can provide additional information about the event such as precisely which component of the scrollbar the user activates. The method is not implemented in IE5/Mac.

A key aspect of this method is that you invoke it on any element that you want to use as the point of reference. For example, if you want to find out if a `mouseup` event occurs in an element whose ID is `myTable`, invoke the method as follows:

```
var result = document.all.myTable.componentFromPoint(event.clientX,
event.clientY)
```

Parameters passed to the method are x and y coordinates. These coordinates do not have to come from an event, but the most likely scenario links this method with an event of some kind. Mouse events (other than `click`) work best.

The value returned by the method is a string that provides details about where the coordinate point is with respect to the current element. If the coordinate point is inside the element's rectangle, the returned value is an empty string. Conversely, if the point is completely outside of the element, the returned value is the string `"outside"`. For scrollbar pieces, the list of possible returned values is quite lengthy (as shown in Table 15-8). Microsoft defines additional values representing pieces of element resizing handles when the browser is set to what the company calls DHTML authoring mode in Windows. This mode involves a special ActiveX control that is outside the scope of this book. Table 15-8 lists these extra values just the same.

Table 15-8 Returned Values for componentFromPoint()

Returned String	*Element Component at Coordinate Point*
`scrollbarDown`	Scrollbar down arrow
`scrollbarHThumb`	Scrollbar thumb on horizontal bar
`scrollbarLeft`	Scrollbar left arrow
`scrollbarPageDown`	Scrollbar page-down region
`scrollbarPageLeft`	Scrollbar page-left region
`scrollbarPageRight`	Scrollbar page-right region
`scrollbarPageUp`	Scrollbar page-up region
`scrollbarRight`	Scrollbar right arrow
`scrollbarUp`	Scrollbar up arrow
`scrollbarVThumb`	Scrollbar thumb on vertical bar
`handleBottom`	Resize handle at bottom
`handleBottomLeft`	Resize handle at bottom left
`handleBottomRight`	Resize handle at bottom right
`handleLeft`	Resize handle at left
`handleRight`	Resize handle at right
`handleTop`	Resize handle at top
`handleTopLeft`	Resize handle at top left
`handleTopRight`	Resize handle at top right

You do not have to use this method for most collision or event detection, however. The `event` object's `srcElement` property returns a reference to whatever object receives the event.

On the CD-ROM

Example (with Listing 15-24) on the CD-ROM

Related Item: `event` object.

`contains(`*`elementObjectReference`*`)`

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `contains()` method reports whether the current object contains another known object within its HTML containment hierarchy. Note that this is not geographical collision detection of overlapping elements, but rather the determination of whether one element is nested somewhere within another.

The scope of the `contains()` method extends as deeply within the current object's hierarchy as is necessary to locate the object. In essence, the `contains()` method examines all of the elements that are part of an element's `all` array. Therefore, you can use this method as a shortcut replacement for a `for` loop that examines each nested element of a container for the existence of a specific element.

The parameter to the `contains()` method is a reference to an object. If you have only the element's ID as a string to go by, you can use the `document.all.item()` method to generate a valid reference to the nested element. If the parameter is a reference to an element that has the same ID as another within the scope of the method, a script error results because a reference to such an element returns an array of elements rather than a valid object reference.

Note

An element always contains itself.

On the CD-ROM

Example on the CD-ROM

Related Items: `item()`, `document.getElementById()` methods.

detachEvent()

See `attachEvent()`.

dispatchEvent(*eventObject*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `dispatchEvent()` method allows a script to fire an event aimed at any object capable of supporting that event. This is the W3C event model way of generalizing mechanisms that earlier browsers sometimes mimic with object methods such as `click()` and `focus()`.

The process of generating one of these events is similar to the way a script generates a new node and inserts that node somewhere in the document object model. For events, however, the object that is created is an `Event` object, which is generated via the `document.createEvent()` method. An event generated in this manner is simply a specification about an event. Use properties of an event object to supply specifics about the event, such as its coordinates or mouse button. Then dispatch the event to a target object by invoking that target object's `dispatchEvent()` method and passing the newly created `Event` object as the sole parameter.

Interpreting the meaning of the Boolean value that the `dispatchEvent()` method returns is not straightforward. The browser follows the dispatched event through whatever event propagation is in effect for that object and event type (either bubbling or capture). If any of the event listener functions that are triggered by this dispatched event invoke the `preventDefault()` method, the `dispatchEvent()` method returns `false` to indicate that the event did not trigger the native action of the object; otherwise, the method returns `true`. Notice that this returned value indicates nothing about propagation type or how many event listeners run as a result of dispatching this event.

Caution While the `dispatchEvent()` method is implemented in NN6, the browser does not yet provide a way to generate new events from scratch. And if you attempt to redirect an existing event to another object via the `dispatchEvent()` method, the browser is prone to crashing.

On the CD-ROM Example (with Listing 15-25) on the CD-ROM

Related Item: `fireEvent()` method.

fireEvent("*eventType*"[, *eventObjectRef*])

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

While some objects have methods that emulate physical events (for example, the `click()` and `focus()` methods), IE5.5 generalizes the mechanism by letting a script direct any valid event to any object. The `fireEvent()` method is the vehicle.

One required parameter is the event type, formatted as a string. IE event types are coded just like the property names for event handlers (for example, `onclick`, `onmouseover`, and so on).

A second, optional parameter is a reference to an existing `event` object. This object can be an event that some user or system action triggers (meaning that the `fireEvent()` method is in a function invoked by an event handler). The existing event can also be an object created by the IE5.5 `document.createEventObject()` method. In either case, the purpose of providing an existing `event` object is to set the properties of the `event` object that the `fireEvent()` method creates. The event type is defined by the method's first parameter, but if you have other properties to set (for example, coordinates or a keyboard key code), then those properties are picked up from the existing object. Here is an example of a sequence that creates a new `mousedown` event, stuffs some values into its properties, and then fires the event at an element on the page:

```
var newEvent = document.createEventObject()
newEvent.clientX = 100
newEvent.clientY = 30
newEvent.cancelBubble = false
newEvent.button = 1
document.all.myElement.fireEvent("onmousedown", newEvent)
```

Events generated by the `fireEvent()` method are just like regular IE `window.event` objects, and they have several important `event` object properties that the browser presets. Importantly, `cancelBubble` is set to `false` and `returnValue` is set to `true`—just like a regular user- or system-induced event. This means that if you want to prevent event bubbling and/or prevent the default action of the event's source element, then the event handler functions must set these `event` object properties just like normal event handling in IE.

The `fireEvent()` method returns a Boolean value that the `returnValue` property of the event determines. If the `returnValue` property is set to `false` during event handling, then the `fireEvent()` method returns `false`. Under normal processing, the method returns `true`.

Although the W3C DOM Level 2 event model includes the `dispatchEvent()` method to accommodate script-generated events (and `Event` object methods to create event objects), Microsoft has so far elected to ignore the standard recommendation. While there is some similarity between the basic operations of `fireEvent()` and `dispatchEvent()`, the two methods diverge significantly in advanced applications (for example, the way events can propagate and the W3C notion of an `Event` object).

On the CD-ROM

Example (with Listing 15-26) on the CD-ROM

Related Item: `dispatchEvent()` method.

focus()

See `blur()`.

getAdjacentText("*position*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `getAdjacentText()` method enables you to extract plain text components of an element object (in other words, without any HTML tag information). This method is not implemented in IE5/Mac. The sole parameter is one of four case-insensitive string constant values that indicate from where, in relation to the current object, the text should be extracted. The values are:

Parameter Value	*Description*
`beforeBegin`	Text immediately in front of the element's tag, back to the preceding tag
`afterBegin`	Text that begins inside the element tag, up to the next tag (whether it be a nested element or the element's end tag)
`beforeEnd`	Text immediately in front of the element's end tag, back to the preceding tag (whether it be a nested element or the element's start tag)
`afterEnd`	Text immediately following the element's end tag, forward until the next tag

If the current object has no nested elements, then the `afterBegin` and `beforeEnd` versions both return the same as the object's `innerText` property. When the current object is encased immediately within another element (for example, a TD element inside a TR element), there is no text before the element's beginning or after the element's end so these values are returned as empty strings.

The strings returned from this method are roughly equivalent to values of text fragment nodes in the W3C DOM, but IE5 treats these data pieces only as string data types rather than as text node types. Cross-browser DOM equivalents for the four versions are:

```
document.getElementById("objName").previousSibling.nodeValue
document.getElementById("objName").firstChild.nodeValue
document.getElementById("objName").lastChild.nodeValue
document.getElementById("objName").nextSibling.nodeValue
```

On the CD-ROM

Example on the CD-ROM

Related Items: `childNodes`, `data`, `firstChild`, `lastChild`, `nextSibling`, `nodeValue`, and `previousSibling` properties.

getAttribute("*attributeName*"[, *caseSensitivity*])

Returns: See text.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `getAttribute()` method returns the value assigned to a specific attribute of the current object. You can use this method as an alternative to retrieving properties of an object, particularly when your script presents you with the attribute name as a string (in contrast to a fully formed reference to an object and its property). Thus, the following example statements yield the same data:

```
var mult = document.all.mySelect.multiple
var mult = document.all.mySelect.getAttribute("multiple")
```

Returned value types from `getAttribute()` are either strings (including attribute values assigned as unquoted numeric values) or Booleans (for example, the `multiple` property of a SELECT element object).

Note

The W3C DOM Level 2 standard recommends `getAttribute()` and `setAttribute()` for reading and writing element object attribute values, rather than reading and writing those values by way of their corresponding properties. While using these methods is certainly advisable for XML elements, the same DOM standard sends conflicting signals by defining all kinds of properties for HTML element objects. Browsers, of course, will support access via properties well into the future, so don't feel obligated to change your ways.

All browsers that support the `getAttribute()` method require one parameter, which is a string of the attribute name. By default, this parameter is not case-sensitive. Note that this has impact on custom attributes that you might assign to HTML or XML elements in your documents. Attribute names are automatically converted to lowercase when they are turned into properties of the object. Therefore, you must avoid reusing attribute names, even if you use different case letters in the source code assignments.

IE includes an optional extension to the method in the form of a second parameter that enables you to be more specific about the case-sensitivity of the first parameter. The default value of the second parameter is `false`, which means that the first parameter is not case-sensitive. A value of `true` makes the first parameter case-sensitive. This matters only if you use `setAttribute()` to add a parameter to an existing object and in the IE version of that method insists on case-sensitivity. The default behavior of `setAttribute()` respects the case of the attribute name. See also the discussion of the `setAttribute()` method later in this chapter with regard to `setAttribute()`'s influence over the IE `attributes` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `attributes` property; `document.createAttribute()`, `setAttribute()` methods.

getAttributeNode("*attributeName*")

Returns: Attribute node object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

In the W3C DOM, an attribute is an object that inherits all the properties of a `Node` object (see Chapter 14). As its name implies, an attribute object represents a name–value pair of an attribute that is explicitly defined inside an element's tag. The ability to treat attributes as node objects is far more important when working with XML than HTML, but it is helpful to understand attribute nodes within the context of the W3C DOM object-oriented view of a document. Importantly, attribute nodes specifically are not recognized as nodes of a document hierarchy. Therefore, an attribute node is not a child node of the element that defines the attribute.

But the "nodeness" of attributes comes into play when comparing the contents of an object's `attributes` property in the IE and W3C DOM worlds. In IE5+, the `attributes` property returns an array of all attributes for an element (whether or not the attributes are explicitly included in the tag). But the W3C `attributes` property builds on the DOM's formal structure by returning an object known (internally) as a *named node map*. Like an array, the named node map has a `length` property (facilitating `for` loop interation through the map), plus several methods that allow for inserting, removing, reading, or writing attribute name–value pairs within the node map. To a script, the value of the `attributes` property can behave the same in both IE5 and the W3C DOM provided that scripts don't have to dig too deeply into the nature of each object model's idea of what an attribute object is.

In IE5, an attribute object is a relatively simple object consisting of `nodeName`, `nodeValue`, and `specified` properties. In the W3C DOM, an attribute object is something more substantial, primarily because it inherits all the properties of the `Node` object. Table 5-9 compares the properties of an attribute object in NN6 and IE5.

Table 15-9 Attribute Object Properties in NN6 and IE5

NN6	***IE5***
`attributes`	
`childNodes`	
`firstChild`	
`lastChild`	
`name`	
`nextSibling`	
`nodeName`	`nodeName`
`nodeType`	
`nodeValue`	`nodeValue`
`ownerDocument`	
`parentNode`	
`previousSibling`	
`specified`	`specified`
`value`	

Admittedly, the three properties implemented in IE5 are the most important, but the shortcut approach negates the object-oriented system of the W3C DOM.

All of this is a long way to explain the W3C DOM `getAttributeNode()` method, which returns a W3C DOM attribute object. The sole parameter of the method is a case-insensitive string version of the attribute's name. You can then use any of the properties shown in Table 15-9 to get or set attribute values. Of course, HTML attributes are generally exposed as properties of HTML elements, so it is usually easier to read or write the object's properties directly.

Example on the CD-ROM

Related Items: `attributes` property; `getAttribute()`, `removeAttributeNode()`, `setAttributeNode()` methods.

getBoundingClientRect()

Returns: `TextRectangle` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

IE5+ assigns to every content-holding element a rectangle that describes the space that the element occupies on the page. This rectangle is called a *bounding rectangle*, and it is expressed in the IE5/Windows object model as a `TextRectangle` object (even when the content is an image or some other kind of object). A `TextRectangle` object has four properties (`top`, `left`, `bottom`, and `right`) that are the pixel coordinates that define the rectangle. The `getBoundingClientRect()` method returns a `TextRectangle` object that describes the bounding rectangle of the current object. You can access an individual measure of an object's bounding rectangle, as in the following example:

```
var parTop = document.all.myP.getBoundingClientRect().top
```

For elements that consist of text, such as paragraphs, the dimensions of individual `TextRectangle`s for each line of text in the element influence the dimensions of the bounding rectangle. For example, if a paragraph contains two lines, and the second line extends only halfway across the width of the first line, the width of the second line's `TextRectangle` object is only as wide as the actual text in the second line. But because the first line extends close to the right margin, the width of the encompassing bounding rectangle is governed by that wider, first line `TextRectangle`. Therefore, an element's bounding rectangle is as wide as its widest line and as tall as the sum of the height of all `TextRectangle` objects in the paragraph.

Another method, `getClientRects()`, enables you to obtain a collection of line-by-line `TextRectangle` objects for an element. Neither method is implemented in IE5/Mac.

On the CD-ROM

Example (with Listing 15-27) on the CD-ROM

Related Items: `getClientRects()` method; `TextRectangle` object (Chapter 19).

getClientRects()

Returns: Array of `TextRectangle` objects.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `getClientRects()` method returns an array of all `TextRectangle` objects that fall within the current object the moment the method is invoked. Each `TextRectangle` object has its own `top`, `left`, `bottom`, and `right` coordinate properties. You can then, for example, loop through all objects in this array to calculate the pixel width of each line. If you want to find out the aggregate height and/or maximum width of the entire collection, you can use the `getBoundingClientRect()` method as a shortcut. This method is not implemented in IE5/Mac.

On the CD-ROM

Example on the CD-ROM

Related Items: `getBoundingClientRect()` method; `TextRectangle` object (Chapter 19).

getElementsByTagName("*tagName*")

Returns: Array of element objects.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `getElementsByTagName()` method returns an array of all elements of the current object whose tags match the tag name supplied as the sole parameter to the method. The tag name parameter must be in the form of a string and is case-insensitive. The group of elements returned in the array includes only those elements that are within the containment scope of the current object. Therefore, if you have two table objects in a document and you invoke the `getElementsByTagName("td")` method on one of them, the list of returned table cell elements is confined to those cells within the current table object. The current element is not included in the returned array.

The W3C DOM (but not implemented in IE5.*x*/Windows) accepts a wildcard character (`"*"`) as a parameter to the `getElementsByTagName()` method. The resulting array of elements is similar to what IE4+ returns via the `document.all` collection. See Chapter 14 for ideas on simulating `document.all` in NN6 using this technique.

Internet Explorer provides additional alternate syntax for this method: the `tags()` method of the `all` collection. This alternate syntax also works in IE4 (see the `all` property earlier in this chapter).

On the CD-ROM

Example on the CD-ROM

Related Items: `getElementById()`, `tags()` methods.

getExpression("*attributeName*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `getExpression()` method (not implemented in IE5/Mac) returns the text of the expression that was assigned to an element's attribute via the `setExpression()` method. The returned value is not the value of the expression, but rather the expression itself. If you want to find out the current value of the expression (assuming that the variables used are within the scope of your script), you can use the `eval()` function on the call to `getExpression()`. This action converts the string to a JavaScript expression and returns the evaluated result.

One parameter, a string version of the attribute name, is required.

On the CD-ROM

Example on the CD-ROM

Related Items: `document.recalc()`, `removeExpression()`, `setExpression()` methods.

hasChildNodes()

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `hasChildNodes()` method returns `true` if the current object has child nodes nested within; it returns `false` otherwise. A child node is not necessarily the same as a child element, so the following two expressions return `true` when the current object has at least one child node:

```
document.getElementById("myObject").hasChildNodes()
document.getElementById("myObject").childNodes.length > 0
```

You cannot use the second expression interchangeably with the following statement (which uses the IE-only `children` property):

```
document.getElementById("myObject").children.length > 0
```

You generally use the `hasChildNodes()` method in a conditional expression to make sure such nodes exist before performing operations on them:

```
if (document.getElementById("myObject").hasChildNodes() {
    statements that apply to child nodes
}
```

On the CD-ROM

Example on the CD-ROM

Related Items: `childNodes` property; `appendChild()`, `removeChild()`, `replaceChild()` methods.

insertAdjacentElement("*location*", *elementObject*)

Returns: Object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `insertAdjacentElement()` method (not implemented in IE5/Mac) inserts an element object (coming from a variety of sources) in a specific position relative to the current object. Both parameters are required. The first must be one of four possible case-insensitive locations for the insertion, shown in the following table:

Location	***Description***
`beforeBegin`	Before the current element's start tag
`afterBegin`	After the start tag, but before any nested content
`beforeEnd`	Before the end tag, but after all other nested content
`afterEnd`	After the end tag

These locations are relative to the current object. The element type of the current object (a block-level or inline element) has great bearing on how the inserted element is rendered. For example, suppose you create a B element (using `document.createElement()`) and assign some inner text to it. You then use `insertAdjacentElement()` in an effort to insert this B element before some text in a P element. Because a P element is a block-level element, the location beforeBegin places the new B element before the start tag of the P element. This means, however, that the bold text appears in a text line above the start of the P element because a <P> tag begins a new block at the left margin of its container (unless instructed otherwise by style sheets). The resulting HTML looks like the following:

```
<B>The new element.</B><P>The original paragraph element.</P>
```

To make the new B element a part of the P element — but in front of the existing P element's content — use the afterBegin location. The resulting HTML looks like the following:

```
<P><B>The new element.</B>The original paragraph element.</P>
```

To complete the demonstration of the four location types, the following is the result of the beforeEnd location:

```
<P>The original paragraph element. <B>The new element.</B></P>
```

and this is the result of the afterEnd location:

```
<P>The original paragraph element.</P><B>The new element.</B>
```

The object to be inserted is a reference to an element object. The object reference can come from any expression that evaluates to an element object or, more likely, from the result of the document.createElement() method. Bear in mind that the object generated by document.createElement() initially has no content, and all attribute values are set to default values. Moreover, the object is passed to insertAdjacentElement() by reference, which means that there is only one instance of that object. If you attempt to insert that object in two places with two statements, the object is moved from the first location to the second. If you need to copy an existing object so that the original is not moved or otherwise disturbed by this method, use the cloneNode() method to specify the true parameter to capture all nested content of the node.

Do not use this method to insert new table elements into a table. Instead, use the many table-specific insertion methods that better treat rows, columns, and cells of a table (see Chapter 27). And if you wish to insert an element that surrounds the current element or wraps all of the content of the current element, use the applyElement() method.

On the CD-ROM

Example on the CD-ROM

Related Items: document.createElement(), applyElement() methods.

insertAdjacentHTML("*location*", "*HTMLtext*")
insertAdjacentText("*location*", "*text*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These two methods insert HTML or straight text at a location relative to the current element. They are intended for use after a page loads, rather than inserting content while the page loads (in which case you can use `document.write()` wherever you need evaluated content to appear on the page).

The first parameter must be one of four possible case-insensitive locations for the insertion, shown in the following table:

Location	***Description***
`beforeBegin`	Before the current element's start tag
`afterBegin`	After the start tag, but before any nested content
`beforeEnd`	Before the end tag, but after all other nested content
`afterEnd`	After the end tag

These locations yield the same results as described in the `insertAdjacentElement()` function discussed earlier.

Whether you use `insertAdjacentHTML()` or `insertAdjacentText()` depends on the nature of your content and what you want the browser to do with it. If the content contains HTML tags that you want the browser to interpret and render as if it were part of the page source code, then use the `insertAdjacentHTML()` method. All tags become objects in the document's object model. But if you want only to display some text (including HTML tags in their "raw" form), use `insertAdjacentText()`. The rendering engine does not interpret any tags included in the string passed as the second parameter. Instead, these tags are displayed as characters on the page. This distinction is identical to the one between the `innerHTML` and `innerText` properties.

The difference between `insertAdjacentHTML()` and `insertAdjacentElement()` is the nature of the content that you insert. The former enables you to accumulate the HTML as a string, while the latter requires the creation of an element object. Also, the two methods in this section work with IE4+ (including Mac versions), whereas `insertAdjacentElement()` requires the newer object model of IE5 and later.

If the HTML you pass as the second parameter of `insertAdjacentHTML()` contains `<SCRIPT>` tags, you must set the `DEFER` attribute in the opening tag. This prevents script statements from executing as you insert them.

For inserting new elements into an existing table, use the variety of table object methods for managing rows, columns, and cells (see Chapter 27).

On the CD-ROM

Example on the CD-ROM

Related Items: `innerText`, `innerHTML`, `outerText`, `outerHTML` properties; `insertAdjacentElement()`, `replaceAdjacentText()` methods.

insertBefore(*newChildNodeObject*[, *referenceChildNode*])

Returns: `Node` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `insertBefore()` method is the W3C DOM syntax for inserting a new child node into an existing element. Node references for both parameters must be valid `Node` objects (including those that `document.createElement()` generates).

The behavior of this method might seem counter-intuitive at times. If you include the second parameter (a reference to an existing child node of the current element), the new child node is inserted before that existing one. But if you omit the second parameter (or its value is `null`), the new child node is inserted as the last child of the current element — in which case, the method acts the same as the `appendChild()` method. The true power of this method is summoned when you specify that second parameter; from the point of view of a parent element, you can drop a new child into any spot among its existing children.

Bear in mind that the `insertBefore()` method works from a parent element. Internet Explorer provides additional methods, such as `insertAdjacentElement()`, to operate from the perspective of what will become a child element.

On the CD-ROM

Example (with Listing 15-28) on the CD-ROM

Related Items: `appendChild()`, `replaceChild()`, `removeChild()`, `insertAdjacentElement()` methods.

item(*index* | "*index*" [, *subIndex*])

Returns: Object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `item()` method works with most objects that are themselves collections of other objects. In the W3C DOM framework, these kinds of objects are known as *named node lists* (for objects such as nodes and attributes) or *HTML collections* (for objects such as elements of a form). While the W3C DOM defines the `item()` method, it does so with a single numeric parameter that is the index value of the desired object within the collection. NN6 implements this version. If you know the index number of the item, you can use JavaScript array syntax instead. The following two statements return the same object reference:

```
document.getElementById("myTable").childNodes.item(2)
document.getElementById("myTable").childNodes[2]
```

And for IE's `all` object, the index value for a given element is the same as the element's `sourceIndex` property.

IE4+ extends the possibilities by also allowing a string of the ID of an object within the collection. (Integer values are required for the `attributes`, `rules`, and `TextRectangle` objects, however.) Additionally, if the collection has more than one object with the same ID (never a good idea except when necessary), a second numeric parameter enables you to select which identically named group you want (using zero-based index values within that subgroup). This obviously does not apply to collections, such as attributes and rules, which have no ID associated with them.

The method returns a reference to the object specified by the parameters.

On the CD-ROM

Example on the CD-ROM

Related Items: All object element properties that return collections (arrays) of other objects.

mergeAttributes("*sourceObject*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `mergeAttributes()` method (not implemented in IE5/Mac) is a convenient way to propagate attributes in newly created elements without painstakingly adding attributes one at a time. Once you have an object whose attributes can function as a prototype for other elements, those attributes (except for the `ID` attribute) can be applied to a newly created element instantaneously.

On the CD-ROM

Example (with Listing 15-29) on the CD-ROM

Related Items: `clearAttributes()`, `cloneNode()`, `removeAttributes()` methods.

normalize()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

In the course of appending, inserting, removing, and replacing child nodes of an element, it is conceivable that two text nodes can end up adjacent to each other. While this typically has no effect on the rendering of the content, some XML-centric applications that rely heavily on the document node hierarchy to interpret content properly may not like having two text nodes sitting next to each other. The "proper" form of a node hierarchy is for a single text node to be bounded by other node types. The `normalize()` method sweeps through the child nodes of the current node object and combines adjacent text nodes into a single text node. The effect obviously impacts the number of child nodes of an element, but it also cleanses the nested node hierarchy.

On the CD-ROM

Example on the CD-ROM

Related Items: `document.createTextNode()`, `appendChild()`, `insertBefore()`, `removeChild()`, `replaceChild()` methods.

releaseCapture()
setCapture(*containerBoolean*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

You can instruct a single object on an IE5+/Windows page to capture all mouse events (`onmousedown`, `onmouseup`, `onmousemove`, `onmouseout`, `onmouseover`, `onclick`, and `ondblclick`) via the IE-specific `setCapture()` method. This type of event capture is somewhat similar to event capture mechanisms of NN4 and NN6 (which are quite different in and of themselves). However, the syntax is entirely different, as is the overall approach to the code that handles events (see Chapter 29 on the `Event` object).

A primary scenario for IE mouse event capture is when some content appears on the page that you wish to leave as the center of user focus — items such as pull-down menus, context menus, or simulated modal window areas. When such items appear on the screen, you want the effect of blocking all mouse events except those that apply to the menu or currently visible pseudowindow. When the region disappears, mouse events can be released so that individual elements (such as buttons and links elsewhere on the page) respond to mouse events.

Event capture does not block the events. Instead, the events are redirected to the object set to capture all mouse events. Events bubble up from that point unless explicitly cancelled (see Chapter 29). For example, consider a document that has a `<BODY>` tag containing an `onClick` event handler that governs the entire document at all times. If you turn on event capture for a DIV somewhere in the document, the click event first goes to the DIV. That DIV might have an `onClick` event handler that looks to process click events when they occur in some of its child elements. If the event handler for the DIV does not also cancel the bubbling of that click event, the BODY element's `onClick` event handler eventually receives and processes the event, even though the DIV initially captured the event.

Deciding which object should capture events is an important design issue to confront. With event capture engaged, all mouse events (no matter where they occur) get funneled to the object set to capture the events. Therefore, if you design an application whose entire interface consists of clicking and dragging positionable elements, you can set one of those elements (or even the `document` object) to perform the capturing. For pop-up regions, however, it is generally more logical and convenient for your coding to assign the capture mechanism to the primary container of the pop-up content (usually a positioned DIV).

The `setCapture()` method has one optional Boolean parameter. The parameter controls whether mouse events on child elements within the capturing object are under control of the event capture mechanism. The default value (`true`) means that all mouse events targeted at elements within the current object go to the current object rather than to the original target — the most likely way you will use `setCapture()` for things such as pop-up and context menus. But if you specify `false` as the parameter, then mouse events occurring in child elements of the capturing container receive their events directly. From there, regular event bubbling upward from the target ensues (see Chapter 29).

You may encounter odd behavior when the region you set up to capture mouse events contains form elements such as text input fields and SELECT lists. Because these elements require mouse events to gain focus for interaction, the event capture mechanism inhibits access to these items. To work around this behavior, you can examine the click event's `srcElement` property to see if the click was on one of these elements and script the focus of that element (or instruct the user to press the Tab key until the element gets focus manually).

Once an object is set to capture events, your other code must define which events actually do something; and decide whether events should bubble up beyond the capturing element. You need to worry about bubbling only if your design includes mouse event handlers in elements higher up the element containment hierarchy. You may not wish for those event handlers to fire while event capture is on; in this case, you need to cancel the bubbling of those events in the capturing object.

If your application design requires that the pop-up area be hidden and event handling be returned to normal (such as after the user makes a pop-up menu selection), use the `releaseCapture()` method in conjunction with hiding the container. Because event capture can be engaged for only one element at a time, you can release capture by invoking the `releaseCapture()` method from the container or from the `document` object.

Event capture is automatically disengaged when the user performs any of the following actions:

- ✦ Gives focus to any other window
- ✦ Displays any system modal dialog window (for example, alert window)
- ✦ Scrolls the page
- ✦ Opens a browser context menu (by right-clicking)
- ✦ Tabs to give focus to the Address field in the browser window

Therefore, you may want to set the `document` object's `onLoseCapture` event handler to hide any container that your script displays in concert with event capture.

Also be aware that even though mouse events may be captured to prevent mouse access to the rest of the page, keyboard events are not captured. Thus, using the event capture mechanism to simulate modal windows is not foolproof: a user can tab to any form element or link in the page and press the spacebar or Enter key to activate that element.

Event capture, as defined in the W3C DOM, operates differently from IE event capture. In the W3C DOM, you can instruct the browser to substitute event capture of any kind of event for the normal event bubbling behavior. For example, you can attach an event listener to the BODY element in such a way that it sees all click events aimed at elements contained by the BODY element before the events reach their target elements. (See Chapters 14 and 29 for more on the W3C DOM event model and how to integrate it into cross-browser applications.)

On the CD-ROM

Example (with Listing 15-30) on the CD-ROM

Related Items: `addEventListener()`, `dispatchEvent()`, `fireEvent()`, `removeEventListener()` methods; `onlosecapture` event; `Event` object (Chapter 29).

removeAttribute("*attributeName*"[, *caseSensitivity*])

Returns: Boolean (IE); Nothing (NN).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

If you create an attribute with the `setAttribute()` method, you can eliminate that attribute from the element object via the `removeAttribute()` method. The required parameter is the name of the attribute. IE4+ permits you to set and remove attributes such that the attribute names are case-sensitive. The default behavior of `removeAttribute()` in IE (the second parameter is a Boolean value) is `false`. Therefore, if you supply a value of `true` for the case-sensitivity parameter in `setAttribute()`, you should set the parameter to `true` in `removeAttribute()` to ensure a proper balance between created and removed attributes.

The NN6 (and W3C) version of the `removeAttribute()` method has a single parameter (a case-insensitive attribute name) and returns no value. The returned value in IE is `true` if the removal succeeds and `false` if it doesn't succeed (or the attribute is one that you set in some other manner).

On the CD-ROM

Example on the CD-ROM

Related Items: `attributes` property; `document.createAttribute()`, `getAttribute()`, and `setAttribute()` methods.

`removeAttributeNode(`*`attributeNode`*`)`
`setAttributeNode(`*`attributeNode`*`)`

Returns: `Attribute` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

As discussed in the coverage of the `getAttributeNode()` method earlier in this chapter, the W3C DOM treats a name–value attribute pair as an attribute object. An attribute object is a distinct node within a named node map — a collection of attribute objects belonging to an element. Understanding named node maps and attribute objects is more useful in an XML environment where attributes cannot only contain valuable data, but are not exposed to the document object model as properties you can access via script. Instead of accessing an object's properties, you work with the actual attributes.

If you want to insert an attribute in the formal W3C methodology, you can use `document.createAttribute()` to generate a new attribute object. Subsequent script statements assign values to the `nodeName` and `nodeValue` properties to give the attribute its traditional name–value pair. You can then insert that new attribute object into the attribute list of an object via the `setAttributeNode()` method. The sole parameter is an attribute object, and the return value is a reference to the newly inserted attribute object.

To remove an attribute node from an element using this syntax, employ the `removeAttributeNode()` method. Again, the sole parameter is an attribute object. If your script knows only the attribute's name, you can use `getAttributeNode()` to obtain a valid reference to the attribute object. The `removeAttributeNode()` method returns a reference to the removed attribute object. That object remains in the browser's memory, but it is not part of the document hierarchy. By capturing this removed attribute object in a variable, you have the flexibility to modify and assign it to another object elsewhere in the document.

Caution

A bug in NN6 prevents the `setAttributeNode()` method from returning a reference to an attribute when the attribute being set is not specified in the element's tag. The new attribute succeeds in becoming part of the element, but your script does not automatically receive a reference to it. This behavior may disrupt a design plan to create an attribute node via `document.createAttribute()`, insert the new attribute temporarily via `setAttributeNode()`, and use the reference returned by setAttributeNode() as the parameter to `removeAttributeNode()` later.

In practice, you may rarely, if ever, need to address attributes as nodes. Other methods — notably `getAttribute()`, `removeAttribute()`, and `setAttribute()` — do the job when your scripts have only the name (as a string) of an attribute belonging to an element.

On the CD-ROM

Example on the CD-ROM

Related Items: `attributes` property; `document.createAttribute()`, `getAttribute()`, `getAttributeNode()`, `setAttribute()` methods.

removeBehavior(*ID*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `removeBehavior()` method detaches a behavior from an object. It assumes that the behavior was added to the object via the `addBehavior()` method. The return value of the `addBehavior()` method is a unique identifier for that particular behavior. This identifier is the required parameter for the `removeBehavior()` method. Thus, you can add two behaviors to an object and remove just one of them if so desired. If the removal succeeds, the `removeBehavior()` method returns `true`; otherwise, it returns `false`.

On the CD-ROM

Example on the CD-ROM

Related Item: addBehavior() method.

removeChild(*nodeObject*)

Returns: Node object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The removeChild() method erases a child element from the current element. Content associated with the child element is no longer visible on the page, and the object is no longer part of the document object hierarchy.

As destructive as that sounds, the specifications for the deleted object are not lost to the ether necessarily. The removeChild() method returns a reference to the removed node. By assigning this value to a variable, you can hold onto that object specification for insertion later in the session. You are free to use this value as a parameter to such methods as appendChild(), replaceChild(), swapNode(), and insertBefore().

Remember that removeChild() is invoked from the point of view of a parent element. If you simply want to remove an element, you can do so more directly (in IE5+) with the removeNode() method.

On the CD-ROM

Example on the CD-ROM

Related Items: appendChild(), replaceChild(), removeNode() methods.

removeEventListener()

See addEventListener().

removeExpression("*propertyName*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

If you assign an expression to an object property (including an object's style object) via the setExpression() method, you can remove it under script control with the removeExpression() method. The sole parameter is the name of the property in string form. Property names are case-sensitive.

The method returns true if the removal succeeds; otherwise, false is returned. Be aware that removing an expression does not alter the value that is currently assigned to the property. In other words, you can use setExpression() to set a property's value and then remove the expression so that no further changes are made when the document recalculates expressions. If this is your goal, however, you are probably better served by simply setting the property directly via scripting.

On the CD-ROM

Example on the CD-ROM

Related Items: document.recalc(), getExpression(), setExpression() methods.

removeNode(*removeChildrenFlag*)

Returns: Node object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

You can use the removeNode() method to delete the current node from an element hierarchy in IE5+. The sole parameter is a Boolean value that directs the method to remove only itself (without its child nodes) or the node and all of its children (value of true). Exercise care with this method when you use a default parameter value of false: If the node has child nodes (for example, you attempt to remove a TABLE but not its child nodes), IE5 can crash on you. However, you can safely remove the node and all of its children.

The method returns a reference to the node object removed. This removed object is no longer accessible to the document object model. But the returned value contains all properties of the object as it existed before you removed it (including properties such as outerHTML and explicitly set style sheet rules). Thus, you can use this value as a parameter to insert the node elsewhere in the document.

While the W3C and Navigator 6 DOM do not have a removeNode() method, the cross-browser method whose behavior most closely resembles removeNode() is the removeChild() method. The scope of the removeChild() method is one level up the object hierarchy from the object you use for the removeNode() method.

On the CD-ROM

Example on the CD-ROM

Related Items: Node object; appendChild(), cloneChild(), removeChild(), replaceChild(), replaceNode() methods.

replaceAdjacentText("*location*", "*text*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `replaceAdjacentText()` method (not implemented in IE5/Mac) enables you to replace one chunk of document text with another in a specific position relative to the current object. Be aware that this method works only for plain text and not HTML tags. The returned value is the string of the text that you replace.

Both parameters are required. The first must be one of four possible case-insensitive locations for the insertion, shown in the following table:

Location	*Description*
`beforeBegin`	Before the current element's start tag
`afterBegin`	After the start tag, but before any nested content
`beforeEnd`	Before the end tag, but after all other nested content
`afterEnd`	After the end tag

This method is best used with inline (rather than block) elements when specifying the `beforeBegin` and `afterEnd` parameters. For example, if you attempt to use `replaceAdjacentText()` with `beforeBegin` on the second of two consecutive paragraph elements, the replacement text is inserted into the end of the first paragraph. You can think of the `replaceAdjacentText()` method in terms of text fragment nodes (even though IE5 does not fully support this W3C DOM feature). The method replaces the text fragment node (given any one of the four position parameters) with new text. Replacing the text of a simple element with either the `afterBegin` or `beforeEnd` locations is the same as assigning that text to the object's `innerText` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `innerText`, `outerText` properties; `getAdjacentText()`, `insertAdjacentHTML()`, `insertAdjacentText()` methods.

replaceChild(*newNodeObject*, *oldNodeObject*)

Returns: `Node` object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `replaceChild()` method enables you to swap an existing child node object for a new node object. Parameters for the `replaceChild()` method are node object references, and they must be in the order of the new object followed by the object you want to replace. The old object must be an immediate child node of the parent used to invoke the method, and the new object must also be a "legal" child element within the document containment hierarchy.

The method returns a reference to the child object that you replaced with the new object. This reference can be used as a parameter to any of the node-oriented insertion or replacement methods.

Remember that `replaceChild()` is invoked from the point of view of a parent element. If you simply want to change an element, you can do so more directly with the `swapNode()` method (or, in IE5, the `replaceNode()` method).

On the CD-ROM

Example on the CD-ROM

Related Items: `appendChild()`, `removeChild()`, `replaceNode()`, `swapNode()` methods.

replaceNode(*newNodeObject*)

Returns: `Node` object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `replaceNode()` method (not implemented in IE5/Mac) is related to the `replaceChild()` method, but you invoke this method on the actual node you want to replace (instead of the object's parent). The sole parameter is a reference to a valid node object, which you can generate via the `document.createElement()` method or copy from an existing node. The value returned from the method is a reference to the object that you replace. Thus, you can preserve a copy of the replaced node by storing the results in a variable for use later.

If the node you replace contains other nodes, the `replaceNode()` method removes all contained nodes of the original from the document. Therefore, if you want to change a wrapper node but want to maintain the original children, your script must capture the children and put them back into the new node as shown in the following example.

On the CD-ROM

Example (with Listing 15-31) on the CD-ROM

Related Items: `removeChild()`, `removeNode()`, `replaceChild()`, `swapNode()` methods.

scrollIntoView(*topAlignFlag*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `scrollIntoView()` method scrolls the page (vertically and/or horizontally as needed) such that the current object is visible within the window or frame that contains it. A single parameter, a Boolean value, controls the location of the element within the viewable space. A value of `true` (the default) causes the element to be displayed so that its top is aligned with the top of the window or frame (provided the document beneath it is long enough to allow this amount of scrolling). But a value of `false` causes the bottom of the element to align with the bottom of the viewable area. In most cases, you want the former so that the beginning of a page section is at the top of the viewable area. But if you don't want a user to see content below a certain element when you jump to the new view, then use the `false` parameter.

For form elements, you must use the typical form element reference (`document.`*`formName`*`.`*`elementName`*`.scrollIntoView()`) unless you also specify an ID attribute for the element (`document.all.`*`elementID`*`.scrollIntoView()`).

On the CD-ROM

Example on the CD-ROM

Related Items: `window.scroll()`, `window.scrollBy()`, `window.scrollTo()` methods.

setActive()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `setActive()` method lets a script designate an element object as the active element. However, unlike the `focus()` method, the window does not scroll the active element into view. Any `onFocus` event handler defined for the element fires when `setActive()` is invoked, without the browser giving the element focus.

Example on the CD-ROM

Related Item: `focus()` method.

setAttribute("*attributeName*", *value*[, *caseSensitivity*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `setAttribute()` method assigns a new value to an existing attribute of the current object or inserts an entirely new attribute name–value pair among the attributes of the current object. This method represents an alternative syntax to setting a property of the object directly.

Note: The W3C DOM Level 2 standard recommends `getAttribute()` and `setAttribute()` for reading and writing element object attribute values, rather than reading and writing those values by way of their corresponding properties. While using these methods is certainly advisable for XML elements, the same DOM standard sends conflicting signals by defining all kinds of properties for HTML element objects. Browsers, of course, will support access via properties well into the future, so don't feel obligated to change your ways.

The first two parameters of `setAttribute()` are required. The first is the name of the attribute. The default behavior of this method respects the case of the attribute name. Therefore, if you use `setAttribute()` to adjust the value of an existing attribute in default mode, the first parameter must match the case of the attribute as known by the object model for the current document. Remember that all names of all attributes assigned as inline source code attributes are automatically converted to lowercase letters.

A value you assign to the attribute is the second parameter. For cross-browser compatibility, the value should be either a string or Boolean data type.

IE provides an optional third parameter to control the case-sensitivity issue for the attribute name. The default value (`true`) has a different impact on your object depending on whether you use `setAttribute()` to assign a new attribute or reassign an existing one. In the former case, the third parameter as `true` means that the attribute name assigned to the object observes the case of the first parameter. In the latter case, the third parameter as `true` means that the attribute isn't reassigned unless the first parameter matches the case of the attribute currently associated with the object. Instead, a new attribute with a different case sequence is created.

Attempting to manage the case-sensitivity of newly created attributes is fraught with peril, especially if you try to reuse names but with different case sequences. I strongly recommend using default case-sensitivity controls for `setAttribute()` and `getAttribute()`.

IE4+ imposes some limitations on the action resulting from the `setAttribute()` method. Any attribute you add via `setAttribute()` does not become part of the `attributes` collection associated with the element. While you can extract the value of such a newly added attribute via `getAttribute()`, you cannot access the new attribute from the `attributes` collection. Thus, after creating a new attribute as follows:

```
document.all.myTable.setAttribute("currYear", (new Date()).getFullYear())
```

you can access that attribute value through either of the following two statements:

```
var tableYear = document.all.myTable.getAttribute("curryear")
var tableYear = document.all.myTable.currYear
```

However, you cannot access the attribute value with the following statement:

```
var tableYear = document.all.myTable.attributes["currYear"]
```

See also the W3C DOM facilities for treating attributes as node objects in the discussions of the `getAttributeNode()` and `removeAttributeNode()` methods earlier in this chapter.

On the CD-ROM

Example on the CD-ROM

Related Items: `attributes` property; `document.createAttribute()`, `getAttribute()`, `getAttributeNode()`, `removeAttribute()`, `removeAttributeNode()`, `setAttributeNode()` methods.

setAttributeNode()

See `removeAttributeNode()`.

setCapture(*containerBoolean*)

See `releaseCapture()`.

setExpression("*propertyName*", "*expression*","*language*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Use the `setExpression()` method (not implemented in IE5/Mac) to assign the result of an executable expression to the value of an element object property. This method can assign values to both HTML element objects and style objects that belong to them.

The `setExpression()` method is a scripted way of assigning expressions to attributes. But you can also assign expressions directly to style sheet definitions in the HTML tag of an element using the `expression()` syntax, as in the following example:

```
<P STYLE="width:expression(document.body.style.width * 0.75)">
```

The `setExpression()` method requires three parameters. The first parameter is the name of the property (in string form) to which you assign the expression. Property names are case-sensitive. The second parameter is a string form of the expression to be evaluated to supply a value for the property. Expressions can refer to global variables or properties of other objects in the same document (provided the property is anything other than an array). An expression may also contain math operators.

Pay close attention to the data type of the evaluated value of the expression. The value must be a valid data type for the property. For example, the URL of the body background image must be a string. But for numeric values, you can generally use number and string types interchangeably because the values are converted to the proper type for the property. Even for expressions that evaluate to numbers, encase the expression inside quotes. It may not be necessary in all cases, but if you get into the habit of using quotes, you'll have fewer problems for strings or complex expressions that require them.

You are not limited to using JavaScript as the language for the expression because you also specify the scripting language of the expression in the third parameter. Acceptable parameter values for the language are

```
JScript
VBScript
JavaScript
```

For all intents and purposes, JScript and JavaScript are the same. Both languages are ECMA-262 compatible.

One reason to use `setExpression()` for dynamic properties is to let the property always respond to the current conditions on the page. For example, if you set a property that is dependent on the current width of the body, then you want a recalculation that is applied to the property if the user resizes the window. The browser automatically responds to many events and updates any dynamic properties. In essence, the browser recalculates the expressions and applies the new values to the property. Keyboard events, in particular, trigger this kind of automatic recalculation for you. But if your scripts perform actions on their own (in other words, not triggered by events), then your scripts need to force the recalculation of the expressions. The `document.recalc()` method takes care of this, but you must invoke it to force the recalculation of dynamic properties in these cases.

On the CD-ROM

Example (with Figure 15-1 and Listing 15-32) on the CD-ROM

Related Items: `document.recalc()`, `removeExpression()`, `setExpression()` methods.

swapNode(*otherNodeObject*)

Returns: `Node` object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `swapNode()` method (not implemented in IE5/Mac) exchanges the positions of two nodes within an element hierarchy. Contents of both nodes are preserved in their entirety during the exchange. The single parameter must be a valid node object (perhaps created with `document.createElement()` or copied from an existing node). A return value is a reference to the object whose `swapNode()` method was invoked.

On the CD-ROM

Example on the CD-ROM

Related Items: `removeChild()`, `removeNode()`, `replaceChild()`, `replaceNode()` methods.

tags("*tagName*")

Returns: Array of element objects.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `tags()` method does not belong to every element, but it is a method of every collection of objects (such as `all`, `forms`, and `elements`). The method is best thought of as a kind of filter for the elements that belong to the current collection. For example, to get an array of all P elements inside a document, use this expression:

```
document.all.tags("P")
```

You must pass a parameter string consisting of the tag name you wish to extract from the collection. The tag name is case-insensitive.

The return value is an array of references to the objects within the current collection whose tags match the parameter. If there are no matches, the returned array has a length of zero. If you need cross-browser compatibility, use the `getElementsByTagName()` method described earlier in this chapter.

On the CD-ROM

Example on the CD-ROM

Related Item: `getElementsByTagName()` method.

`urns("`*`behaviorURN`*`")`

Returns: Array of element objects.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `urns()` method does not belong to every element, but it is a method of every collection of objects. You must pass a parameter string consisting of the URN (Uniform Resource Name) of a behavior resource (most typically `.htc` for IE5) assigned to one or more elements of the collection. The parameter does not include the extension of the filename. If there is no matching behavior URN for the specified parameter, the `urns()` method returns an array of zero length. This method is related to the `behaviorUrns` property, which contains an array of behavior URNs assigned to a single element object.

Note

Neither the `behaviorUrns` property nor the `urns()` method appear to be working as described by Microsoft. Perhaps the potential exposure of URNs by script was deemed a privacy risk. As proven thus far with IE5 for Win32, the `urns()` method always returns an array of zero length.

On the CD-ROM

Example on the CD-ROM

Related Item: `behaviorUrns` property.

Event handlers

onActivate
onBeforeDeactivate
onDeactivate

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `onActivate` and `onDeactivate` event handlers are new with IE5.5. But in some circumstances, they are very similar to the `onFocus` and `onBlur` event handlers, respectively. If an element receives focus, the `onActivate` event fires for that element just before the `onFocus` event fires; conversely, just prior to the element losing focus, events fire in the sequence: `onBeforeDeactivate`, `onDeactivate`, `onBlur`. Only elements that, by their nature, can accept focus (for example, links and form input controls) or that have a `TABINDEX` attribute set can become the active element (and therefore fire these events).

IE5.5 maintains the original `onFocus` and `onBlur` event handlers. But because the behaviors are so close to those of the `onActivate` and `onDeactivate` events, I don't recommend mixing the old and new event handler names in your coding style. If you script exclusively for IE5.5+, then you can use the new terminology throughout.

On the CD-ROM

Example on the CD-ROM

Related Items: `onBlur`, `onFocus` event handlers.

onBeforeCopy

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onBeforeCopy` event handler (not implemented in IE5/Mac) fires before the actual copy action takes place whenever the user initiates a content copy action via the Edit menu (including the Ctrl+C keyboard shortcut) or the right-click context menu. If the user accesses the Copy command via the Edit or context menu, the `onBeforeCopy` event fires before either menu displays. In practice, the event may fire twice even though you expect it only once. Just because the `onBeforeCopy` event fires, it does not guarantee that a user will complete the copy operation (for example, the context menu may close before the user makes a selection).

Unlike paste-related events, the `onBeforeCopy` event handler does not work with form input elements. Just about any other HTML element is fair game, however.

Example (with Listing 15-33) on the CD-ROM

Related Items: `onBeforeCut`, `onCopy` event handlers.

onBeforeCut

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onBeforeCut` event handler fires before the actual cut action takes place whenever the user initiates a content cut via the Edit menu (including the Ctrl+X keyboard shortcut) or the right-click context menu. If the user accesses the Cut command via the Edit or context menu, the `onBeforeCut` event fires before either menu displays. In practice, the event may fire twice even though you expect it only once. Just because the `onBeforeCut` event fires, it does not guarantee that a user will complete the cut operation (for example, the context menu may close before the user makes a selection). If you add the `onBeforeCut` event handler to an HTML element, the context menu usually disables the Cut menu item. But assigning a JavaScript call to this event handler brings the Cut menu item to life.

Example on the CD-ROM

Related Items: `onBeforeCopy`, `onCut` event handlers.

onBeforeDeactivate

See: `onActivate` event handler.

onBeforeEditFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onBeforeEditFocus` event handler (not implemented in IE5/Mac) is triggered whenever you edit an element on a page in an environment such as Microsoft's DHTML Editing ActiveX control or with the editable page content feature of IE5.5. This discussion focuses on the latter scenario because it is entirely within the scope of client-side JavaScript. The `onBeforeEditFocus` event fires just before the element receives its focus. (There may be no onscreen feedback that editing is turned on unless you script it yourself.) The event fires each time a user clicks the element, even if the element just received edit focus elsewhere in the same element.

On the CD-ROM Example on the CD-ROM

Related Items: `document.designMode`, `contentEditable`, `isContentEditable` properties.

onBeforePaste

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Like `onBeforeCopy` and `onBeforeCut`, the `onBeforePaste` event (not implemented in IE5/Mac) occurs just prior to the display of either the context or menu bar Edit menu when the current object is selected (or has a selection within it). The primary value of this event comes when you use scripts to control the copy and paste process of a complex object. Such an object may have multiple kinds of data associated with it, but your script captures only one of the data types. Or, you may want to put some related data about the copied item (for example, the `id` property of the element) into the clipboard. By using the `onBeforePaste` event handler to set the `event.returnValue` property to `false`, you guarantee that the pasted item is enabled in the context or Edit menu (provided the clipboard is holding some content). A handler invoked by `onPaste` should then apply the specific data subset from the clipboard to the currently selected item.

On the CD-ROM Example on the CD-ROM

Related Items: `onCopy`, `onCut`, `onPaste` event handlers.

onBlur

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `onBlur` event fires when an element that has focus is about to lose focus because some other element is about to receive focus. For example, a text input element fires the `onBlur` event when a user tabs from that element to the next one inside a form. The `onBlur` event of the first element fires before the `onFocus` event of the next element.

The availability of the `onBlur` event has expanded with succeeding generations of script-capable browsers. In the earlier versions, blur and focus were largely confined to text-oriented input elements (including the SELECT element). These are safe to use with all scriptable browser versions. The `window` object received the onBlur event handler starting with NN3 and IE4. IE4 also extended the event handler to more form elements, predominantly on the Windows operating system because that OS has a user interface clue (the dotted rectangle) when items such as buttons and links receive focus (so that you may act upon them by pressing the keyboard's spacebar). For IE5, the onBlur event handler is available to virtually every HTML element. For most of those elements, however, blur and focus are not possible unless you assign a value to the TABINDEX attribute of the element's tag. For example, if you assign TABINDEX=1 inside a <P> tag, the user can bring focus to that paragraph (highlighted with the dotted rectangle in Windows) by clicking the paragraph or pressing the Tab key until that item receives focus in sequence.

If you plan to use the onBlur event handler on window or text-oriented input elements, be aware that there might be some unexpected and undesirable consequences of scripting for the event. For example, in IE, a window object that has focus loses focus (and triggers the onBlur event) if the user brings focus to any element on the page (or even clicks a blank area on the page). Similarly, the interaction between onBlur, onFocus, and the alert() dialog box can be problematic with text input elements. This is why I generally recommend using the onChange event handler to trigger form validation routines. If you should employ both the onBlur and onChange event handler for the same element, the onChange event fires before onBlur. For more details about using this event handler for data validation, see Chapter 43.

IE5.5 adds the onDeactivate event handler, which fires immediately before the onBlur event handler. Both the onBlur and onDeactivate events can be blocked if the onBeforeDeactivate event handler function sets event.returnValue to false.

On the CD-ROM

Example (with Listing 15-34) on the CD-ROM

Related Items: blur(), focus() methods; onDeactivate, onBeforeDeactivate, onFocus, onActivate event handlers.

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The onClick event fires when a user presses down (with the primary mouse button) and releases the button with the pointer atop the element (both the down and up strokes must be within the rectangle of the same element). The event also fires with non-mouse click equivalents in operating systems such as Windows 95 and later. For example, you can use the keyboard to give focus to a clickable object and then press the spacebar or Enter key to perform the same action as clicking the element. In IE, if the element object supports the click() method, the onClick event fires with the invocation of that method (notice that this does not apply to Navigator).

The availability of the onClick event has expanded with succeeding generations of script-capable browsers. In the earlier versions, the event was limited primarily to button style input elements (including checkbox and radio input elements) and links (A elements with HREF attributes assigned to them). You can safely use this event handler for elements that date back to the earliest scriptable browsers. In Navigator 4, the AREA element gained the onClick event (and window, document, and layer objects could capture onClick events, as described in Chapter 29). In IE4+, virtually every element that you can see on a page can have an onClick event handler defined for it and thereby respond to user clicks.

Beginning with version 4 browsers, scripters could access more mouse-related events. It is important to know the sequence of these incremental events as a user clicks or double-clicks an element. The other related events are onMouseDown, onMouseUp, and onDoubleClick. The onMouseDown event fires when the user makes contact with the mouse switch on the downstroke of a click action. Next comes the onMouseUp event (when the contact breaks). Only then does the onClick event fire — provided that the onMouseDown and onMouseUp events have fired in the same object. See the discussions on the onMouseDown and onMouseUp events later in this chapter for examples of their usage.

Interaction with the onDblClick event is simple: the onClick event fires first (after the first click), followed by the onDblClick event (after the second click). See the discussion of the onDblClick event handler later in this chapter for more about the interaction of these two event handlers.

When used with objects that have intrinsic actions when users click them (namely links and areas), the onClick event handler can perform all of the action — including navigating to the destination normally assigned to the HREF attribute of the element. For example, to be compatible with all scriptable browsers, you can make an image clickable if you surround its tag with an <A> link tag. This lets the onClick event of that tag substitute for the missing onClick event handler of earlier <IMG> tags. If you assign an onClick event handler without special protection, the event handler will execute and the intrinsic action of the element will be carried out. Therefore, you need to block the intrinsic action. To accomplish this, the event handler must evaluate to the statement return false. You can do this in two ways. The first is to append a return false statement to the script statement assigned to the event handler:

```
<A HREF="#" onClick="yourFunction(); return false"><IMG...></A>
```

As an alternative, you can let the function invoked by the event handler supply the false part of the return false statement, as shown in the following sequence:

```
function yourFunction() {
    [statements that do something here]
    return false
}
...
<A HREF="#" onClick="return yourFunction()"><IMG...></A>
```

Either methdology is acceptable. A third option is to not use the onClick event handler at all, but assign a javascript: pseudo-URL to the HREF attribute (see the link object in Chapter 21).

The event model in IE5+ provides one more way to prevent the intrinsic action of an object from firing when a user clicks it. If the `onClick` event handler function sets the `returnValue` property of the event object to `false`, the intrinsic action is cancelled. Simply include the following statement in the function invoked by the event handler:

```
event.returnValue = false
```

The event model of the W3C DOM has a different approach to cancelling the default action. In the event handler function for an event, invoke the *`eventObj`*`.cancelDefault()` method.

A common mistake made by scripting beginners is to use a submit type input button as a button intended to perform some script action rather than submitting a form. The typical scenario is an INPUT element of type `submit` assigned an `onClick` event handler to perform some local action. The submit input button has an intrinsic behavior, just like links and areas. While you can block the intrinsic behavior, as just described, you should use an INPUT element of type `button`.

If you are experiencing difficulty with an implementation of the `onClick` event handler (such as trying to find out which mouse button was used for the click), it may be that the operating system or default browser behavior is getting in the way of your scripting. But you can usually get what you need via the `onMouseDown` event handler. (The `onMouseUp` event may not fire when you use the secondary mouse button to click an object.) Use the `onClick` event handler whenever possible to capture user clicks because this event behaves most like users are accustomed to in their daily computing work. But fall back on `onMouseDown` in an emergency.

On the CD-ROM

Example (with Listing 15-35) on the CD-ROM

Related Items: `click()` method; `onContextMenu`, `onDblClick`, `onMouseDown`, `onMouseUp` event handlers.

onContextMenu

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onContextMenu` event (not implemented in IE5/Mac) fires when the user clicks an object with the secondary (usually the right-hand) mouse button. The only click-related events that fire with the secondary button are `onMouseDown` and `onContextMenu`.

To block the intrinsic application menu display of the `onContextMenu` event, use any of the three event cancellation methodologies available in IE5+ (as just described in the `onClick` event handler description: two variations of evaluating the event handler to `return false`; assigning `false` to the `event.returnValue` property). It is not uncommon to wish to block the context menu from appearing so that users are somewhat inhibited from downloading copies of images or viewing the source code of a frame. Be aware, however, that if a user turns Active Scripting off in IE5+, the event handler cannot prevent the context menu from appearing.

Another possibility for this event is to trigger the display of a custom context menu constructed with other DHTML facilities. In this case, you must also disable the intrinsic context menu so that both menus do not display at the same time.

On the CD-ROM

Example on the CD-ROM

Related Items: `releaseCapture()`, `setCapture()` methods.

onControlSelect

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `onControlSelect` event should fire just before a user makes a selection on what Microsoft calls a *control selection*. Microsoft is less than clear in explaining what a control selection is, but it appears to have something to do with a user edit mode. I have not been able to have this event fire naturally in IE5.5. If I receive further details, they will appear at the *JavaScript Bible* Support Center (`http://www.dannyg.com`).

Related Items: `onResizeEnd`, `onResizeStart` event handlers.

onCopy
onCut

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onCopy` and `onCut` events (not implemented in IE5/Mac) fire immediately after the user or script initiates a copy or cut edit action on the current object. Each event is preceded by its associated "before" event, which fires before any Edit or context menu appears (or before the copy or cut action, if initiated by keyboard shortcut).

Use these event handlers to provide edit functionality to elements that don't normally allow copying or cutting. In such circumstances, you need to enable the Copy or Cut menu items in the context or Edit menu by setting the `event.returnValue` for the `onBeforeCopy` or `onBeforeCut` event handlers to `false`. Then your `onCopy` or `onCut` event handlers must manually stuff a value into the clipboard by way of the `setData()` method of the `clipboardData` object. If you use the `setData()`

method in your onCopy or onCut event handler, you must also set the event.returnValue property to false in the handler function to avoid the default copy or cut action from wiping out your clipboard contents.

Because you are in charge of what data is stored in the clipboard, you are not limited to a direct copy of the data. For example, you might wish to store the value of the src property of an image object so that the user can paste it elsewhere on the page.

In the case of the onCut event handler, your script is also responsible for cutting the element or selected content from the page. To eliminate all of the content of an element, you can set the element's innerHTML or innerText property to an empty string. For a selection, use the selection.createRange() method to generate a TextRange object whose contents you can manipulate through the TextRange object's methods.

On the CD-ROM

Example (with Listing 15-36) on the CD-ROM

Related Items: onBeforeCopy, onBeforeCut, onBeforePaste, and onPaste event handlers.

onDblClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The onDblClick event fires after the second click of a double-click sequence. The timing between clicks depends on the client's mouse control panel settings. The onClick event also fires, but only after the first of the two clicks.

NN4 implements the onDblClick event handler only for link objects (but not at all on the Macintosh version of NN4). IE4 introduced the event to virtually every HTML element.

In general, it is rarely a good design to have an element perform one task when the mouse is single-clicked and a different task if double-clicked. With the event sequence employed in modern browsers, this isn't practical anyway (the onClick event always fires, even when the user double-clicks). But it is not uncommon to have the mouse down action perform some helper action. You see this in most icon-based file systems: if you click a file icon, it is highlighted at mouse down to select the item; you can double-click the item to launch it. In either case, one event's action does not impede the other nor confuse the user.

On the CD-ROM

Example on the CD-ROM

Related Items: onClick, onMouseDown, onMouseUp event handlers.

onDrag

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onDrag` event fires after the `onDragStart` event and continues firing repeatedly while the user drags a selection or object on the screen. Unlike the `onMouseMove` event, which fires only as the cursor moves on the screen, the `onDrag` event continues to fire even when the cursor is stationary. In the IE5+ environment, users can drag objects to other browser windows or other applications. The event fires while the dragging extends beyond the browser window.

Because the event fires regardless of what is underneath the dragged object, you can use it in a game or training environment in which the user has only a fixed amount of time to complete a dragging operation (for example, matching similar pairs of objects). If future versions of the browser accommodate downloadable cursors, the `onDrag` event could cycle the cursor through a series of cursor versions to resemble an animated cursor.

Understanding the sequence of drag-related events during a user drag operation can be helpful if your scripts need to micromanage the actions (usually not necessary for basic drag-and-drop operations). Consider the drag-and-drop operation shown in Figure 15-2.

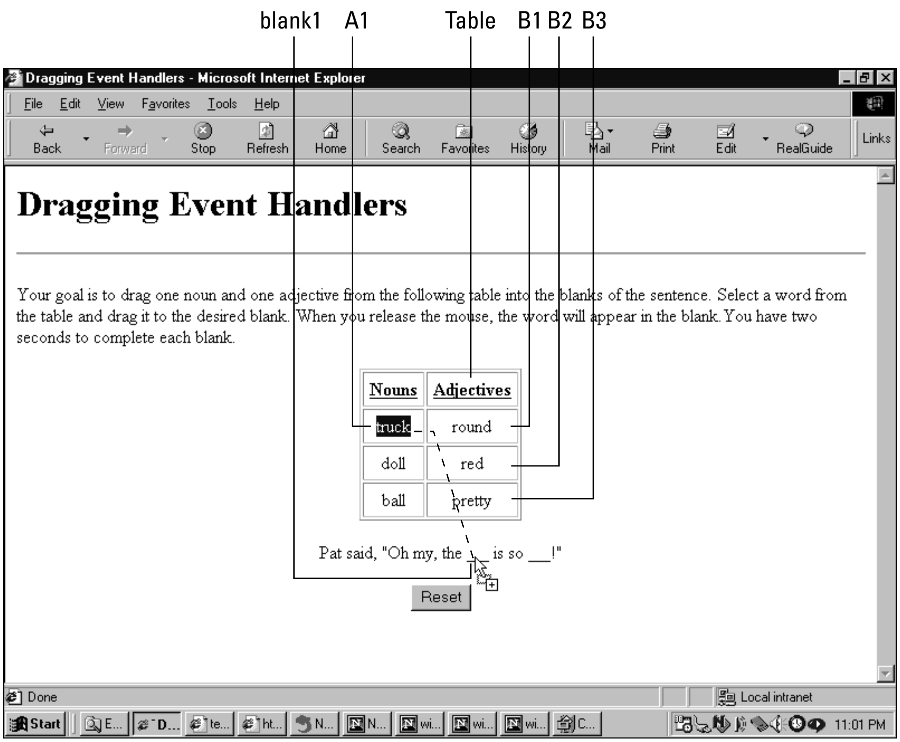

Figure 15-2: A typical drag-and-drop operation

It helps to imagine that the cells of the table with draggable content are named like spreadsheet cells: "truck" is cell A1; "round" is B1; "doll" is A2; and so on. During the drag operation, many objects are the targets of a variety of drag-related events. Table 15-10 lists the event sequence and the event targets.

Table 15-10 Events and Their Targets During a Typical Drag-and-Drop Operation

Event	*Target*	*Discussion*
`onDragStart`	cell A1	The very first event that fires during a drag-and-drop operation.
`onDrag`	cell A1	Fires continually on this target throughout the entire operation. Other events get interspersed, however.
`onDragEnter`	cell A1	Even though the cursor hasn't moved from cell A1 yet, the `onDragEnter` event fires upon first movement within the source element.
`onDragOver`	cell A1	Fires continually on whatever element the cursor rests on at that instant. If the user simply holds the mouse button down and does not move the cursor during a drag, the `onDrag` and `onDragOver` events fire continually, alternating between the two.
`(repetition)`	cell A1	`onDrag` and `onDragOver` events fire alternately while the cursor remains atop cell A1.
`onDragEnter`	TABLE	The TABLE element, represented by the border and/or cell padding, receives the `onDragEnter` event when the cursor touches its space.
`onDragLeave`	cell A1	Notice that the `onDragLeave` event fires after the `onDragEnter` event fires on another element.
`onDrag`	cell A1	Still firing away.
`onDragOver`	TABLE	The source element for this event shifts to the TABLE because that's what the cursor is "over" at this instant. If the cursor doesn't move from this spot, the `onDrag` (cell A1) and `onDragOver` (TABLE) events continue to fire in turn.
`onDragEnter`	cell B1	The drag is progressing from the TABLE border space to cell B1.
`onDragLeave`	TABLE	
`onDrag`	cell A1	The `onDrag` event continues to fire on the cell A1 object.
`onDragOver`	cell B1	The cursor is atop cell B1 now, so the `onDragOver` event fires for that object. Fires multiple times (depending on the speed of the computer and the user's drag action), alternating with the previous `onDrag` event.

Continued

Table 15-10 *(continued)*

Event	***Target***	***Discussion***
[More of the same as the cursor progresses from cell B1 through the TABLE border again to cell B2, the TABLE again, cell B3, and the outermost edge of the TABLE.]		
`onDragEnter`	BODY	Dragging is free of the TABLE and is floating free on the bare BODY element.
`onDragLeave`	TABLE	Yes, you just left the TABLE.
`onDrag`	cell A1	Still alive and receiving this event.
`onDragOver`	BODY	That's where the cursor is now. Fires multiple times (depending on the speed of the computer and the user's drag action), alternating with the previous `onDrag` event.
`onDragEnter`	blank1	The cursor reaches the SPAN element whose ID is `blank1`, where the empty underline is.
`onDragLeave`	BODY	Just left the BODY for the blank.
`onDrag`	cell A1	Still kicking.
`onDragOver`	blank1	That's where the cursor is now. Fires multiple times (depending on the speed of the computer and the user's drag action), alternating with the previous `onDrag` event.
`onDrop`	blank1	The SPAN element gets the notification of a recent drop.
`onDragEnd`	cell A1	The original source element gets the final word that dragging is complete. This event fires even if the drag does not succeed because the drag does not end on a drop target.

In practice, some of the events shown in Table 15-10 may not fire. Much has to do with how many event handlers you trap that need to execute scripts along the way. The other major factor is the physical speed at which the user performs the drag-and-drop operation (which interacts with the CPU processing speed). The kinds of events that are most likely to be skipped are the `onDragEnter` and `onDragLeave` events, and perhaps some `onDragOver` events if the user flies over an object before its `onDragOver` event has a chance to fire.

Despite this uncertainty about drag-related event reliability, you can count on several important ones to fire all the time. The `onDragStart`, `onDrop` (if over a drop target), and `onDragEnd` events — as well some interstitial `onDrag` events — will definitely fire in the course of dragging on the screen. All but `onDrop` direct their events to the source element, while `onDrop` fires on the target.

On the CD-ROM

Example (with Listing 15-37) on the CD-ROM

Related Items: `event.dataTransfer` object; `onDragEnd`, `onDragEnter`, `onDragLeave`, `onDragOver`, `onDragStart`, `onDrop` event handlers.

onDragEnter
onDragLeave

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

These events (not implemented in IE5/Mac) fire during a drag operation. When the cursor enters the rectangular space of an element on the page, the `onDragEnter` event fires on that element. Immediately thereafter, the `onDragLeave` event fires on the element from which the cursor came. While this may seem to occur out of sequence from the physical action, the events always fire in this order. Depending on the speed of the client computer's CPU and the speed of the user's dragging action, one or the other of these events may not fire—especially if the physical action outstrips the computer's capability to fire the events in time. See the discussion of the `onDrag` event handler earlier in this chapter for more details on the sequence of drag-related events.

On the CD-ROM

Example (with Listing 15-38) on the CD-ROM

Related Items: `onDrag`, `onDragEnd`, `onDragOver`, `onDragStart`, `onDrop` event handlers.

onDragOver

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onDragOver` event (not implemented in IE5/Mac) fires continually while a dragged cursor is atop an element. In the course of dragging from one point on the page to another, the `onDragOver` event target changes with the element beneath the cursor. If no other drag-related events are firing (the mouse button is still down in the drag operation, but the cursor is not moving), the `onDrag` and `onDragOver` events fire continually, alternating between the two.

You should have the `onDragOver` event handler of a drop target element set the `event.returnValue` property to `false`. See the discussion of the `onDrag` event handler earlier in this chapter for more details on the sequence of drag-related events.

Example on the CD-ROM

Related Items: event.dataTransfer object; onDrag, onDragEnd, onDragEnter, onDragLeave, onDragStart, onDrop event handlers.

onDragStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The onDragStart event handler is the first event to fire in the long sequence of events that occur in a typical drag-and-drop operation by the user. This event handler is associated with the element that is the source element of the drag operation. Typically, the onDragStart event handler sets the dataTransfer.effectAllowed property in IE5 for Windows, packages the data being passed along with the drag (via the dataTransfer.setData() method), and overrides default behavior by setting the event.returnValue property to false. See the discussion of the onDrag event handler earlier in this chapter for more details on the sequence of drag-related events.

Example on the CD-ROM

Related Items: event.dataTransfer object; onDrag, onDragEnd, onDragEnter, onDragLeave, onDragOver, onDrop event handlers.

onDrop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The onDrop event (not implemented in IE5/Mac) fires on the drop target element as soon as the user releases the mouse button at the end of a drag-and-drop operation. Microsoft recommends that you denote a drop target by applying the onDragEnter, onDragOver, and onDrop event handlers to the target element. In each of those event handlers, you should set the dataTransfer.dropEffect to the transfer effect you wish to portray in the drag-and-drop operation (signified by a different cursor for each type). These settings should match the dataTransfer.effectAllowed property that is usually set in the onDragStart event handler. Each of the three drop-related handlers should also override the default event behavior by setting the event.returnValue property to false. See the discussion of the onDrag event handler earlier in this chapter for more details on the sequence of drag-related events.

Example on the CD-ROM

Related Items: `event.dataTransfer` object; `onDrag`, `onDragEnd`, `onDragEnter`, `onDragLeave`, `onDragOver`, `onDragStart` event handlers.

onFilterChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onFilterChange` event (not implemented in IE5/Mac) fires whenever an object's visual filter switches to a new state or a transition completes (a transition may be extended over time). Only objects that accommodate filters and transitions in IE (primarily block elements and form controls) receive the event.

A common usage of the `onFilterChange` event is to trigger the next transition within a sequence of transition activities. This may include an infinite loop transition, for which the object receiving the event toggles between two transition states. If you don't want to get into a loop of that kind, place the different sets of content into their own positionable elements and use the `onFilterChange` event handler in one to trigger the transition in the other.

Example (with Listing 15-39) on the CD-ROM

Related Item: `filter` object.

onFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `onFocus` event fires when an element receives focus, usually following some other object losing focus. (The element losing focus receives the `onBlur` event before the current object receives the `onFocus` event.) For example, a text input element fires the `onFocus` event when a user tabs to that element while navigating through a form via the keyboard. Clicking an element also gives that element focus, as does making the browser the frontmost application on the client desktop.

The availability of the `onFocus` event has expanded with succeeding generations of script-capable browsers. In earlier versions, blur and focus were largely confined to text-oriented input elements (including the SELECT element). The `window` object received the `onFocus` event handler starting with NN3 and IE4. IE4 also extended the event handler to more form elements, predominantly on the Windows operating system because that OS has a user interface clue (the dotted rectangle) when items such as buttons and links receive focus (so that users may act upon them by pressing the keyboard's spacebar). For IE5, the `onFocus` event handler is available to virtually every HTML element. For most of those elements, however, you cannot use blur and focus unless you assign a value to the `TABINDEX` attribute of the element's tag. For example, if you assign `TABINDEX=1` inside a `<P>` tag, the user can bring focus to that paragraph (highlighted with the dotted rectangle in Windows) by clicking the paragraph or pressing the Tab key until that item receives focus in sequence.

If you plan to use the `onFocus` event handler on window or text-oriented input elements, be aware that there might be some unexpected and undesirable consequences of scripting for the event. For example, in IE5 (but not IE4), some object almost always has focus. In most cases, the window has focus but loses it when the user clicks an element wired to receive focus. Clicking anywhere on an unwired element brings focus back to the `window` object. Similarly, the interaction between `onBlur`, `onFocus`, and the alert dialog box can be problematic with text input elements.

IE5.5 adds the `onActivate` event handler, which fires immediately before the `onFocus` event handler. You can use one or the other, but there is little need to include both event handlers for the same object unless you temporarily wish to block an item from receiving focus. To prevent an object from receiving focus in IE5.5, include an `event.returnValue=false` statement in the `onActivate` event handler for the same object. In older browsers, you can usually get away with assigning `onFocus="this.blur()"` as an event handler for elements such as form controls. However, this is not a foolproof way to prevent a user from changing a control's setting. Unfortunately, there are few reliable alternatives.

On the CD-ROM

Example on the CD-ROM

Related Items: `onActivate`, `onBlur`, `onDeactivate` event handlers.

onHelp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onHelp` event handler fires in Windows whenever an element of the document has focus and the user presses the F1 function key on a Windows PC. As of IE5/Mac, the event fires only on the window (in other words, event handler specified in the `<BODY>` tag) and does so via the dedicated Help key on a Mac keyboard. Browser Help menu choices do not activate this event. To prevent the browser's Help window from appearing, the event handler must evaluate to `return false` (for IE4+) or set the `event.returnValue` property to `false` (IE5+). Because the event handler can be associated with individual elements of a document in the Windows version, you can create a context-sensitive help system. However, if the focus is in the Address field of the browser window, you cannot intercept the event. Instead, the browser's Help window appears.

On the CD-ROM

Example (with Listing 15-40) on the CD-ROM

Related Items: `window.showHelp()`, `window.showModalDialog()` methods.

onKeyDown
onKeyPress
onKeyUp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

When someone presses and releases a keyboard key, a sequence of three events fires in quick succession. The `onKeyDown` event fires when the key makes its first contact. This is followed immediately by the `onKeyPress` event. When contact is broken by the key release, the `onKeyUp` event fires. If you hold a character key down until it begins auto-repeating, the `onKeyDown` and `onKeyPress` events fire with each repetition of the character.

The sequence of events can be crucial in some keyboard event handling. Consider the scenario that wants the focus of a series of text fields to advance automatically after the user enters a fixed number of characters (for example, date, month, and two-digit year). By the time the `onKeyUp` event fires, the character associated with the key press action is already added to the field and you can accurately determine the length of text in the field, as shown in this simple example:

```
<HTML>
<HEAD>
<SCRIPT Language="JavaScript">
function jumpNext(fromFld, toFld) {
    if (fromFld.value.length == 2) {
        document.forms[0].elements[toFld].focus()
        document.forms[0].elements[toFld].select()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
Month: <INPUT Name="month" Type="text" Size="3" VALUE=""
    onKeyUp="jumpNext(this, day)"  maxLength="2">
```

```
Day: <INPUT Name="day" Type="text" Size="3" VALUE=""
    onKeyUp ="jumpNext(this, year)"  maxLength="2">
Year: <INPUT Name="year" Type="text" Size="3" VALUE=""
    onKeyUp ="jumpNext(this, month)"  maxLength="2">
</FORM>
</BODY>
</HTML>
```

These three events do not fire for all keys of the typical PC keyboard on all browser versions that support keyboard events. The only keys that you can rely on supporting the events in all browsers shown in the preceding compatibility chart are the alphanumeric keys represented by ASCII values. This includes keys such as the spacebar and Enter (Return on the Mac), but it excludes all function keys, arrow keys, and other navigation keys. Modifier keys, such as Shift, Ctrl (PC), Alt (PC), Command (Mac), and Option (Mac), generate some events on their own (depending on browser and version). However, functions invoked by other key events can always inspect the pressed states of these modifier keys.

Scripting keyboard events almost always entails examining which key is pressed so that some processing or validation can be performed on that key press. This is where the situation gets very complex if you are writing for cross-browser implementation. In some cases, even writing just for Internet Explorer gets tricky because non-alphanumeric keys generate only the `onKeyDown` and `onKeyUp` events.

In fact, to fully comprehend keyboard events, you need to make a distinction between *key codes* and *character codes*. Every PC keyboard key has a key code associated with it. This key code is always the same regardless of what other keys you press at the same time. Only the alphanumeric keys (letters, numbers, spacebar, and so on), however, generate character codes. The code represents the typed character produced by that key. The value might change if you press a modifier key. For example, if you type the "A" key by itself, it generates a lowercase "a" character (character code 97); if you also hold down the Shift key, that same key produces an uppercase "A" character (character code 65). The key code for that key (65 for Western language keyboards) remains the same no matter what.

That brings us, then, to where these different codes are made available to scripts. In all cases, the code information is conveyed as one or two properties of the browser's `event` object. IE's `event` object has only one such property—`keyCode`. It contains key codes for `onKeyDown` and `onKeyUp` events, but character codes for `onKeyPress` events. The NN6 event object, on the other hand, contains two separate properties: `charCode` and `keyCode`. You can find more details and examples about these `event` object properties in Chapter 29.

The bottom-line script consideration is to use either `onKeyDown` or `onKeyUp` event handlers when you want to look for non-alphanumeric key events (for example, function keys, arrow and page navigation keys, and so on). To process characters as they appear in text boxes, use the `onKeyPress` event handler. You can experiment with these events and codes in Listing 15-41 as well as in examples from Chapter 29.

Common keyboard event tasks

IE4+ (but not NN) enables you to modify the character that a user who is editing a text box enters. The `onKeyPress` event handler can modify the `event.keyCode` property and allow the event to continue (in other words, don't evaluate to `return false` or set the `event.returnValue` property to `false`). The following IE function (invoked by an onKeyPress event handler) makes sure text entered into a text field is all uppercase, even if you type it as lowercase:

```
function assureUpper() {
    if (event.charCode >= 97 && event.charCode <= 122) {
        event.charCode = event.charCode - 32
    }
}
```

Doing this might confuse (or frustrate) users, so think carefully before implementing such a plan.

To prevent a keyboard key press from becoming a typed character in a text field, the onKeyPress event handler prevents the default action of the event. For example, the following (NN4+, IE4+) HTML page shows how to inspect a text field's entry for numbers only:

```
<HTML>
<HEAD>
<TITLE>Keyboard Capture</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkIt(evt) {
    var charCode = (evt.which) ? evt.which : event.keyCode
    if (charCode > 31 && (charCode < 48 || charCode > 57)) {
        alert("Please make sure entries are numbers only.")
        return false
    }
    return true
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Enter any positive integer: <INPUT TYPE="text" NAME="numeric"
    onKeyPress="return checkIt(event)">
</FORM>
</BODY>
</HTML>
```

Whenever a user enters a non-number, the user receives a warning and the character is not appended to the text box's text.

Keyboard events also enable you to script the submission of a form when a user presses the Enter (Return on the Mac) key within a text box. The ASCII value of the Enter/Return key is 13. Therefore, you can examine each key press in a text box and submit the form whenever value 13 arrives, as shown in the following function, which works in IE4+ and NN4+:

```
function checkForEnter(evt) {
    evt = (evt) ? evt : event
    var charCode = (evt.which) ? evt.which : evt.keyCode
    if (charCode == 13) {
        document.forms[0].submit()
        return false
    }
    return true
}
```

By assigning the `checkForEnter()` function to each field's `onKeyPress` event handler, you suddenly add some extra power to a typical HTML form.

You can intercept Ctrl+keyboard combinations (letters only) in HTML pages most effectively in Internet Explorer, but only if the browser itself does not use the combination. In other words, you cannot redirect Ctrl+key combinations that the browser uses for its own control. The `onKeyPress keyCode` value for Ctrl+combinations ranges from 1 through 26 for letters A through Z (except for those used by the browser, in which case no keyboard event fires).

On the CD-ROM

Example (with Listing 15-41) on the CD-ROM

Related Item: `String.fromCharCode()` method.

onLoseCapture

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onLoseCapture` event handler fires whenever an object that has event capture turned on no longer has that capture. Event capture is automatically disengaged when the user performs any of the following actions:

✦ Gives focus to any other window

✦ Displays any system modal dialog box (for example, alert window)

✦ Scrolls the page

✦ Opens a browser context menu (right-clicking)

✦ Tabs to give focus to the Address field in the browser window

A function associated with the `onLoseCapture` event handler should perform any cleanup of the environment due to an object no longer capturing mouse events.

On the CD-ROM

Example on the CD-ROM

Related Items: `releaseCapture()`, `setCapture()` methods.

onMouseDown
onMouseUp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The onMouseDown event handler fires when the user presses any button of a mouse. The onMouseUp event handler fires when the user releases the mouse button, provided the object receiving the event also received an onMouseDown event. When a user performs a typical click of the mouse button atop an object, mouse events occur in the following sequence: onMouseDown, onMouseUp, onClick. But if the user presses the mouse atop an object and then slides the cursor away from the object, only the onMouseDown event fires. In NN4, these two mouse events were limited to button, radio button, checkbox, link, and area objects.

These events enable authors and designers to add more application-like behavior to images that act as action or icon buttons. If you notice the way most buttons work, the appearance of the button changes while you press the mouse button and reverts to its original style when you release the mouse button (or you drag the cursor out of the button). These events enable you to emulate that behavior.

The event object created with every mouse button action has a property that reveals which mouse button the user pressed. NN4's event model calls that property the which property. IE4+ and NN6 call it the button property (but with different values for the buttons). It is most reliable to test for the mouse button number on either the onMouseDown or onMouseUp event, rather than on onClick. The onClick event object does not always contain the button information.

On the CD-ROM

Example (with Listing 15-42) on the CD-ROM

Related Item: onClick event handler.

onMouseEnter
onMouseLeave

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Two event handlers that are new with IE5.5 are onMouseEnter and onMouseLeave. Both event handlers operate just like the onMouseOver and onMouseOut event handlers, respectively. Microsoft simply offers an alternate terminology. The old and new events continue to fire in IE5.5. The old ones fire just before the new ones for each act of moving the cursor atop, and exiting from atop, the object. If you are scripting exclusively for IE5.5+, then you should use the new terminology; otherwise, stay with the older versions.

On the CD-ROM

Example on the CD-ROM

Related Items: `onMouseOver`, `onMouseOut` event handlers.

onMouseMove

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			(✓)	✓			✓	✓	✓

The `onMouseMove` event handler fires whenever the cursor is atop the current object and the mouse is moved, even by a single pixel. You do not have to press the mouse button for the event to fire, although the event is most commonly used in element dragging — especially in NN, where no `onDrag` event handler is available.

Even though the granularity of this event can be at the pixel level, you should not use the number of event firings as a measurement device. Depending on the speed of cursor motion and the performance of the client computer, the event may not fire at every pixel location.

In NN4, you cannot assign the `onMouseMove` event handler to any object by way of tag attributes. But you can use the NN4 event capturing mechanism to instruct (via scripting) a `window`, `document`, or `layer` object to capture `mouseMove` events. This allows for NN4 scripts to produce positioned element (layer) dragging. In IE4+ and NN6+, however, you can assign the `onMouseMove` event handler to any element (although you can drag only with positioned elements). When designing a page that encourages users to drag multiple items on a page, it is most common to assign the `onMouseMove` event handler to the `document` object and let all such events bubble up to the document for processing.

On the CD-ROM

Example (with Listing 15-43) on the CD-ROM

Related Items: `onDrag`, `onMouseDown`, `onMouseUp` event handlers.

onMouseOut
onMouseOver

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `onMouseOver` event fires for an object whenever the cursor rolls into the rectangular space of the object on the screen (one event per entry into the object — except for a bug in NN4/Windows, which causes the `onMouseOver` event to fire with mouse movement). The onMouseOut event handler fires when you move the cursor outside the object's rectangle. These events most commonly display explanatory text about an object in the window's status bar and effect image swapping (so-called mouse rollovers). Use the onMouseOver event handler to change the state to a highlighted version; use the onMouseOut event handler to restore the image or status bar to its normal setting.

While these two events have been in object models of scriptable browsers since the beginning, they were not available to most objects in earlier browsers. The onMouseOver event was available only to the link object until the version 4 browsers. Even then, NN4 still restricted this event to link, area, and layer objects. The onMouseOut event handler first surfaced for link and area objects in Navigator 3. IE4+ and NN6+ provide support for these events on every element that occupies space on the screen. IE5.5 includes an additional pair of event handlers — onMouseEnter and onMouseLeave — that duplicate the onMouseOver and onMouseOut events but with different terminology. The old event handlers fire just before the new versions.

Note

The onMouseOut event handler commonly fails to fire if the event is associated with an element that is near a frame or window edge and the user moves the cursor quickly outside of the current frame.

On the CD-ROM

Example (with Listing 15-44) on the CD-ROM

Related Items: onMouseEnter, onMouseLeave, onMouseMove event handlers.

onPaste

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The onPaste event (not implemented in IE5/Mac) fires immediately after the user or script initiates a paste edit action on the current object. The event is preceded by the onBeforePaste event, which fires prior to any edit or context menu that appears (or before the paste action if initiated by keyboard shortcut).

Use this event handler to provide edit functionality to elements that don't normally allow pasting. In such circumstances, you need to enable the Paste menu item in the context or Edit menu by setting the event.returnValue for the onBeforePaste event handler to false. Then your onPaste event handler must manually retrieve data from the clipboard (by way of the getData() method of the clipboardData object) and handle the insertion into the current object.

Because you are in charge of what data is stored in the clipboard, you are not limited to a direct copy of the data. For example, you might wish to store the value of the src property of an image object so that you can paste it elsewhere on the page.

On the CD-ROM

Example (with Listing 15-45) on the CD-ROM

Related Items: `onCopy`, `onCut`, `onBeforePaste` event handlers.

onPropertyChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onPropertyChange` event fires in Windows versions of IE5+ whenever a script modifies an object's property. This includes changes to the properties of an object's style. Changing properties by way of the `setAttribute()` method also triggers this event.

A script can inspect the nature of the property change because the `event.propertyName` property contains the name (as a string) of the property that was just changed. In the case of a change to an object's `style` object, the `event.propertyName` value begins with `"style."` as in `style.backgroundcolor`.

You can use this event handler to localize any object-specific post-processing of changes to an object's properties. Rather than include the post-processing statements inside the function that makes the changes, you can make that function generalized (perhaps to modify properties of multiple objects).

On the CD-ROM

Example (with Listing 15-46) on the CD-ROM

Related Items: `style` property; `setAttribute()` method.

onReadyStateChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onReadyStateChange` event handler fires whenever the ready state of an object changes. See details about these states in the discussion of the `readyState` property earlier in this chapter (and notice the limits for IE4). The change of state does not guarantee that an object is, in fact, ready for script statements to access its properties. Always check the `readyState` property of the object in any script that the `onReadyStateChange` event handler invokes.

This event fires for objects that are capable of loading data: APPLET, `document`, FRAME, FRAMESET, IFRAME, IMG, LINK, OBJECT, SCRIPT, and XML objects. The event doesn't fire for other types of objects unless a Microsoft DHTML behavior is associated with the object. The `onReadyStateChange` event does not bubble, nor can you cancel it.

On the CD-ROM

Example on the CD-ROM

Related Item: `readyState` property.

onResize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `onResize` event handler fires whenever an object is resized in response to a variety of user or scripted actions. In NN4+, the `onResize` event handler is available only for the `window` object; IE4 includes this event handler for the APPLET, AREA, BUTTON, DIV, FIELDSET, FRAMESET, IMG, MARQUEE, SELECT, TABLE, TD, TH, and `window` objects. Virtually every content-containing element in IE5+ has this event handler, provided the object has dimensional style attributes (for example, height, width, or position) assigned to it.

Window resizing presents potentially serious problems in NN4, especially when the page contains positioned elements. Unlike IE4+ and NN6, the NN4 rendering engine typically fails to redraw a resized page properly. A reload of the page usually fixes the problems. You can use the `onResize` event handler in NN4 to repair the damage:

```
window.onresize = restorePage
function restorePage() {
    history.go(0)
}
```

But there is one additional complication in NN4 for Windows when the content of a window or frame requires scrollbars. The application of the scrollbars forces another resize event. In concert with the preceding code, the page gets in an infinite loop of reloading the page. To guard against this, your script must compare the `innerWidth` and `innerHeight` of the window before and after the resize event:

```
var Nav4 = ((navigator.appName == "Netscape")&&
(parseInt(navigator.appVersion) == 4))
window.onresize = restorePage
if (Nav4) {
     var startWidth = window.innerWidth
     var startHeight = window.innerHeight
}
function restorePage() {
    if (Nav4) {
         if (startWidth != window.innerWidth||
startHeight != window.innerHeight) {
            history.go(0)
        }
    }
}
```

In IE4+ and NN6, the `onResize` event does not bubble. Resizing the browser window or frame does not cause the window's `onLoad` event handler to fire.

On the CD-ROM

Example on the CD-ROM

Related Item: `window.resize()` method.

onResizeEnd
onResizeStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `onResizeEnd` and `onResizeStart` event handlers fire only on a resizable object in Windows edit mode. As mentioned in the discussion of the `onControlSelect` event handler, an authoritative description or example is not available yet.

Related Item: `onControlSelect` event handler.

onSelectStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onSelectStart` event handler fires when a user begins to select content on the page. Selected content can be inline text, images, or text within an editable text field. If the user selects more than one object, the event fires in the first object affected by the selection.

On the CD-ROM

Example (with Listing 15-47) on the CD-ROM

Related Item: `onSelect` event handler for a variety of objects

✦ ✦ ✦

CHAPTER 16

Window and Frame Objects

✦ ✦ ✦ ✦

In This Chapter

Scripting communication among multiple frames

Creating and managing new windows

Controlling the size, position, and appearance of the browser window

Details of Window, FRAME, FRAMESET, and IFRAME objects

✦ ✦ ✦ ✦

A quick look at the basic document object model diagram in Chapter 14 (Figure 14-1) reveals that the `window` object is the outermost, most global container of all document-related objects that you script with JavaScript. All HTML and JavaScript activity takes place inside a window. That window may be a standard Windows, Mac, or Xwindows application-style window, complete with scrollbars, toolbars, and other "chrome;" you can also generate windows that have only some of a typical window's chrome. A frame is also a window, even though a frame doesn't have many accoutrements beyond scrollbars. The `window` object is where everything begins in JavaScript references to object. IE4+ and NN6 treat the frameset as a special kind of `window` object, so that it is also covered in this chapter.

Of all the objects associated with browser scripting, the `window` and window-related objects have by far the most object-specific terminology associated with them. This necessitates a rather long chapter to keep the discussion in one place. Use the running footers as a navigational aid through this substantial collection of information.

Window Terminology

The `window` object is often a source of confusion when you first learn about the document object model. A number of synonyms for `window` objects muck up the works: `top`, `self`, `parent`, and `frame`. Aggravating the situation is that these terms are also properties of a `window` object. Under some conditions, a window is its own parent, but if you define a frameset with two frames, you have only one parent among a total of three `window` objects. It doesn't take long before the whole subject can make your head hurt.

If you do not use frames in your Web applications, all of these headaches never appear. But if frames are part of your design plan, you should get to know how frames affect the object model.

Frames

The application of frames has become a religious issue among Web designers: some swear by them, while others swear at them. I believe there can be compelling reasons to use frames at times. For example, if you have a document that requires considerable scrolling to get through, you may want to maintain a static set of navigation controls visible at all times. By placing those controls — be they links or image maps — in a separate frame, you have made the controls available for immediate access, regardless of the scrolled condition of the main document.

Creating frames

The task of defining frames in a document remains the same whether or not you're using JavaScript. The simplest framesetting document consists of tags that are devoted to setting up the frameset, as follows:

```
<HTML>
<HEAD>
<TITLE>My Frameset</TITLE>
</HEAD>
<FRAMESET>
    <FRAME NAME="Frame1" SRC="document1.html">
    <FRAME NAME="Frame2" SRC="document2.html">
</FRAMESET>
</HTML>
```

The preceding HTML document, which the user never sees, defines the frameset for the entire browser window. Each frame must have a URL reference (specified by the `SRC` attribute) for a document to load into that frame. For scripting purposes, assigning a name to each frame with the `NAME` attribute greatly simplifies scripting frame content.

The frame object model

Perhaps the key to successful frame scripting is understanding that the object model in the browser's memory at any given instant is determined by the HTML tags in the currently loaded documents. All canned object model graphics, such as Figure 16-1 in this book, do not reflect the precise object model for your document or document set.

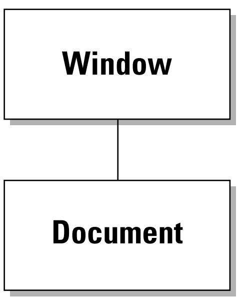

Figure 16-1: The simplest window–document relationship

For a single, frameless document, the object model starts with just one `window` object, which contains one document, as shown in Figure 16-1. In this simple structure, the `window` object is the starting point for all references to any loaded object. Because the window is always there — it must be there for a document to load into — a reference to any object in the document can omit a reference to the current window.

In a simple two-framed frameset model (Figure 16-2), the browser treats the container of the initial, framesetting document as the parent window. The only visible evidence that the document exists is that the framesetting document's title appears in the browser window title bar.

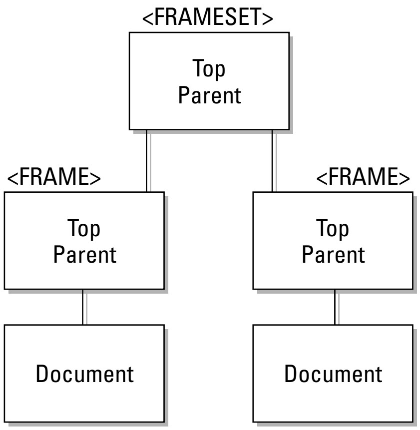

Figure 16-2: The parent and frames are part of the object model.

Each `<FRAME>` tag inside the `<FRAMESET>` tag set creates another `window` object into which a document is loaded. Each of those frames, then, has a `document` object associated with it. From the point of view of a given document, it has a single window container, just as in the model shown in Figure 16-1. And although the `parent` object is not visible to the user, it remains in the object model in memory. The presence of the parent often makes it a convenient repository for variable data that need to be shared by multiple child frames or must persist between loading of different documents inside a child frame.

In even more complex arrangements, as shown in Figure 16-3, a child frame itself may load a framesetting document. In this situation, the differentiation between the `parent` and `top` objects starts to come into focus. The top window is the only one in common with all frames in Figure 16-3. As you see in a moment, when frames need to communicate with other frames (and their documents), you must fashion references to the distant object via the `window` object that they all have in common.

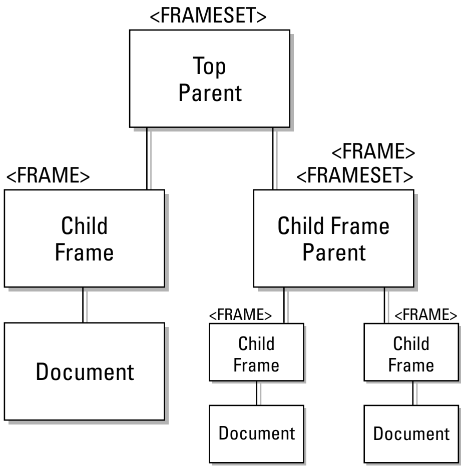

Figure 16-3: Three generations of window objects

Referencing frames

The purpose of an object reference is to help JavaScript locate the desired object in the object model currently held in memory. A reference is a road map for the browser to follow, so that it can track down, say, the value of a particular text field in a particular document. Therefore, when you construct a reference, think about where the script appears in the object model and how the reference can help the browser determine where it should go to find the distant object. In a two-generation scenario, such as the one shown in Figure 16-2, three intergenerational references are possible:

✦ Parent-to-child

✦ Child-to-parent

✦ Child-to-child

Assuming that you need to access an object, function, or variable in the relative's frame, the following are the corresponding reference structures:

✦ `frameName.objFuncVarName`

✦ `parent.objFuncVarName`

✦ `parent.frameName.objFuncVarName`

The rule is this: Whenever a reference must point to another frame, begin the reference with the `window` object that the two destinations have in common. To demonstrate that rule on the complex model in Figure 16-3, if the left-hand child frame's document needs to reference the document at the bottom right of the map, the reference structure is

```
top.frameName.frameName.document. ...
```

Follow the map from the top `window` object down through two frames to the final document. JavaScript has to take this route, so your reference must help it along.

Top versus parent

After seeing the previous object maps and reference examples, you may be wondering, Why not use `top` as the leading object in all trans-frame references? From an object model point of view, you'll have no problem doing that: A parent in a two-generation scenario is also the top window. What you can't count on, however, is your framesetting document always being the `top` window object in someone's browser. Take the instance where a Web site loads other Web sites into one of its frames. At that instant, the `top` window object belongs to someone else. If you always specify `top` in references intended just for your parent window, your references won't work and will probably lead to script errors for the user. My advice, then, is to use `parent` in references whenever you mean one generation above the current document.

Preventing framing

You can use your knowledge of `top` and `parent` references to prevent your pages from being displayed inside another Web site's frameset. Your top-level document must check whether it is loaded into its own top or parent window. When a document is in its own top window, a reference to the `top` property of the current window is equal to a reference to the current window (the `window` synonym `self` seems most grammatically fitting here). If the two values are not equal, you can script your document to reload itself as a top-level document. When it is critical that your document be a top-level document, include the script in Listing 16-1 in the head portion of your document:

Listing 16-1: Prevention from Getting "Framed"

```
<SCRIPT LANGUAGE="JavaScript">
if (top != self) {
    top.location = location
}
</SCRIPT>
```

Your document may appear momentarily inside the other site's frameset, but then the slate is wiped clean, and your top-level document rules the browser window.

Ensuring framing

When you design a Web application around a frameset, you may want to make sure that a page always loads the complete frameset. Consider the possibility that a visitor adds only one of your frames to a bookmarks list. On the next visit, only the bookmarked page appears in the browser, without your frameset, which may contain valuable navigation aids to the site.

A script can make sure that a page always loads into its frameset by comparing the URLs of the `top` and `self` windows. If the URLs are the same, it means that the page needs to load the frameset. Listing 16-2 shows the simplest version of this technique, which loads a fixed frameset. The listing includes a workaround for an NN4-specific behavior that prevents printing a frame. (NN4 for Windows and Unix reloads a page into a separate hidden window for printing and runs any immediate scripts in the process). For a more complete implementation that passes a parameter to the frameset so that it opens a specific page in one of the frames, see the `location.search` property in Chapter 17.

Listing 16-2: **Forcing a Frameset to Load**

```
<SCRIPT LANGUAGE="JavaScript">
var isNav4 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) == 4)
if (top.location.href == window.location.href) {
    if (isNav4) {
        if (window.innerWidth != 0) {
            top.location.href = "myFrameset.html"
        }
    } else {
        top.location.href = " myFrameset.html"
    }
}
</SCRIPT>
```

Switching from frames to frameless

Some sites load themselves in a frameset by default and offer users the option of getting rid of the frames. Only IE4+ and NN6+ let you modify a frameset's `cols` or `rows` properties on the fly to simulate adding or removing frames from the current view (see the FRAMESET element object later in this chapter). In other browsers, you cannot dynamically change the makeup of a frameset after it has loaded, but you can load the content page of the frameset into the main window. Simply include a button or link whose action loads that document into the `top` window object:

```
top.location.href = "mainBody.html"
```

A switch back to the frame version entails nothing more complicated than loading the framesetting document.

Inheritance versus containment

Scripters who have experience in object-oriented programming environments probably expect frames to inherit properties, methods, functions, and variables defined in a parent object. That's not the case with scriptable browsers. You can, however, still access those parent items when you make a call to the item with a complete reference to the parent. For example, if you want to define a deferred function in the framesetting parent document that all frames can share, the scripts in the frames refer to that function with this reference:

```
parent.myFunc()
```

You can pass arguments to such functions and expect returned values.

Navigator 2 Bug: Parent Variables

Some bugs in Navigator 2 cause problems when accessing variables in a parent window from one of its children. If a document in one of the child frames unloads, a parent variable value that depends on that frame may get scrambled or disappear. Using a temporary `document.cookie` for global variable values may be a better solution. For Navigator 3, you should declare parent variables that are updated from child frames as first-class string objects (with the `new String()` constructor) as described in Chapter 34.

Frame synchronization

A pesky problem for some scripters' plans is that including immediate scripts in the framesetting document is dangerous — if not crash-prone in Navigator 2. Such scripts tend to rely on the presence of documents in the frames being created by this framesetting document. But if the frames have not yet been created and their documents have not yet loaded, the immediate scripts will likely crash and burn.

One way to guard against this problem is to trigger all such scripts from the frameset's `onLoad` event handler. In theory, this handler won't trigger until all documents have successfully loaded into the child frames defined by the frameset. Unfortunately, IE4+ for Windows has a nasty bug that fires the `onLoad` event handler in the frameset even if the loading has been interrupted by the browser's Stop button or pressing the Esc key. At the same time, be careful with `onLoad` event handlers in the documents going into a frameset's frames. If one of those scripts relies on the presence of a document in another frame (one of its brothers or sisters), you're doomed to eventual failure. Anything coming from a slow network or server to a slow modem can get in the way of other documents loading into frames in the ideal order.

One way to work around these problems is to create a Boolean variable in the parent document to act as a flag for the successful loading of subsidiary frames. When a document loads into a frame, its `onLoad` event handler can set that flag to `true` to indicate that the document has loaded. Any script that relies on a page being loaded should use an `if` construction to test the value of that flag before proceeding.

Despite the horrible IE4+/Windows bug described above, it is best to construct the code so that the parent's `onLoad` event handler triggers all the scripts that you want to run after loading. Depending on other frames is a tricky business, but the farther the installed base of Web browsers gets from Navigator 2, the less the associated risk. For example, beginning with Navigator 3, if a user resizes a window, the document does not reload itself, as it used to in Navigator 2. Even so, you still should test your pages thoroughly for any residual effects that may accrue if someone resizes a window or clicks Reload.

Blank frames

Often, you may find it desirable to create a frame in a frameset but not put any document in it until the user has interacted with various controls or other user interface elements in other frames. Navigator and recent IE versions have a somewhat empty document in one of its internal URLs (`about:blank`). But with

Navigator 2 and 3 on the Macintosh, an Easter egg–style message appears in that window when it displays. This URL is also not guaranteed to be available on all browsers. If you need a blank frame, let your framesetting document write a generic HTML document to the frame directly from the SRC attribute for the frame, as shown in the skeletal code in Listing 16-3. Loading an "empty" HTML document requires no additional transactions.

Listing 16-3: Creating a Blank Frame

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
<!--
function blank() {
     return "<HTML></HTML>"
}
//-->
</SCRIPT>
</HEAD>
<FRAMESET>
    <FRAME NAME="Frame1" SRC="someURL.html">
    <FRAME NAME="Frame2" SRC="javascript:parent.blank()">
</FRAMESET>
</HTML>
```

Viewing frame source code

Studying other scripters' work is a major learning tool for JavaScript (or any programming language). With most scriptable browsers you can easily view the source code for any frame, including those frames whose content is generated entirely or in part by JavaScript. Click the desired frame to activate it (a subtle border may appear just inside the frame on some browser versions, but don't be alarmed if the border doesn't appear). Then select Frame Source (or equivalent) from the View menu (or right-click submenu). You can also print or save a selected frame.

Frames versus FRAME element objects

With the expansion of object models that expose every HTML element to scripting (IE4+, NN6), a terminology conflict comes into play. Everything that you have read about frames thus far in the chapter refers to the original object model, where a frame is just another kind of window, with a slightly different referencing approach. That still holds true, even in the latest browsers.

But when the object model also exposes HTML elements, then the notion of the FRAME element object is somewhat distinct from the frame object of the original model. The FRAME element object represents an object whose properties are dominated by the attributes you set inside the <FRAME> tag. This provides access to settings, such as the frame border and scrollability — the kinds of properties that are not exposed to the original frame object.

References to the frame and FRAME element objects are also different. You've seen plenty of examples of how to reference an old-fashioned frame earlier in this chapter. But access to a FRAME element object is either via the element's `ID` attribute or through the child node relationship of the enclosing FRAMESET element (you cannot use the `parentNode` property to back your way out of the current document to the FRAME element that encloses the document). The way I prefer is to assign an `ID` attribute to `<FRAME>` tags and access the FRAME element object by way of the `document` object that lives in the parent (or top) of the frameset hierarchy. Therefore, to access the `frameBorder` property of a FRAME element object from a script living in any frame of a frameset, the syntax is

```
parent.document.all.frame1ID.frameBorder
```

or, for IE5+ and NN6+

```
parent.document.getElementById("frame1ID").frameBorder
```

There is no access to the document contained by a frame when the reference goes through the FRAME element object.

Window Object

Properties	***Methods***	***Event Handlers***
appCore	alert()	onAbort††
clientInformation	attachEvent()†	onAfterPrint
clipboardData	back()	onBeforePrint
closed	blur()†	onBeforeUnload
Components	captureEvents()	onBlur†
controllers	clearInterval()	onChange††
crypto	clearTimeout()	onClick††
defaultStatus	close()	onClose††
dialogArguments	confirm()	onDragDrop
dialogHeight	createPopup()	onError
dialogLeft	detachEvent()†	onFocus†
dialogTop	disableExternalCapture()	onHelp
dialogWidth	enableExternalCapture()	onKeyDown††
directories	execScript()	onKeyPress††
document	find()	onKeyUp††
event	fireEvent()†	onLoad
external	focus()†	onMouseDown††

Continued

Properties	*Methods*	*Event Handlers*
frameElement	forward()	onMouseMove††
frames	GetAttention()	onMouseOut††
history	handleEvent()	onMouseOver††
innerHeight	home()	onMouseUp††
innerWidth	moveBy()	onMove
length	moveTo()	onReset††
loading	navigate()	onResize
location	open()	onScroll
locationbar	print()	onSelect††
menubar	prompt()	onSubmit††
name	releaseEvents()	onUnload
navigator	resizeBy()	
offscreenBuffering	resizeTo()	
opener	routeEvent()	
outerHeight	scroll()	
outerWidth	scrollBy()	
pageXOffset	scrollTo()	
pageYOffset	setActive()†	
parent	setCursor()	
personalbar	setInterval()	
pkcs11	setTimeout()	
prompter	showHelp()	
returnValue	showModalDialog()	
screen	showModelessDialog()	
screenLeft	sizeToContent()	
screenTop	stop()	
screenX		
screenY		
scrollbars		
scrollX		
scrollY		
self		

Properties	Methods	Event Handlers
sidebar		
status		
statusbar		
toolbar		
top		
window		

†See Chapter 15.

††To handle captured or bubbled events of other objects in IE4+ and NN6

Syntax

Creating a window:

```
var windowObject = window.open([parameters])
```

Accessing window properties or methods:

```
window.property | method([parameters])

self.property | method([parameters])

windowObject.property | method([parameters])
```

About this object

The `window` object has the unique position of being at the top of the object hierarchy, encompassing even the almighty `document` object. This exalted position gives the `window` object a number of properties and behaviors unlike those of any other object.

Chief among its unique characteristics is that because everything takes place in a window, you can usually omit the `window` object from object references. You've seen this behavior in previous chapters when I invoked document methods, such as `document.write()`. The complete reference is `window.document.write()`. But because the activity was taking place in the window that held the document running the script, that window was assumed to be part of the reference. For single-frame windows, this concept is simple enough to grasp.

As previously stated, among the list of properties for the `window` object is one called `self`. This property is synonymous with the `window` object itself (which is why it shows up in hierarchy diagrams as an object). Having a property of an object that is the same name as the object may sound confusing, but this situation is not that uncommon in object-oriented environments. I discuss the reasons why you may want to use the `self` property as the window's object reference in the `self` property description that follows.

As indicated earlier in the syntax definition, you don't always have to specifically create a `window` object in JavaScript code. After you start your browser, it usually opens a window. That window is a valid `window` object, even if the window is blank. Therefore, after a user loads your page into the browser, the `window` object part of that document is automatically created for your script to access as it pleases.

One conceptual trap to avoid is believing that a `window` object's event handler or custom property assignments outlive the document whose scripts make the assignments. Except for some obvious physical properties of a window, each new document that loads into the window starts with a clean slate of window properties and event handlers.

Your script's control over an existing (already open) window's user interface elements varies widely with the browser and browser version for which your application is intended. Before the version 4 browsers, the only change you can make to an open window is to the status line at the bottom of the browser window. With IE4+ and NN4+, however, you can control such properties as the size, location, and (with signed scripts in Navigator) the presence of "chrome" elements (toolbars and scrollbars, for example) on the fly. Many of these properties can be changed beyond specific safe limits only if you cryptographically sign the scripts (see Chapter 46) and/or the user grants permission for your scripts to make those modifications.

Window properties are far more flexible on all browsers when your scripts generate a new window (with the `window.open()` method): You can influence the size, toolbar, or other view options of a window. Recent browser versions provide even more options for new windows, including the position of the window and whether the window should even display a title bar. Again, if an option can conceivably be used to deceive a user (for example, silently hiding one window that monitors activity in another window), signed scripts and/or user permission are necessary.

The `window` object is also the level at which a script asks the browser to display any of three styles of dialog boxes (a plain alert dialog box, an OK/Cancel confirmation dialog box, or a prompt for user text entry). Although dialog boxes are extremely helpful for cobbling together debugging tools for your own use (Chapter 45), they can be very disruptive to visitors who navigate through Web sites. Because most JavaScript dialog boxes are modal (that is, you cannot do anything else in the browser — or anything at all on a Macintosh — until you dismiss the dialog box), use them sparingly, if at all. Remember that some users may create macros on their computers to visit sites unattended. Should such an automated access of your site encounter a modal dialog box, it is trapped on your page until a human intervenes.

All dialog boxes generated by JavaScript identify themselves as being generated by JavaScript (less egregiously so in version 4 browsers and later). This is primarily a security feature to prevent deceitful scripts from creating system- or application-style dialog boxes that convince visitors to enter private information. It should also discourage dialog box usage in Web page design. And that's good, because dialog boxes tend to annoy users.

With the exception of the IE-specific modal and modeless dialog boxes (see the `window.showModalDialog()` and `window.showModeless()` methods), JavaScript dialog boxes are not particularly flexible in letting you fill them with text or graphic elements beyond the basics. In fact, you can't even change the text of the dialog box buttons or add a button. With DHTML-capable browsers, you can use positioned DIV or IFRAME elements to simulate dialog box behavior in a cross-browser way.

Properties

appCore
Components
controllers
prompter
sidebar

Values: See Text Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Navigator 6 provides scriptable access to numerous services that are part of the xpconnect package ("xp" stands for "cross-platform"). These services allow scripts to work with COM objects and the mozilla.org XUL (XML-based User Interface Language) facilities — lengthy subjects that extend well beyond the scope of this book. You can begin to explore this subject within the context of Navigator 6 and scripting at `http://www.mozilla.org/scriptable/`.

clientInformation

Value: `navigator` object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In an effort to provide scriptable access to browser-level properties while avoiding reference to the Navigator browser brand, Microsoft provides the `clientInformation` property. Its value is identical to that of the `navigator` object — an object name that is also available in IE. Use the `navigator` object for cross-browser applications. (See Chapter 28.)

Related Items: `navigator` object.

clipboardData

Value: Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Use the `clipboardData` object (not implemented in IE5/Mac) to transfer data for such actions as cutting, copying, and pasting under script control. The object contains data of one or more data types associated with a transfer operation. Use this property only when editing processes via the Edit menu (or keyboard equivalents) or context menu controlled by script — typically in concert with edit-related event handlers.

Working with the `clipboardData` object requires knowing about its three methods shown in Table 16-1. Familiarity with the edit-related event handlers ("before" and "after" versions of cut, copy, and paste) is also helpful (see Chapter 15).

Table 16-1 window.clipboardData Object Methods

Method	*Returns*	*Description*
`clearData([`*format*`])`	Nothing	Removes data from the clipboard. If no format parameter is supplied, all data is cleared. Data formats can be one or more of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`.
`getData(`*format*`)`	String	Retrieves data of the specified format from the clipboard. The format is one of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`. The clipboard is not emptied when you get the data, so that the data can be retrieved in several sequential operations.
`setData(`*format*`, `*data*`)`	Boolean	Stores string data in the clipboard. The format is one of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`. For non-text data formats, the data must be a string that specifies the path or URL to the content. Returns `true` if the transfer to the clipboard is successful.

You cannot use the `clipboardData` object to transfer data between pages that originate from different domains or arrive via different protocols (`http` versus `https`).

On the CD-ROM

Example on the CD-ROM

Related Items: `event.dataTransfer` property; `onBeforeCopy`, `onBeforeCut`, `onBeforePaste`, `onCopy`, `onCut`, `onPaste` event handlers.

closed

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

When you create a subwindow with the `window.open()` method, you may need to access object properties from that subwindow, such as setting the value of a text field. Access to the subwindow is via the `window` object reference that is returned by the `window.open()` method, as in the following code fragment:

```
var newWind = window.open("someURL.html","subWind")
...
newWind.document.entryForm.ZIP.value = "00000"
```

In this example, the `newWind` variable is not linked "live" to the window, but is only a reference to that window. If the user should close the window, the `newWind` variable still contains the reference to the now missing window. Thus, any script reference to an object in that missing window will likely cause a script error. What you need to know before accessing items in a subwindow is whether the window is still open.

The `closed` property returns `true` if the `window` object has been closed either by script or by the user. Any time you have a script statement that can be triggered after the user has an opportunity to close the window, test for the `closed` property before executing that statement.

As a workaround for Navigator 2, any property of a closed window reference returns a `null` value. Thus, you can test whether, say, the `parent` property of the new window is `null`: If so, the window has already closed. Internet Explorer 3, on the other hand, triggers a scripting error if you attempt to access a property of a closed window — you have no error-free way to detect whether a window is open or closed in Internet Explorer 3.

On the CD-ROM

Example (with Listing 16-4) on the CD-ROM

Related Items: `window.open()`, `window.close()` methods.

Components

See `appCore`.

controllers

See `appCore`.

crypto
pkcs11

Values: Object References Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `crypto` and `pkcs11` properties return references to browser objects that are relevant to internal public-key cryptography mechanisms. These subjects are beyond the scope of this book, but you can read more about Netscape's efforts on this front at `http://www.mozilla.org/projects/security/`.

defaultStatus

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

After a document is loaded into a window or frame, the statusbar's message field can display a string that is visible any time the mouse pointer is not atop an object that takes precedence over the statusbar (such as a link object or an image map). The `window.defaultStatus` property is normally an empty string, but you can set this property at any time. Any setting of this property will be temporarily overridden when a user moves the mouse pointer atop a link object (see `window.status` property for information about customizing this temporary statusbar message).

Probably the most common time to set the `window.defaultStatus` property is when a document loads into a window. You can do this as an immediate script statement that executes from the Head or Body portion of the document or as part of a document's `onLoad` event handler.

Tip

The `defaultStatus` property does not work well in Navigator 2 or Internet Explorer 3, and experiences problems in Navigator 3, especially on the Macintosh (where the property doesn't change even after loading a different document into the window). Many users simply don't notice the statusbar change during Web surfing, so don't put mission-critical information in the statusbar.

On the CD-ROM

Example (with Listing 16-5) on the CD-ROM

Related Items: `window.status` property.

dialogArguments

Value: Varies Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `dialogArguments` property is available only in a window that is generated by the IE-specific `showModalDialog()` or `showModelessDialog()` methods. Those methods allow a parameter to be passed to the dialog box window, and the `dialogArguments` property lets scripts inside the dialog box window's scripts to access that parameter value. The value can be in the form of a string, number, or JavaScript array (convenient for passing multiple values).

On the CD-ROM

Example on the CD-ROM

Related Items: `window.showModalDialog()`, `window.showModelessDialog()` methods.

dialogHeight
dialogWidth

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Scripts in a document located inside an IE-specific modal or modeless dialog box (generated by `showModalDialog()` or `showModelessDialog()`) can read or modify the height and width of the dialog box window via the `dialogHeight` and `dialogWidth` properties. Scripts can access these properties from the main window only for modeless dialog boxes, which remain visible while the user can control the main window contents.

Values for these properties are strings and include the unit of measure, the pixel (`px`).

On the CD-ROM

Example on the CD-ROM

Related Items: `window.dialogLeft`, `window.dialogTop` properties.

dialogLeft
dialogTop

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Scripts in a document located inside an IE-specific modal or modeless dialog box (generated by `showModalDialog()` or `showModelessDialog()`) can read or modify the left and top coordinates of the dialog box window via the `dialogLeft` and `dialogTop` properties. Scripts can access these properties from the main window only for modeless dialog boxes, which remain visible while the user can control the main window contents.

Values for these properties are strings and include the unit of measure, the pixel (`px`). If you attempt to change these values so that any part of the dialog box window would be outside the video monitor, the browser overrides the settings to keep the entire window visible.

On the CD-ROM

Example on the CD-ROM

Related Items: `window.dialogHeight`, `window.dialogTopWidth` properties.

directories
locationbar
menubar
personalbar
scrollbars
statusbar
toolbar

Value: Object Read/Write (with signed scripts)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Beyond the rectangle of the content region of a window (where your documents appear), the Netscape browser window displays an amalgam of bars and other features known collectively as *chrome*. All browsers can elect to remove these chrome items when creating a new window (as part of the third parameter of the `window.open()` method), but until signed scripts were available in Navigator 4, these items could not be turned on and off in the main browser window or any existing window.

Navigator 4 promotes these elements to first-class objects contained by the `window` object. Navigator 6 adds one more feature, called the directories bar — a frame-like device that can be opened or hidden from the left edge of the browser window. At the same time, however, NN6 no longer permits hiding and showing the browser window's scrollbars. Figure 16-4 points out where each of the six bars appears in a fully chromed Navigator 4 window. The only element that is not part of this scheme is the window's title bar. You can create a new window without a title bar (with a signed script), but you cannot hide and show the title bar on an existing window.

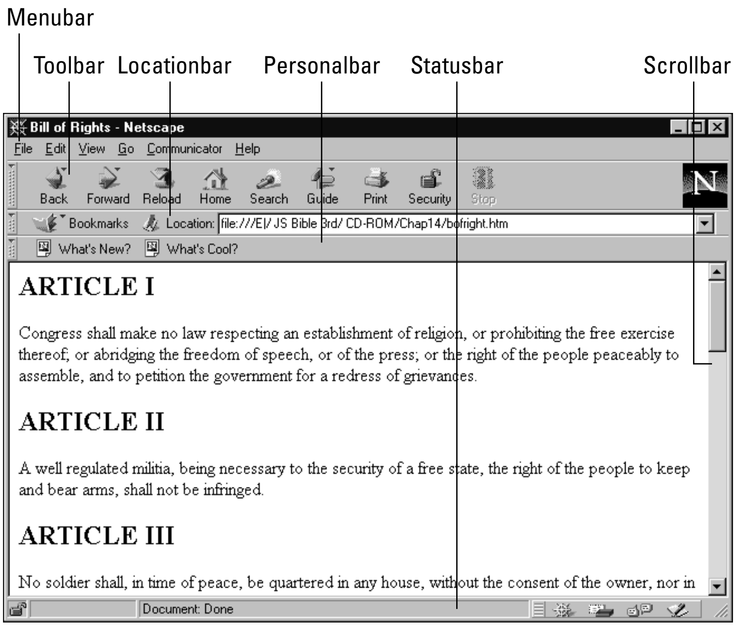

Figure 16-4: Window chrome items

Chrome objects have but one property: `visible`. Reading this Boolean value (possible without signed scripts) lets you inspect the visitor's browser window for the elements currently engaged. There is no intermediate setting or property for the expanded/collapsed state of the toolbar, locationbar, and personalbar in NN4.

Changing the visibility of these items on the fly alters the relationship between the inner and outer dimensions of the browser window. If you must carefully size a window to display content, you should adjust the chrome elements before sizing the window. Before you start changing chrome visibility before the eyes of your page visitors, weigh the decision carefully. Experienced users have fine-tuned the look of their browser windows to just the way they like them. If you mess with that look, you may anger your visitors. Fortunately, changes you make to a chrome element's visibility are not stored to the user's preferences. However, the changes you make survive an unloading of the page. If you change the settings, be sure you first save the initial settings and restore them with an `onUnload` event handler.

Tip The Macintosh menu bar is not part of the browser's window chrome. Therefore, its visibility cannot be adjusted from a script.

On the CD-ROM Example (with Listing 16-6) on the CD-ROM

Related Items: `window.open()` method.

document

Value: Object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

I list the `document` property here primarily for completeness. Each `window` object contains a single `document` object (although in Navigator 4, a window may also contain layers, each of which has a `document` object, as described in Chapter 31). The value of the `document` property is the `document` object, which is not a displayable value. Instead, you use the `document` property as you build references to properties and methods of the document and to other objects contained by the document, such as a form and its elements. To load a different document into a window, use the `location` object (see Chapter 17). The `document` object is described in detail in Chapter 18.

Related Items: `document` object.

event

Value: Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Only IE4+ treats the `event` object as a property of the `window` object. Navigator 4+ and the W3C DOM pass an instance of the `Event` object as an argument to event handler functions. The connection with the `window` object in IE is relatively inconsequential, because all action involving the `event` object occurs in event handler functions. The only difference is that the object can be treated as a more global object when one event handler function invokes another. Instead of having to pass the `event` object parameter to the next function, IE functions can access the `event` object directly (with or without the `window.` prefix in the reference).

For complete details about the `event` object in all browsers, see Chapter 29.

Related Items: `event` object.

external

Value: Object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `external` property (not implemented in IE5/Mac) is useful only when the browser window is a component in another application. The property provides a gateway between the current browser window and the application that acts as a host to the browser window component.

With IE4+ acting as a component to the host operating system, the `external` property can be used to access several methods that influence behaviors outside of the browser. Perhaps the three most useful methods to regular Web page scripters are `AddDesktopComponent()`, `AddFavorite()`, and `NavigateAndFind()`. The first two methods display the same kind of alert dialog box that users get after making these choices from the browser or desktop menus, so that you won't be able to sneak your Web site onto desktops or Favorites listings without the visitor's approval. Table 16-2 describes the parameters for these three methods.

Table 16-2 Popular window.external Object Methods

Method	*Description*
`AddDesktopComponent("`*`URL`*`", "`*`type`*`"[, `*`left`*`, `*`top`*`, `*`width`*`, `*`height`*`])`	Adds a Web site or image to the Active Desktop (if turned on in the user's copy of Windows). The *`type`* parameter value is either `website` or `image`. Dimensional parameters (optional) are all integer values.
`AddFavorite("`*`URL`*`"[, "`*`title`*`"])`	Adds the specified URL to the user's Favorites list. The optional title string parameter is how the URL should be listed in the menu (if missing, the URL appears in the list).
`NavigateAndFind("`*`URL`*`", "`*`findString`*`", "`*`target`*`")`	Navigates to the URL in the first parameter and opens the page in the target frame (an empty string opens in the current frame). The *`findString`* is text to be searched for on that page and highlighted when the page loads.

To learn more about the `external` object and how to extend the MS object model, visit `http://msdn.microsoft.com.workshop/browser/overview/Overview.asp#Extending_the_Dynami`.

On the CD-ROM

Example on the CD-ROM

frameElement

Values: FRAME or IFRAME Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

If the current window exists as a result of a `<FRAME>` or `<IFRAME>` tag, the window's `frameElement` property returns a reference to the hosting element. As is made clear in the discussion later in this chapter about the FRAME element object, a reference to a FRAME or IFRAME element object provides access to the properties that echo the attributes of the HTML element object. For a window that is not part of a frameset, the frameElement property returns `null`.

The convenience of this property becomes apparent when a single document is loaded into multiple framesets. A script in the document can still refer to the containing FRAME element, even when the ID of the element changes from one frameset to another. The FRAMESET element is also accessible via the `parentElement` property of the `frameElement` property:

```
var frameSetObj = self.frameElement.parentElement
```

A reference to the FRAMESET element opens possibilities of adjusting frame sizes.

Related Items: FRAME, IFRAME objects.

frames

Value: Array Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

In a multiframe window, the top or parent window contains any number of separate frames, each of which acts as a full-fledged `window` object. The `frames` property (note the plural use of the word as a property name) plays a role when a statement must reference an object located in a different frame. For example, if a button in one frame is scripted to load a document in another frame, the button's event handler must be able to tell JavaScript precisely where to display the new HTML document. The `frames` property assists in that task.

To use the `frames` property to communicate from one frame to another, it should be part of a reference that begins with the `parent` or `top` property. This lets JavaScript make the proper journey through the hierarchy of all currently loaded objects to reach the desired object. To find out how many frames are currently active in a window, use this expression:

```
parent.frames.length
```

This expression returns a number indicating how many frames the parent window defines. This value does not, however, count further nested frames, should a third generation of frame be defined in the environment. In other words, no single property exists that you can use to determine the total number of frames in the browser window if multiple generations of frames are present.

The browser stores information about all visible frames in a numbered (indexed) array, with the first frame (that is, the topmost `<FRAME>` tag defined in the framesetting document) as number 0:

```
parent.frames[0]
```

Therefore, if the window shows three frames (whose indexes are `frames[0]`, `frames[1]`, and `frames[2]`, respectively), the reference for retrieving the `title` property of the document in the second frame is

```
parent.frames[1].document.title
```

This reference is a road map that starts at the parent window and extends to the second frame's document and its `title` property. Other than the number of frames defined in a parent window and each frame's name (`top.frames[i].name`), no other values from the frame definitions are directly available from the frame object via scripting until you get to IE4 and NN6 (see the FRAME element object later in this chapter). In these browsers, individual FRAME element objects have several properties that reveal `<FRAME>` tag attributes.

Using index values for frame references is not always the safest tactic, however, because your frameset design may change over time, in which case the index values will also change. Instead, you should take advantage of the `NAME` attribute of the `<FRAME>` tag, and assign a unique, descriptive name to each frame. A value you assign to the `NAME` attribute is also the name that you use for `TARGET` attributes of links to force a linked page to load in a frame other than the one containing the link. You can use a frame's name as an alternative to the indexed reference. For example, in Listing 16-7, two frames are assigned distinctive names. To access the title of a document in the `JustAKid2` frame, the complete object reference is

```
parent.JustAKid2.document.title
```

with the frame name (case-sensitive) substituting for the `frames[1]` array reference. Or, in keeping with JavaScript flexibility, you can use the object name in the array index position:

```
parent.frames["JustAKid2"].document.title
```

The supreme advantage to using frame names in references is that no matter how the frameset structure may change over time, a reference to a named frame will always find that frame, although its index value (that is, position in the frameset) may change.

On the CD-ROM

Example (with Figure 16-5 and Listings 16-7 and 16-8) on the CD-ROM

Related Items: `frame`, `frameset` objects; `window.parent`, `window.top` properties.

history

Value: Object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

See the discussion of the `history` object in Chapter 17.

innerHeight
innerWidth
outerHeight
outerWidth

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Navigator 4+ lets scripts adjust the height and width of any window, including the main browser window by setting properties (NN4+ and IE4+ have methods that also resize the browser window). This adjustment can be helpful when your page shows itself best with the browser window sized to a particular height and width. Rather than relying on the user to size the browser window for optimum viewing of your page, you can dictate the size of the window (although the user can always manually resize the main window). And because you can examine the operating system of the visitor via the `navigator` object (see Chapter 28), you can size a window to adjust for the differences in font and form element rendering on different platforms.

Netscape provides two different points of reference for measuring the height and width of a window: inner and outer. Both are measured in pixels. The inner measurements are that of the active document area of a window (sometimes known as a window's content region). If the optimum display of your document depends on the document display area being a certain number of pixels high and/or wide, the `innerHeight` and `innerWidth` properties are the ones to set.

In contrast, the outer measurements are of the outside boundary of the entire window, including whatever chrome is showing in the window: scrollbars, statusbar, and so on. Setting the `outerHeight` and `outerWidth` is generally done in concert with a reading of `screen` object properties (Chapter 28). Perhaps the most common usage of the outer properties is to set the browser window to fill the available screen area of the visitor's monitor.

A more efficient way of modifying both outer dimensions of a window is with the `window.resizeTo()` method, which is also available in IE4+. The method takes pixel width and height (as integer values) as parameters, thus accomplishing a window resizing in one statement. Be aware that resizing a window does not adjust the location of a window. Therefore, just because you set the outer dimensions of a window to the available space returned by the `screen` object doesn't mean that the window will suddenly fill the available space on the monitor. Application of the `window.moveTo()` method is necessary to ensure the top-left corner of the window is at screen coordinates 0,0.

Despite the freedom that these properties afford the page author, Netscape has built in a minimum size limitation for scripts that are not cryptographically signed. You cannot set these properties such that the outer height and width of the window is smaller than 100 pixels on a side. This limitation is to prevent an unsigned script from setting up a small or nearly invisible window that monitors activity in other windows. With signed scripts, however, windows can be made smaller than 100 × 100 pixels with the user's permission. IE4+ maintains a smaller minimum size to prevent resizing a window to zero size.

On the CD-ROM

Example (with Listing 16-9) on the CD-ROM

Related Items: `window.resizeTo()`, `window.moveTo()` methods; `screen` object; `navigator` object.

`loading`

Value: Boolean Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

This NN4-specific property allows you to query whether the window is still loading content. The property returns `true` if the page is still loading and `false` if the page has completed loading all of its content.

location

Value: Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

See the discussion of the `location` object in Chapter 17.

locationbar

See `directories`.

name

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

All `window` objects can have names assigned to them. Names are particularly useful for working with frames, because a good naming scheme for a multiframe environment can help you determine precisely which frame you're working with in references coming from other frames.

The main browser window, however, has no name attached to it by default. Its value is an empty string. There aren't many reasons to assign a name to the window, because JavaScript and HTML provide plenty of other ways to refer to the `window` object (the `top` property, the `_top` constant for `TARGET` attributes, and the `opener` property from subwindows).

If you want to attach a name to the main window, you can do so by setting the `window.name` property at any time. But be aware that because this is one window property whose life extends beyond the loading and unloading of any given document, chances are that your scripts would use the reference in only one document or frameset. Unless you restore the default empty string, your programmed window name will be present for any other document that loads later. My suggestion in this regard is to assign a name in a window's or frameset's `onLoad` event handler, and then reset it to empty in a corresponding `onUnload` event handler:

```
<BODY onLoad="self.name = 'Main'"   onUnload="self.name = ''">
```

You can see an example of this application in Listing 16-16, where setting a parent window name is helpful for learning the relationships among parent and child windows.

Related Items: `top` property; `window.open()`, `window.sizeToContent()`methods.

`navigator`

Value: Object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Although the `navigator` object appears as a property of the `window` object only in the most recent browsers, the `navigator` object has been around since the very beginning (see Chapter 28). In previous browsers, the `navigator` object was referenced as a standalone object. And because you can omit any reference to the `window` object for a `window` object's properties, you can use the same window-less reference syntax for compatibility across all scriptable browsers (at least for the `navigator` object properties that exist across all browsers). That's the way I recommend referring to the `navigator` object.

On the CD-ROM

Example on the CD-ROM

Related Items: `navigator` object.

`offscreenBuffering`

Value: Boolean or String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Internet Explorer 4+ (for Win32 platforms) by default initially renders a page in a buffer (a chunk of memory) before it is blasted to the video screen. You can control this behavior explicitly by modifying the `window.offscreenBuffering` property.

The default value of the property is the string `auto`. You can also assign Boolean `true` or `false` to the property to override IE's normal automatic handling of this behavior.

On the CD-ROM

Example on the CD-ROM

`onerror`

Value: Function Read/Writ

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `onerror` property is an exception to the rule of this book to not describe event handlers as properties within object reference sections. The reason is that the `onError` event brings along some special properties that are useful to control by setting the event handler property in scripts.

Recent browsers (IE5+ and NN4+) are designed to prevent script errors from being intrusive if a user encounters a script error while loading or interacting with a page. Even so, even the subtle hints about problems (messages or icons in the statusbar) can be confusing for users who have no idea what JavaScript is. JavaScript lets you turn off the display of script error windows or messages as someone executes a script on your page. The question is: When should you turn off these messages?

Script errors generally mean that something is wrong with your script. The error may be the result of a coding mistake or, conceivably, a bug in JavaScript (perhaps on a platform version of the browser that you haven't been able to test). If such errors occur, often the script won't continue to do what you intended. Hiding the script error from yourself during development would be foolhardy, because you'd never know whether unseen errors are lurking in your code. It can be equally dangerous to turn off error dialog boxes for users who may believe that the page is operating normally, when, in fact, it's not. Some data values may not be calculated or displayed correctly.

That said, I can see some limited instances of when you may want to keep such dialog box windows from appearing. For example, if you know for a fact that a platform-specific bug trips the error message without harming the execution of the script, you may want to prevent that error alert dialog box from appearing in the files posted to your Web site. You should do this only after extensive testing to ensure that the script ultimately behaves correctly, even with the bug or error.

Note

IE fires the `onError` event handler only for runtime errors. This means that if you have a syntactical error in your script that trips the browser as the page loads, the `onError` event doesn't fire, and you cannot trap that error message. Moreover, if the user has the IE script debugger installed, any code you use to prevent browser error messages from appearing will not work.

When the browser starts, the `window.onerror` property is `<undefined>`. In this state, all errors are reported via the normal JavaScript error window or message. To turn off error alerts, set the `window.onerror` property to invoke a function that does absolutely nothing:

```
function doNothing() {return true}
window.onerror = doNothing
```

To restore the error messages, reload the page.

You can, however, also assign a custom function to the `window.onerror` property. This function then handles errors in a more friendly way under your script control. Whenever error messages are turned on (the default behavior), a script error (or Java applet or class exception) invokes the function assigned to the `onerror` property, passing three parameters:

✦ Error message

✦ URL of document causing the error

✦ Line number of the error

You can essentially trap for all errors and handle them with your own interface (or no user notification at all). The last statement of this function must be `return true` if you do not want the JavaScript script error message to appear.

Note

NN6 does not pass error-related parameters to a function invoked by `onError`. This may be an attempt to lure scripters to the more modern `try-catch` error trapping mechanism (see Chapter 39). But it means that NN6 cannot take complete advantage of older error reporting code, including that shown in Listing 16-10.

If you are using LiveConnect to communicate with a Java applet or (in NN3+) to call up Java class methods directly from your scripts, you can use the same scheme to handle any exception that Java may throw. A Java exception is not necessarily a mistake kind of error: Some methods assume that the Java code will trap for exceptions to handle special cases (for example, reacting to a user's denial of access when prompted by a signed script dialog box). See Chapter 44 for an example of trapping for a specific Java exception. Also, see Chapter 39 for JavaScript exception handling introduced for W3C DOM-compatible browsers.

On the CD-ROM

Example (with Figure 16-6 and Listing 16-10) on the CD-ROM

Related Items: `location.reload()` method; JavaScript exception handling (Chapter 39); debugging scripts (Chapter 45).

opener

Value: Window object reference Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	✓	✓	✓	✓	✓

Many scripters make the mistake of thinking that a new browser window created with the `window.open()` method has a child–parent relationship similar to the one that frames have with their parents. That's not the case at all. New browser windows, once created, have a very slim link to the window from whence they came: via the `opener` property. The purpose of the `opener` property is to provide scripts in the new window with valid references back to the original window. For example, the original window may contain some variable values or general-purpose functions that a new window at this Web site wants to use. The original window may also have form elements whose settings are either of value to the new window or get set by user interaction in the new window.

Because the value of the `opener` property is a reference to a genuine `window` object, you can begin references with the property name. Or, you may use the more complete `window.opener` or `self.opener` reference. But the reference must then include some object or property of that original window, such as a window method or a reference to something contained by that window's document.

Although this property was new for Navigator 3 (and was one of the rare Navigator 3 features to be included in Internet Explorer 3), you can make your scripts backward compatible to Navigator 2. For every new window you create, make sure it has an `opener` property as follows:

```
var newWind = window.open()
if (newWind.opener == null) {
    newWind.opener = self
}
```

For Navigator 2, this step adds the `opener` property to the `window` object reference. Then, no matter which version of JavaScript-enabled Navigator the user has, the `opener` property in the new window's scripts points to the desired original window.

If a subwindow opens yet another subwindow, the chain is still valid, albeit one step longer. The third window can reach the main window with a reference that begins:

```
opener.opener....
```

It's a good idea for the third window to store in a global variable the value of `opener.opener` while the page loads. Thus, if the user closes the second window, the variable can be used to start a reference to the main window.

When a script that generates a new window is within a frame, the `opener` property of the subwindow points to that frame. Therefore, if the subwindow needs to communicate with the main window's parent or another frame in the main window, you have to very carefully build a reference to that distant object. For example, if the subwindow needs to get the `checked` property of a checkbox in a sister frame of the one that created the subwindow, the reference is

```
opener.parent.sisterFrameName.document.formName.checkboxName.checked
```

It is a long way to go, indeed, but building such a reference is always a case of mapping out the path from where the script is to where the destination is, step-by-step.

On the CD-ROM

Example (with Figure 16-7 and Listings 16-11 and 16-12) on the CD-ROM

Related Items: `window.open()`, `window.focus()` methods.

outerHeight
outerWidth

See `innerHeight` and `innerWidth`, earlier.

pageXOffset
pageYOffset

Value: Integer Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The top-left corner of the content (inner) region of the browser window is an important geographical point for scrolling documents. When a document is scrolled all the way to the top and flush left in the window (or when a document is small enough to fill the browser window without displaying scrollbars), the document's location is said to be 0,0, meaning zero pixels from the top and zero pixels from the left. If you were to scroll the document, some other coordinate point of the document would be under that top-left corner. That measure is called the page offset, and the `pageXOffset` and `pageYOffset` properties let you read the pixel value of the document at the inner window's top-left corner: `pageXOffset` is the horizontal offset, and `pageYOffset` is the vertical offset.

The value of these measures becomes clear if you design navigation buttons in your pages to carefully control paging of content being displayed in the window. For example, you might have a two-frame page in which one of the frames features navigation controls, while the other displays the primary content. The navigation controls take the place of scrollbars, which, for aesthetic reasons, are turned off in the display frame. Scripts connected to the simulated scrolling buttons can determine the `pageYOffset` value of the document, and then use the `window.scrollTo()` method to position the document precisely to the next logical division in the document for viewing.

IE4+ has corresponding values as `body` object properties: `body.scrollLeft` and `body.scrollTop` (see Chapter 18).

On the CD-ROM

Example (with Listing 16-13) on the CD-ROM

Related Items: `window.innerHeight`, `window.innerWidth`, `body.scrollLeft`, `body.scrollTop` properties; `window.scrollBy()`, `window.scrollTo()` methods.

parent

Value: Window object reference Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `parent` property (and the `top` property that follows later in this section) comes into play primarily when a document is to be displayed as part of a multiframe window. The HTML documents that users see in the frames of a multiframe browser window are distinct from the document that specifies the frameset for the entire window. That document, though still in the browser's memory (and appearing as the URL in the location field of the browser), is not otherwise visible to the user (except in the Source View).

If scripts in your visible documents need to reference objects or properties of the frameset window, you can reference those frameset window items with the `parent` property (do not, however, expand the reference by preceding it with the `window` object, as in `window.parent.`*`propertyName`*, as this causes problems in early browsers). In a way, the `parent` property seems to violate the object hierarchy because, from a single frame's document, the property points to a level seemingly higher in precedence. If you didn't specify the `parent` property or instead specified the `self` property from one of these framed documents, the object reference is to the frame only, rather than to the outermost framesetting `window` object.

A nontraditional but perfectly legal way to use the `parent` object is as a means of storing temporary variables. Thus, you could set up a holding area for individual variable values or even an array of data. These values can then be shared among all documents loaded into the frames, including when documents change inside the frames. You have to be careful, however, when storing data in the parent on the fly (that is in response to user action in the frames). Variables can revert to their default values (that is, the values set by the parent's own script) if the user resizes the window in early browsers.

A child window can also call a function defined in the parent window. The reference for such a function is

```
parent.functionName([parameters])
```

At first glance, it may seem as though the `parent` and `top` properties point to the same framesetting `window` object. In an environment consisting of one frameset window and its immediate children, that's true. But if one of the child windows was, itself, another framesetting window, then you wind up with three generations of windows. From the point of view of the "youngest" child (for example, a window defined by the second frameset), the `parent` property points to its immediate parent, whereas the `top` property points to the first framesetting window in this chain.

On the other hand, a new window created via the `window.open()` method has no parent–child relationship to the original window. The new window's `top` and `parent` point to that new window. You can read more about these relationships in the "Frames" section earlier in this chapter.

On the CD-ROM Example (with Figure 16-8 and Listings 16-14 and 16-15) on the CD-ROM

Related Items: `window.frames`, `window.self`, `window.top` properties.

personalbar

See `directories`.

returnValue

Value: Any data type Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Scripts use the `returnValue` property in a document that loads into the IE-specific modal dialog box. A modal dialog box is generated via the `showModalDialog()` method, which returns whatever data has been assigned to the `returnValue` property of the dialog box window before it closes. This is possible because script processing in the main window freezes while the modal dialog box is visible. As the dialog box closes, a value can be returned to the main window's script right where the modal dialog box was invoked, and the main window's script resumes executing statements.

On the CD-ROM Example on the CD-ROM

Related Items: `showModalDialog()` method.

screen

Value: `screen` Object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Although the `screen` object appears as a property of the `window` object only in the most recent browsers, the `screen` object is also available in NN4 (see Chapter 28), but as a standalone object. Because you can omit any reference to the `window` object for a `window` object's properties, the same window-less reference syntax can be used for compatibility across all browsers that support the `screen` object. That's the way I recommend referring to the `screen` object.

Example

See Chapter 28 for examples of using the `screen` object to determine the video monitor characteristics of the computer running the browser.

Related Items: `screen` object.

screenLeft
screenTop

Value: Integer   Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

IE5+ (but not IE5/Mac) provides the `screenLeft` and `screenTop` properties of the `window` object to let you read the pixel position (relative to the top-left 0,0 coordinate of the video monitor) of what Microsoft calls the *client area* of the browser window. The client area excludes most window chrome, such as the title bar, address bar, and the window sizing bar. Therefore, when the IE5 browser window is maximized (meaning that no sizing bars are exposed), the `screenLeft` property of the window is 0, while the `screenTop` property varies depending on the combination of toolbars the user has elected to display. For non-maximized windows, if the window has been positioned so that the top and/or left part of the client area are out of view, their property values will be negative integers.

These two properties are read-only. You can position the browser window via the `window.moveTo()` and `window.moveBy()` methods, but these methods position the top-left corner of the entire browser window, not the client area. IE browsers, through version 5.5, do not provide properties for the position of the entire browser window.

On the CD-ROM

Example on the CD-ROM

Related Items: `window.moveTo()`, `window.moveBy()` methods.

screenX
screenY

Value: Integer   Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

NN6 provides the `screenX` and `screenY` properties to read the position of the outer boundary of the browser window relative to the top-left coordinates (0,0) of the video monitor. The browser window includes the four-pixel wide window sizing bars that surround Win32 windows. Therefore, when the NN6/Win32 browser window is maximized, the values for both `screenX` and `screenY` are `-4`. Netscape does not provide the equivalent measures of the browser window client area as found in the `screenLeft` and `screenTop` properties of IE5. You can, however, find out if various toolbars are visible in the browser window (see `window.directories`).

Both properties can be changed by script to alter the location of the window, but the `window.moveTo()` and `window.moveBy()` methods are more convenient, because only one statement is needed to handle both coordinates.

Example on the CD-ROM

Related Items: `window.moveTo()`, `window.moveBy()` methods.

scrollbars

See `directories`.

scrollX
scrollY

Value: Integer   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 `scrollX` and `scrollY` properties let you determine the horizontal and vertical scrolling of a window. Scrolling is possible only if the window displays scrollbars along the desired axis. Values are pixel integers.

While the IE DOM does not provide similar properties for the window, the same information can be derived from the `body.scrollLeft` and `body.scrollTop` properties.

Example on the CD-ROM

Related Items: `body.scrollLeft`, `body.scrollTop` properties.

self

Value: Window object reference Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Just as the `window` object reference is optional, so too is the `self` property when the object reference points to the same window as the one containing the reference. In what may seem to be an unusual construction, the `self` property represents the same object as the `window`. For instance, to obtain the title of the document in a single-frame window, you can use any of the following three constructions:

```
window.document.title
self.document.title
document.title
```

Although `self` is a property of a window, you should not combine the references within a single-frame window script (for example, don't begin a reference with `window.self`, which has been known to cause numerous scripting problems). Specifying the `self` property, though optional for single-frame windows, can help make an object reference crystal clear to someone reading your code (and to you, for that matter). Multiple-frame windows are where you need to pay particular attention to this property.

JavaScript is pretty smart about references to a statement's own window. Therefore, you can generally omit the `self` part of a reference to a same-window document element. But when you intend to display a document in a multiframe window, complete references (including the `self` prefix) to an object make it much easier on anyone who reads or debugs your code to track who is doing what to whom. You are free to retrieve the `self` property of any window. The value that comes back is a `window` object reference.

On the CD-ROM

Example (with Listing 16-16) on the CD-ROM

Related Items: `window.frames`, `window.parent`, `window.top` properties.

sidebar

See `appCore`.

status

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

At the bottom of the browser window is a statusbar. Part of that bar includes an area that normally discloses the document loading progress or the URL of a link that the mouse is pointing to at any given instant. You can control the temporary content of that field by assigning a text string to the `window` object's `status` property (Figure 16-9). You should adjust the `status` property only in response to events that have a temporary effect, such as a link or image map area object's `onMouseOver` event handler. When the `status` property is set in this situation, it overrides any other setting in the statusbar. If the user then moves the mouse pointer away from the object that changes the statusbar, the bar returns to its default setting (which may be empty on some pages).

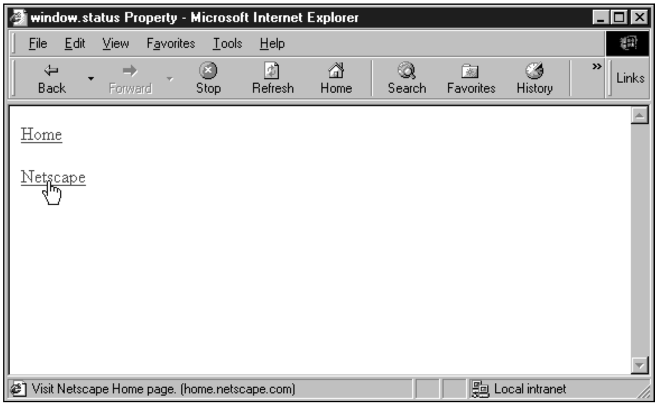

Figure 16-9: The statusbar can be set to display a custom message when the pointer rolls over a link.

Use this window property as a friendlier alternative to displaying the URL of a link as a user rolls the mouse around the page. For example, if you'd rather use the statusbar to explain the nature of the destination of a link, put that text into the statusbar in response to the `onMouseOver` event handler. But be aware that experienced Web surfers like to see URLs down there. Therefore, consider creating a hybrid message for the statusbar that includes both a friendly description followed by the URL in parentheses. In multiframe environments, you can set the `window.status` property without having to worry about referencing the individual frame.

On the CD-ROM Example (with Listings 16-17, 16-18, and 16-19) on the CD-ROM

Related Items: `window.defaultStatus` property; `onMouseOver`, `onMouseOut` event handlers; `link` object.

statusbar
toolbar

See `locationbar`.

top

Value: Window object refererence Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `window` object's `top` property refers to the topmost window in the document object hierarchy. For a single-frame window, the reference is to the same object as the window itself (including the `self` and `parent` properties), so do not include `window` as part of the reference. In a multiframe window, the top window is the one that defines the first frameset (in case of nested framesets). Users don't ever really see the top window in a multiframe environment, but the browser stores it as an object in its memory. The reason is that the top window has the road map to the other frames (if one frame should need to reference an object in a different frame), and its children frames can call upon it. Such a reference looks like

```
top.functionName([parameters])
```

For more about the distinction between the `top` and `parent` properties, see the in-depth discussion about scripting frames at the beginning of this chapter. See also the example of the `parent` property for listings that demonstrate the values of the `top` property.

Related Items: `window.frames`, `window.self`, `window.parent` properties.

window

Value: Window object Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Listing the `window` property as a separate property may be more confusing than helpful. The `window` property is the same object as the `window` object. You do not need to use a reference that begins with `window.window`. Although the `window` object is assumed for many references, you can use `window` as part of a reference to items in the same window or frame as the script statement that makes that reference. You should not, however, use `window` as a part of a reference involving items higher up in the hierarchy (`top` or `parent`).

Methods

`alert("message")`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

An alert dialog box is a modal window that presents a message to the user with a single OK button to dismiss the dialog box. As long as the alert dialog box is showing, no other application or window can be made active. The user must dismiss the dialog box before proceeding with any more work in the browser.

The single parameter to the `alert()` method can be a value of any data type, including representations of some unusual data types whose values you don't normally work with in JavaScript (such as complete objects). This makes the alert dialog box a handy tool for debugging JavaScript scripts. Anytime you want to monitor the value of an expression, use that expression as the parameter to a temporary `alert()` method in your code. The script proceeds to that point and then stops to show you the value. (See Chapter 45 for more tips on debugging scripts.)

What is often disturbing to application designers is that all JavaScript-created modal dialog boxes (via the `alert()`, `confirm()`, and `prompt()` methods) identify themselves as being generated by JavaScript or the browser. The look is particularly annoying in browsers before NN4 and IE4, because the wording appears directly in the dialog box's content area, rather than in the title bar of the dialog box. The purpose of this identification is to act as a security precaution against unscrupulous scripters who might try to spoof system or browser alert dialog boxes, inviting a user to reveal passwords or other private information. These identifying words cannot be overwritten or eliminated by your scripts. You can simulate a modal dialog box window in a cross-browser fashion (see an article at `http://developer.netscape.com/viewsource/goodman_modal/goodman_modal.html`), but it is not as robust as a genuine modal window, which you can create in IE4+ via the `window.showModalDialog()` method.

Because the `alert()` method is of a global nature (that is, no particular frame in a multiframe environment derives any benefit from laying claim to the alert dialog box), a common practice is to omit all `window` object references from the statement that calls the method. Restrict the use of alert dialog boxes in your HTML documents and site designs. The modality of the windows is disruptive to the flow of a user's navigation around your pages. Communicate with users via forms or by writing to separate document window frames.

On the CD-ROM

Example (with Figure 16-10 and Listing 16-20) on the CD-ROM

Related Items: `window.confirm()`, `window.prompt()` methods.

back()
forward()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The purpose of the `window.back()` and `window.forward()` methods in NN4 is to offer a scripted version of the global back and forward navigation buttons, while allowing the `history` object to control navigation strictly within a particular window or frame—as it should. These window methods did not catch on in IE (and the `window` object is out of the scope of the W3C DOM Level 2), so you are better off staying with the `history` object's methods for navigating through browser history. For more information about version compatibility and the back and forward navigation, see the `history` object in Chapter 17.

On the CD-ROM

Example on the CD-ROM

Related Items: `history.back()`, `history.forward()`, `history.go()` methods.

captureEvents(*eventTypeList*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

In Navigator 4, an event filters down from the `window` object and eventually reaches its intended target. For example, if you click a button, the click event first reaches the `window` object; then it goes to the `document` object; and eventually (in a split second) it reaches the button, where an `onClick` event handler is ready to act on that click.

The NN4 "trickle-down" event propagation mechanism allows window, document, and layer objects to intercept events and process them prior to reaching their intended targets (or preventing them from reaching their destinations entirely). But for one of these outer containers to grab an event, your script must instruct it to capture the type of event your application is interested in preprocessing. If you want the `window` object to intercept all events of a particular type, use the `window.captureEvents()` method to turn that facility on.

Note

NN6 (and future browsers that implement the W3C DOM event model) has both a trickle-down and bubble-up event model combination. The syntax for using event capture in NN6 is quite different from that in NN4. The discussions of the `captureEvents()`, `releaseEvents()`, `handleEvent()`, and `routeEvent()` methods of the `window`, `document`, and layer objects apply only to Navigator 4. If your DHTML page design does not need to support NN4, you can skip these discussions.

The `window.captureEvents()` method takes one or more event types as parameters. An event type is a constant value built inside the Navigator 4 `Event` object. One event type exists for every kind of event handler you see in all of the Navigator 4 document objects. The syntax is the event object name (`Event`) and the event name in all uppercase letters. For example, if you want the window to intercept all click events, the statement is

```
window.captureEvents(Event.CLICK)
```

For multiple events, add them as parameters, separated by the pipe (`|`) character:

```
window.captureEvents(Event.MOUSEDOWN | Event.KEYPRESS)
```

After an event type is captured by the `window` object, a function must be ready to deal with the event. For example, perhaps the function looks through all `Event.MOUSEDOWN` events and looks to see if the right mouse button was the one that triggered the event and what form element (if any) is the intended target. The goal is to perhaps display a pop-up menu (as a separate layer) for a right-click. If the click comes from the left mouse button, the event is routed to its intended target.

To associate a function with a particular event type captured by a `window` object, assign a function to the event. For example, to assign a custom `doClickEvent()` function to `click` events captured by the `window` object, use the following statement:

```
window.onclick=doClickEvent
```

Note that the function name is assigned only as a reference name (no quotes or parentheses), not like an event handler within a tag. The function itself is like any function, but it has the added benefit of automatically receiving an instance of the `Event` object as a parameter. To turn off event capture for one or more event types, use the `window.releaseEvent()` method.

Note

Capturing events at the `window`, `document`, or layer level in NN4 does not always work the way you might like. This is especially true if your page contains tables. For example, capturing mouse events has no effect in the Windows version of NN4 unless the cursor is atop a cell border. Event capture works most reliably when a scriptable object has an event handler defined for it (even if it is an empty string) and the element is the target of the event (for example, you are about to type into a text field). For all other elements, events may simply not be captured at the document or window level.

On the CD-ROM

Example (with Listing 16-21) on the CD-ROM

Related Items: `window.disableExternalCapture()`, `window.enableExternalCapture()`, `window.handleEvent()`, `window.releaseEvents()`, `window.routeEvent()` methods.

`clearInterval(`*`intervalIDnumber`*`)`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Use the `window.clearInterval()` method to turn off an interval loop action started with the `window.setInterval()` method. The parameter is the ID number returned by the `setInterval()` method. A common application for the JavaScript interval mechanism is animation of an object on a page. If you have multiple intervals running, each has its own ID value in memory. You can turn off any interval by its ID value. As soon as an interval loop stops, your script cannot resume that interval: It must start a new one, which generates a new ID value.

On the CD-ROM

Example on the CD-ROM

Related Items: `window.setInterval()`, `window.setTimeout()`, `window.clearTimeout()` methods.

`clearTimeout(`*`timeoutIDnumber`*`)`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Use the `window.clearTimeout()` method in concert with the `window.setTimeout()` method, as described later in this chapter, when you want your script to cancel a timer that is waiting to run its expression. The parameter for this method is the ID number that the `window.setTimeout()` method returns when the timer starts ticking. The `clearTimeout()` method cancels the specified timeout. A good practice is to check your code for instances where user action may negate the need for a running timer — and to stop that timer before it goes off.

Example (with Figure 16-11 and Listing 16-22) on the CD-ROM

Related Items: `window.setTimeout()` method.

close()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `window.close()` method closes the browser window referenced by the `window` object. Most likely, you will use this method to close subwindows created from a main document window. If the call to close the window comes from a window other than the new subwindow, the original `window` object must maintain a record of the subwindow object. You accomplish this by storing the value returned from the `window.open()` method in a global variable that will be available to other objects later (for example, a variable not initialized inside a function). If, on the other hand, an object inside the new subwindow calls the `window.close()` method, the `window` or `self` reference is sufficient.

Be sure to include a window as part of the reference to this method. Failure to do so may cause JavaScript to regard the statement as a `document.close()` method, which has different behavior (see Chapter 18). Only the `window.close()` method can close the window via a script. Closing a window, of course, forces the window to trigger an `onUnload` event handler before the window disappears from view; but after you've initiated the `window.close()` method, you cannot stop it from completing its task. Moreover, `onUnload` event handlers that attempt to execute time-consuming processes (such as submitting a form in the closing window) may not complete because the window can easily close before the process completes — a behavior that has no workaround (with the exception of the `onBeforeUnload` event handler in IE4+).

While I'm on the subject of closing windows, a special case exists when a subwindow tries to close the main window (via a statement such as `self.opener.close()`) when the main window has more than one entry in its session history. As a safety precaution against scripts closing windows they did not create, NN3+ and IE4+ ask the user whether he or she wants the main window to close (via a browser-generated dialog box). This security precaution cannot be overridden except in NN4+ via a signed script when the user grants permission to control the browser (Chapter 46).

Example on the CD-ROM

Related Items: `window.open()`, `document.close()` methods.

confirm("*message*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A confirm dialog box presents a message in a modal dialog box along with OK and Cancel buttons. Such a dialog box can be used to ask a question of the user, usually prior to a script performing actions that will not be undoable. Querying a user about proceeding with typical Web navigation in response to user interaction on a form element is generally a disruptive waste of the user's time and attention. But for operations that may reveal a user's identity or send form data to a server, a JavaScript confirm dialog box may make a great deal of sense. Users can also accidentally click buttons, so you should provide avenues for backing out of an operation before it executes.

Because this dialog box returns a Boolean value (OK = `true`; Cancel = `false`), you can use this method as a comparison expression or as an assignment expression. In a comparison expression, you nest the method within any other statement where a Boolean value is required. For example:

```
if (confirm("Are you sure?")) {
    alert("OK")
} else {
    alert("Not OK")
}
```

Here, the returned value of the confirm dialog box provides the desired Boolean value type for the `if...else` construction (Chapter 39).

This method can also appear on the right side of an assignment expression, as in

```
var adult = confirm("You certify that you are over 18 years old?")
if (adult) {
    //statements for adults
} else {
    //statements for children
}
```

You cannot specify other alert icons or labels for the two buttons in JavaScript confirm dialog box windows.

Tip

Be careful how you word the question in the confirm dialog box. In Navigator 2 and 3, the buttons are labeled OK and Cancel in Windows browsers; the Mac versions, however, label the buttons Yes and No. If your visitors may be using older Mac Navigators, be sure your questions are logically answered with both sets of button labels.

On the CD-ROM

Example (with Figure 16-12 and Listing 16-23) on the CD-ROM

Related Items: `window.alert()`, `window.prompt()`, `form.submit()` methods.

createPopup()

Returns: Popup Object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

An IE pop-up window is a chrome-less rectangular space that overlaps the current window. Unlike the dialog boxes generated by the `showModalDialog()` and `showModelessDialog()` methods, the pop-up window's entire content must be explicitly controlled by script. That also goes for the size and location of the window. Generating the window via the `createPopup()` method simply creates the object in memory without displaying it. You can then use the reference to the pop-up window that is returned by the method to position the window, populate its content, and make it visible. See details in the description of the `popup` object later in this chapter.

On the CD-ROM

Example on the CD-ROM

Related Items: `popup` object.

disableExternalCapture()
enableExternalCapture()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

NN4 security restrictions prevent one frame from monitoring events in another frame (when a different domain is in that second frame) unless the user has granted permission to a signed script. Controlling this cross-frame access requires two special `window` object methods: `enableExternalCapture()` and `disableExternalCapture()`.

Putting these methods to work is a little trickier than manipulating the regular `window.captureEvents()` method. You have to turn on external capture in the frame doing the capture, but then set `captureEvents()` and the event handler in the frame whose events you want to capture. Moreover, when a new document loads into the second frame, you must set the `captureEvents()` and event handler for that frame again. See Chapter 46 for details about signed scripts.

On the CD-ROM Example on the CD-ROM

Related Items: `window.captureEvents()` method; `event` object; signed scripts (Chapter 46).

execScript("*exprList*"[, *language*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `window.execScript()` method executes one or more script statements that are passed as string expressions. The first parameter is a string version of one or more script statements (multiple statements must be separated by semicolons). The second, optional parameter is the language interpreter the browser should use to execute the script statement. Acceptable values for the language are `JavaScript`, `JScript`, `VBS`, and `VBScript`. The default value is `JScript`, so you can omit the second parameter when supplying expressions in JavaScript.

Unlike the JavaScript core language `eval()` function (which also executes string versions of JavaScript statements), the `execScript()` method returns no values. Even so, the method operates within the global variable space of the window holding the current document. For example, if a document's script declares a global variable as follows

```
var myVar
```

the `execScript()` method can read or write to that variable:

```
window.execScript("myVar = 10; myVar += 5")
```

After the above statement runs, the global variable `myVar` has a value of 15.

On the CD-ROM Example on the CD-ROM

Related Items: `eval()` function.

`find(["`*`searchString`*`" [, `*`matchCaseBoolean`*`, `*`searchUpBoolean`*`]])`

Returns: Boolean value for nondialog searches.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The NN4-specific `window.find()` method mimics the powers of the browser's Find dialog box, accessible from the Find button in the toolbar.

If you specify no parameters, the browser's Find dialog box appears, just as if the user had clicked the Find button in the toolbar. With no parameters, this function does not return a value.

You can specify a search string as a parameter to the function. The search is based on simple string matching and is not in any way connected with the regular expression kind of search (see Chapter 38). If the search finds a match, the browser scrolls to that matching word and highlights the word, just as if using the browser's own Find dialog box. The function also returns a Boolean `true` after a match is found. If no match is found in the document or no more matches occur in the current search direction (the default direction is from top to bottom), the function returns `false`.

Two optional Boolean parameters to the scripted find action let you specify whether the search should be case-sensitive and whether the search direction should be upward from the bottom of the document. These choices are identical to the ones that appear in the NN4's Find dialog box. Default behavior is case-insensitive and searches from top to bottom. If you specify any one of these two optional parameters, you must specify both of them.

IE4+ also has a text search facility, but it is implemented in an entirely different way (using the `TextRange` object described in Chapter 19). The visual behavior also differs in that it does not highlight and scroll to a matching string in the text.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange`, `Range` objects (Chapter 19).

`forward()`

See `window.blur()`.

GetAttention()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

While the `window.GetAttention()` method is intended for use more by programmers of NN6 user interface themes than by scripters, the object model nevertheless exposes the method to scripters. The purpose of the method is to alert the user that the browser needs attention when the browser is not the frontmost application on the desktop. Each operating system has a different way of signalling this attention to users. Windows flashes the Taskbar rectangle for the browser window needing attention; the MacOS beeps and places a bullet next to the application's name in the Application menu. If the browser window is already the frontmost window on the desktop, then no signals flash or beep.

It is highly unlikely that you would design a script that runs long enough for the user to need to switch to another application. But you might have some scripted mechanism (using the `setTimeout()` method described later in this chapter) that signals the user if the page has no activity for a set number of minutes.

On the CD-ROM

Example on the CD-ROM

handleEvent(*event*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

When you explicitly capture events in the NN4 `window`, `document`, or layer object (by invoking the `captureEvents()` method for that object), you can control where the events go after their initial capture. To let an event continue to its original target (for example, a button that was clicked by a user), you use the `routeEvent()` method. But if you want to redirect an event (or class of events) to a particular event handler elsewhere in the document, use the `handleEvent()` method.

Every NN4 object that has event handlers associated with it also has a `handleEvent()` method. Thus, if you are capturing click events in a window, you can redirect the events to, say, a particular button or link on the page because both of those objects know what to do with click events. Consider the following code excerpt:

```
<SCRIPT LANGUAGE="JavaScript">
// function to run when window captures a click event
function doClicks(evt) {
    // send all clicks to the first link in the document
    document.links[0].handleEvent(evt)
}
// set window to capture click events
window.captureEvents(Event.CLICK)
// assign doClick() function to click events captured by window
window.onclick = doClicks
</SCRIPT>
```

The window is set up to capture all click events and invoke the `doClicks()` function each time the user clicks a clickable item in the window. In the `doClicks()` function is a single statement that instructs the first link in the document to handle the click event being passed as a parameter. The link must have an `onClick` event handler defined for this to be meaningful. Because an `event` object is passed along automatically, the link's event handler can examine event properties (for example, location of the click) and perhaps alter some of the link's properties before letting it perform its linking task. The preceding example is really showing how to use `handleEvent()` with a `link` object, rather than a `window` object. There is little opportunity for other objects to capture events that normally go to the window, but this method is part of every event-aware object in NN4.

The corresponding method in the W3C event model's capture mechanism is `dispatchEvent()`, and the IE5+ equivalent is `fireEvent()`.

Example

See Chapter 29 for details and in-depth examples of working with event objects.

Related Items: `window.captureEvents()`, `window.releaseEvents()`, `window.routeEvent()` methods; `event` object.

home()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Like many of the window methods new to Navigator 4, the `window.home()` method provides an NN-specific scripted way of replicating the action of a toolbar button: the Home button. The action navigates the browser to whatever URL is set in the browser preferences for home page location. You cannot control the default home page of a visitor's browser.

Related Items: `window.back()`, `window.forward()` methods; `window.toolbar` property.

moveBy(*deltaX,deltaY*)
moveTo(*x,y*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

In IE4+ and NN4+, JavaScript can adjust the location of a browser window on the screen. This applies to the main window or any subwindow generated by script. Netscape regards the possibility of a window moved out of screen view as a potential security hole, so signed scripts are needed in NN4+ to move a window off screen.

You can move a window to an absolute position on the screen or adjust it along the horizontal and/or vertical axis by any number of pixels, irrespective of the absolute pixel position. The coordinate space for the x (horizontal) and y (vertical) position is the entire screen, with the top-left corner representing 0,0. The point of the window you set with the `moveBy()` and `moveTo()` methods is the very top-left corner of the outer edge of the browser window. Therefore, when you move the window to point 0,0, that sets the window flush with the top-left corner of the screen. This may not be the equivalent of a truly maximized window for all browsers and operating systems, however, because a maximized window's coordinates may be negative by a handful of pixels.

If you try to adjust the position of the window in NN4 such that any edge falls beyond the screen area, the window remains at the edge of the screen — unless you are using a signed script and have the user's permission to adjust the window partially or completely off screen. Moving the only visible browser window entirely off screen is dangerous because the user has no way to get it back into view without quitting and relaunching the browser.

The difference between the `moveTo()` and `moveBy()` methods is that one is an absolute move, while the other is relative with respect to the current window position. Parameters you specify for `moveTo()` are the precise horizontal and vertical pixel counts on the screen where you want the upper-left corner of the window to appear. In contrast, the parameters for `moveBy()` indicate how far to adjust the window location in either direction. If you want to move the window 25 pixels to the right, you must still include both parameters, but the y value will be zero:

```
window.moveBy(25,0)
```

To move to the left, the first parameter must be a negative number.

On the CD-ROM

Example (with Listing 16-24) on the CD-ROM

Related Items: `window.outerHeight`, `window.outerWidth` properties; `window.resizeBy()`, `window.resizeTo()` methods.

navigate("*URL*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility					✓	✓	✓	✓	✓

The `window.navigate()` method is an IE-specific method that lets you load a new document into a window or frame. This method's action is the same as assigning a URL to the `location.href` property—a property that is available on all scriptable NN and IE browsers. If your audience is entirely IE-based, then this method is safe. Otherwise, I recommend the `location.href` property as the best navigation approach.

On the CD-ROM

Example on the CD-ROM

Related Items: `location` object.

open("*URL*", "*windowName*" [, "*windowFeatures*"][,*replaceFlag*])

Returns: A window object representing the newly created window; `null` if method fails.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

With the `window.open()` method, a script provides a Web site designer with an immense range of options for the way a second or third Web browser window looks on the user's computer screen. Moreover, most of this control can work with all JavaScript-enabled browsers without the need for signed scripts. Because the interface elements of a new window are easier to envision, I cover those aspects of the `window.open()` method parameters first.

Setting new window features

The optional *`windowFeatures`* parameter is one string, consisting of a comma-separated list of assignment expressions (behaving something like HTML tag attributes). **Important:** For the best browser compatibility, do not put spaces after the commas. If you omit the third parameter, JavaScript creates the same type of new window you get from the New Web Browser menu choice in the File menu. But you can control which window elements appear in the new window with the third parameter. Remember this important rule: If you specify even one of the method's original set of third parameter values, all other features are turned off unless the parameters specify the features to be switched on. Table 16-3 lists the attributes that you can control for a newly created window in all browsers. Except where noted, all Boolean values default to `yes` if you do not specify the third parameter.

Table 16-3 window.open() Method Attributes Controllable via Script

Attribute	*Browsers*	*Description*
`alwaysLowered`[3]	NN4+	(Boolean) Always behind other browser windows
`alwaysRaised`[3]	NN4+	(Boolean) Always in front of other browser windows
`channelmode`	IE4+	(Boolean) Theater mode with channel band (default is `no`)
`copyhistory`	NN2+, IE3+	(Boolean) Duplicates Go menu history for new window
`dependent`	NN4+	(Boolean) Subwindow closes if the opener window closes
`directories`	NN2+, IE3+	(Boolean) "What's New" and other buttons in the row
`fullscreen`	IE4+	(Boolean) No title bar or menus (default is `no`)
`height`	NN2+, IE3+	(Integer) Content region height in pixels
`hotkeys`	NN4+	(Boolean) If `true`, disables menu shortcuts (except Quit and Security Info) when menubar is turned off
`innerHeight`[4]	NN4+	(Integer) Content region height; same as old `height` property
`innerWidth`[4]	NN4+	(Integer) Content region width; same as old `width` property
`left`	IE4+	(Integer) Horizontal position of top-left corner on screen
`location`	NN2+, IE3+	(Boolean) Field displaying the current URL
`menubar`[1]	NN2+, IE3+	(Boolean) Menubar at top of window
`outerHeight`[4]	NN4+	(Integer) Visible window height
`outerWidth`[4]	NN4+	(Integer) Visible window width
`resizable`[2]	NN2+, IE3+	(Boolean) Interface elements that allow resizing by dragging
`screenX`[4]	NN4+	(Integer) Horizontal position of top-left corner on screen
`screenY`[4]	NN4+	(Integer) Vertical position of top-left corner on screen
`scrollbars`	NN2+, IE3+	(Boolean) Displays scrollbars if document is larger than window

Attribute	Browsers	Description
`status`	NN2+, IE3+	(Boolean) Statusbar at bottom of window
`titlebar`[3]	NN4+	(Boolean) Title bar and all other border elements
`title`	IE5	(Boolean) Title bar
`toolbar`	NN2+, IE3+	(Boolean) "Back," "Forward," and other buttons in the row
`top`	IE4+	(Integer) Horizontal position of top-left corner on screen
`width`	NN2+, IE3+	(Integer) Content region width in pixels
`z-lock`[3]	NN4+	(Boolean) Window layer is fixed below browser windows

1 Not on Macintosh because the menubar is not in the browser window; when off in NN4/Mac, displays an abbreviated Mac menubar.

2 Macintosh windows are always resizable.

3 Requires a signed script.

4 Requires a signed script to size or position a window beyond safe threshold.

Boolean values are handled a bit differently than you might expect. The value for `true` can be either `yes`, `1`, or just the feature name by itself; for `false`, use a value of `no` or `0`. If you omit any Boolean attributes, they are rendered as `false`. Therefore, if you want to create a new window that shows only the toolbar and statusbar and is resizable, the method looks like this:

```
window.open("newURL","NewWindow", "toolbar,status,resizable")
```

A new window that does not specify the height and width is set to the default size of the browser window that the browser creates from a File menu's New Web Browser command. In other words, a new window does not automatically inherit the size of the window making the `window.open()` method call. A new window created via a script is positioned somewhat arbitrarily, unless you use the window positioning attributes available in NN4+ and IE4+. Notice that the position attributes are different for each browser (`screenX` and `screenY` for NN; `left` and `top` for IE). You can include both sets of attributes in a single parameter string because the browser ignores attributes it doesn't recognize.

Netscape-only signed scripts

Many NN-specific attributes are deemed to be security risks and thus require signed scripts and the user's permission before they are recognized. If the user fails to grant permission, the secure parameter is ignored.

A couple of these attributes have different behaviors on different operating system platforms, due to the way the systems manage their application windows. For example, the `alwaysLowered`, `alwaysRaised`, and `z-locked` styles can exist in layers that range behind Navigator's own windows in the Windows platform; on the Mac, however, such windows are confined to the levels occupied by Navigator. The difference is that Windows allows windows from multiple applications to interleave each other, while the Mac keeps each application's windows in contiguous layers.

To apply signed scripts to opening a new window with the secure window features, you must enable `UniversalBrowserWrite` privileges as you do for other signed scripts (see Chapter 46). A code fragment that generates an `alwaysRaised` style window follows:

```
<SCRIPT LANGUAGE="JavaScript" ARCHIVE="myJar.jar" ID="1">
function newRaisedWindow() {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    var newWindow = window.open("","","HEIGHT=100,WIDTH=300,alwaysRaised")
    netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserWrite")
    var newContent = "<HTML><BODY><B> "On top of spaghetti!"</B>"
    newContent += "<FORM><CENTER><INPUT TYPE='button' VALUE='OK'"
    newContent += "onClick='self.close()'></CENTER></FORM></BODY></HTML>"
    newWindow.document.write(newContent)
    newWindow.document.close()
}
</SCRIPT>
```

You can experiment with the look and behavior of new windows with any combination of attributes with the help of the script in Listing 16-25. This page presents a table of all NN-specific new window Boolean attributes and creates a new 300×300 pixel window based on your choices. This page assumes that if you are using NN4, you have codebase principals turned on for signed scripts (see Chapter 46).

Be careful with turning off the title bar and hotkeys. With the title bar off, the content appears to float in space, because absolutely no borders are displayed. With hotkeys still turned on, you can use Ctrl+W to close this borderless window (except on the Mac, for which the hotkeys are always disabled with the title bar off). This is how you can turn a computer into a kiosk by sizing a window to the screen's dimensions and setting the window options to `"titlebar=no,hotkeys=no, alwaysRaised=yes"`.

Listing 16-25: **New Window Laboratory**

```
<HTML>
<HEAD>
<TITLE>window.open() Options</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var isNav4 = (navigator.appName == "Netscape" &&
navigator.appVersion.charAt(0) >= 4) ? true : false

function makeNewWind(form) {
    if (isNav4) {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    }
    var attr = "HEIGHT=300,WIDTH=300"
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].type == "checkbox") {
            attr += "," + form.elements[i].name + "="
            attr += (form.elements[i].checked) ? "yes" : "no"
        }
    }
    var newWind = window.open("bofright.htm","subwindow",attr)
    if (isNav4) {
```

```
netscape.security.PrivilegeManager.revertPrivilege("UniversalBrowserWrite")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<B>Select new window options:</B>
<TABLE BORDER=2>
<TR>
    <TD COLSPAN=2 BGCOLOR="yellow" ALIGN="middle">All Browsers Features:</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="toolbar">toolbar</TD>
    <TD><INPUT TYPE="checkbox" NAME="location">location</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="directories">directories</TD>
    <TD><INPUT TYPE="checkbox" NAME="status">status</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="menubar">menubar</TD>
    <TD><INPUT TYPE="checkbox" NAME="scrollbars">scrollbars</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="resizable">resizable</TD>
    <TD><INPUT TYPE="checkbox" NAME="copyhistory">copyhistory</TD>
</TR>
<TR>
    <TD COLSPAN=2 BGCOLOR="yellow" ALIGN="middle">Communicator Features:</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="alwaysLowered">alwaysLowered</TD>
    <TD><INPUT TYPE="checkbox" NAME="alwaysRaised">alwaysRaised</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="dependent">dependent</TD>
    <TD><INPUT TYPE="checkbox" NAME="hotkeys" CHECKED>hotkeys</TD>
</TR>
<TR>
    <TD><INPUT TYPE="checkbox" NAME="titlebar" CHECKED>titlebar</TD>
    <TD><INPUT TYPE="checkbox" NAME="z-lock">z-lock</TD>
</TR>
<TR>
    <TD COLSPAN=2 ALIGN="middle"><INPUT TYPE="button" NAME="forAll"
    VALUE="Make New Window" onClick="makeNewWind(this.form)"></TD>
</TR>
</TABLE>
<BR>
</FORM>
</BODY>
</HTML>
```

Specifying a window name

Getting back to the other parameters of `window.open()`, the second parameter is the name for the new window. Don't confuse this parameter with the document's title, which would normally be set by whatever HTML text determines the content of the window. A window name must be the same style of one-word identifier that you use for other object names and variables. This name is also an entirely different entity than the `window` object that the `open()` method returns. You don't use the name in your scripts. At most, the name can be used for `TARGET` attributes of links and forms.

Loading content into a new window

A script generally populates a window with one of two kinds of information:

✦ An existing HTML document whose URL is known beforehand

✦ An HTML page created on the fly

To create a new window that displays an existing HTML document, supply the URL as the first parameter of the `window.open()` method. If your page is having difficulty loading a URL into a new page (except as noted in the sidebar "A Navigator 2 Bug Workaround"), try specifying the complete URL of the target document (instead of just the filename).

Leaving the first parameter as an empty string forces the window to open with a blank document, ready to have HTML written to it by your script (or loaded separately by another statement that sets that window's location to a specific URL). If you plan to write the content of the window on the fly, assemble your HTML content as one long string value and then use the `document.write()` method to post that content to the new window. If you plan to append no further writing to the page, also include a `document.close()` method at the end to tell the browser that you're finished with the layout (so that the `Layout:Complete` or `Done` message appears in the statusbar, if your new window has one).

A call to the `window.open()` method returns a reference to the new window's object if the window opens successfully. This value is vitally important if your script needs to address elements of that new window (such as when writing to its document).

To allow other functions in your script to reference the subwindow, you should assign the result of a `window.open()` method to a global variable. Before writing to the new window the first time, test the variable to make sure that it is not a `null` value — the window may have failed to open because of low memory, for instance. If everything is okay, you can use that variable as the beginning of a reference to any property or object within the new window. For example:

```
var newWindow
...
function createNewWindow() {
    newWindow = window.open("","")
    if (newWindow != null) {
        newWindow.document.write("<HTML><HEAD><TITLE>Hi!</TITLE></HEAD>")
    }
}
```

That global variable reference continues to be available for another function that perhaps closes the subwindow (via the `close()` method).

A Navigator 2 Bug Workaround

If you're concerned about backward compatibility with Navigator 2, you should be aware of a bug in the Macintosh and UNIX flavors of the browser. In those versions, if you include a URL as a parameter to `window.open()`, Navigator opens the window but does not load the URL. A second call to the `window.open()` method is required. Moreover, the second parameter must be an empty string if you add any third-parameter settings. Here is a sample listing you can adapt for your own usage:

```
<HTML>
<HEAD>
<TITLE>New Window</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// workaround for window.open() bug on X and Mac platforms
function makeNewWindow() {
    var newWindow =

window.open("http://www.dannyg.com","","status,height=200,width=300")
    if (parseInt(navigator.appVersion) == 2 && navigator.appName ==
"Netscape") {
        newWindow =

window.open("http://www.dannyg.com","","status,height=200,width=300")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="button" NAME="newOne" VALUE="Create New Window"
onClick="makeNewWindow()">
</FORM>
</BODY>
</HTML>
```

This workaround can also be used without penalty in Windows versions of Navigator.

When scripts in the subwindow need to communicate with objects and scripts in the originating window, you must make sure that the subwindow has an `opener` property if the level of JavaScript in the visitor's browser doesn't automatically supply one. See the discussion about the `window.opener` property earlier in this chapter.

Invoking multiple `window.open()` methods with the same window name parameter (the second parameter) does not create additional copies of that window in Netscape browsers (although it does in Internet Explorer). JavaScript prevents you from creating two windows with the same name. Also be aware that a `window.open()` method does not bring an existing window of that name to the front of the window layers: Use `window.focus()` for that.

Internet Explorer idiosyncracies

Creating subwindows in IE can be complicated at times by undesirable behavior by the browser. One of the most common problems occurs when you attempt to use `document.write()` to put content into a newly created window. IE, including some of the latest versions, fails to complete the window opening job before the script statement that uses `document.write()` executes. This causes a script error because the reference to the subwindow is not yet valid. To work around this, you should put the HTML assembly and `document.write()` statements in a separate function that gets invoked via a `setTimeout()` method after the window is created. You can see an example of this in Listing 16-26.

Another problem that affects IE is the occasional security violation ("access denied") warning when a script attempts to access a subwindow. This problem goes away when the page that includes the script for opening and accessing the subwindow is served from an http server, rather than accessed from a local hard disk.

Finally, an all-too common bug in Windows 95/98 allows the Registry to become mildly corrupted in some key areas that IE needs for opening and referencing new windows. The most common symptom of the problem is a script error on the statement that invokes `window.open()`, but other indications include error messages that the `document.write()` method is not supported in the subwindow or that the "RPC server" is not available. The problem cannot be fixed by JavaScript but requires human intervention on the affected PC. Here are the steps to repair the problem:

1. Click Start and then click Run.
2. In the Open box, type the following line: `regsvr32 actxprxy.dll`
3. Click OK and then click OK again after you receive the following message:

   ```
   DllRegisterServer in actxprxy.dll succeeded.
   ```
4. Click Start and then click Run.
5. In the Open box, type the following line: `regsvr32 shdocvw.dll`
6. Click OK and then click OK again after you receive the following message:

   ```
   DllRegisterServer in shdocvw.dll succeeded.
   ```
7. Shut down and restart your computer.

The corruption is reported to be caused by application installers and uninstallers that don't clean up after themselves the way they should. The fact that this problem is rather common in IE4 under both Windows 95 and 98 might make you gun-shy about utilizing multiple windows in your application.

On the CD-ROM

Example (with Listing 16-26) on the CD-ROM

Related Items: `window.close()`, `window.blur()`, `window.focus()` methods; `window.closed` property.

print()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓				✓	✓

The `print()` method provides a scripted way of sending the window or a frame from a frameset to the printer. In all cases, the Print dialog box appears for the user to make the typical printer choices when printing manually. This prevents a rogue `print()` command from tying up a printer without the user's permission.

The precise behavior of the `print()` method varies a bit with the different ways NN and IE (not to mention operating systems) handle printing. In NN4+ (except for the Windows OS), you can print all frames of a frameset in one `print()` command when it is invoked for the framesetting (parent) document. NN4 for Windows, however, does not print the entire frameset at once. You can write a script that iterates through all frames and prints them with delays to let the content be sent to the print spooler:

```
function printFrames(n) {
    parent.frames[n++].print()
    if (n < parent.frames.length) {
        setTimeout("printFrames(" + n + ")",5000)
    }
}
```

Invoke this function as `printFrames(0)`, and the function does the rest.

In IE5, the print dialog box gives the user the choice of printing just one frame or all of the frames. Make sure that the `print()` method is invoked for the desired frame when you want only that frame to print. The browser defaults to printing just that frame.

IE5 introduces some print-specific event handlers that are triggered by scripted printing as well as manual printing. The events begin to fire after the user has accepted the Print dialog box. An `onBeforePrint` event handler can be used to show content that might be hidden from view but should appear in the printout. After the content has been sent to the print spooler, the `onAfterPrint` event can restore the page.

On the CD-ROM

Example (with Listings 16-27 and 16-28) on the CD-ROM

NN4 printing anomalies

The Windows and Unix versions of NN4 handle printing in a way that can cause the page to not print what the user sees because before the page prints, it is loaded into a hidden window. Any immediate scripts in the page run again, but any user-induced, scripted content modifications will most likely not be a part of the page.

While there is no known workaround for resurrecting modified content, your script can at least know if the page is being loaded into one of these hidden windows: The NN-specific `window.outerHeight` and `window.outerWidth` properties are zero. If you don't want an immediate script statement to run before being printed, use an `if` construction to let the nested statement(s) run only if either of those dimension properties is greater than zero.

Printing in IE4

While the `window.print()` method is not available in IE4, it is possible to script printing in the Win32 OS platforms via the built-in browser object. To use this ActiveX object, you must first include the following HTML somewhere in your document (at the end of the BODY is fine):

```
<OBJECT ID="IEControl" WIDTH=0 HEIGHT=0
CLASSID="clsid:8856F961-340A-11D0-A96B-00C04FD705A2">
</OBJECT>
```

The long `CLASSID` attribute must be copied exactly. This HTML adds an object to the document object model that can be scripted. The object has several commands available, one of which provides printing services. The commands are numbered, and the one for printing is the following:

```
IEControl.ExecWB(6, 1)
```

If the user cancels the Print dialog box, a script error may appear, so be sure to trap for errors (see the `window.onerror` property earlier in this chapter). If you change the second parameter to 2, the Print dialog box does not appear, but that isn't a very user-friendly way to treat printing.

Related Items: `window.back()`, `window.forward()`, `window.home()`, `window.find()` methods.

prompt("*message*", "*defaultReply*")

Returns: String of text entered by user or `null`.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The third kind of dialog box that JavaScript can display includes a message from the script author, a field for user entry, and two buttons (OK and Cancel, or Yes and No on Mac versions of Navigator 2 and 3). The script writer can supply a prewritten answer so that a user confronted with a prompt dialog box can click OK (or press Enter) to accept that answer without further typing. Supplying both parameters to the `window.prompt()` method is important. Even if you don't want to supply a default answer, enter an empty string as the second parameter:

```
prompt("What is your postal code?","")
```

If you omit the second parameter, JavaScript inserts the string `undefined` into the dialog box's field. This string is disconcerting to most Web page visitors.

The value returned by this method is a string in the dialog box's field when the user clicks the OK button. If you're asking the user to enter a number, remember that the value returned by this method is a string. You may need to perform data-type conversion with the `parseInt()` or `parseFloat()` functions (see Chapter 42) to use the returned values in math calculations.

When the user clicks the prompt dialog box's OK button without entering any text into a blank field, the returned value is an empty string (""). Clicking on the Cancel button, however, makes the method return a `null` value. Therefore, the scripter must test for the type of returned value to make sure that the user entered some data that can be processed later in the script, as in

```
var entry = prompt("Enter a number between 1 and 10:","")
if (entry != null) {
    //statements to execute with the value
}
```

This script excerpt assigns the results of the prompt dialog box to a variable and executes the nested statements if the returned value of the dialog box is not null (if the user clicked the OK button). The rest of the statements then include data validation to make sure that the entry is a number within the desired range (see Chapter 43).

It may be tempting to use the prompt dialog box as a handy user input device. But, as with the other JavaScript dialog boxes, the modality of the prompt dialog box is disruptive to the user's flow through a document and can also trap automated macros that some users activate to capture Web sites. In forms, HTML fields are better user interface elements for attracting user text entry. Perhaps the safest way to use a prompt dialog box is to have it appear when a user clicks a button element on a page — and then only if the information you require of the user can be provided in a single prompt dialog box. Presenting a sequence of prompt dialog boxes is downright annoying to users.

On the CD-ROM

Example (with Figure 16-13 and Listing 16-29) on the CD-ROM

Related Items: `window.alert()`, `window.confirm()` method.

releaseEvents(*eventTypeList*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

If your scripts have enabled NN4-specific event capture for the `window` object (or `document` or layer, for that matter), you can turn off that capture with the `releaseEvents()` method. This method does not inhibit events from reaching their intended target. In fact, by releasing capture from a higher object, released events don't bother stopping at those higher objects anymore. Parameters for the `releaseEvents()` method are one or more event types. Each event type is its own entity, so if your window captures three event types at one point, you can release some or all of those event types as the visitor interacts with your page. For example, if the page loads and captures three types of events, as in

```
window.captureEvents(Event.CLICK | Event.KEYPRESS | Event.CHANGE)
```

you can later turn off window event capture for all but the `click` event:

```
window.releaseEvents(Event.KEYPRESS | Event.CHANGE)
```

The window still captures and processes `click` events, but `keyPress` and `change` events go directly to their target objects.

A new mechanism (removing an event listener) is implemented in NN6 based on the W3C event model. See Chapters 14 and 29 for more information.

Related Items: `window.captureEvents()`, `window.routeEvent()` methods.

resizeBy(*deltaX,deltaY*)
resizeTo(*outerwidth,outerheight*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Starting with NN4 and IE4, scripts can control the size of the current browser window on the fly. While you can set the individual inner and (in NN) outer width and height properties of a window, the `resizeBy()` and `resizeTo()` methods let you adjust both axis measurements in one statement. In both instances, all adjustments affect the lower-right corner of the window: To move the top-left corner, use the `window.moveBy()` or `window.moveTo()` methods.

Each resize method requires a different kind of parameter. The `resizeBy()` method adjusts the window by a certain number of pixels along one or both axes. Therefore, it is not concerned with the specific size of the window beforehand — only by how much each axis is to change. For example, to increase the current window size by 100 pixels horizontally and 50 pixels vertically, the statement is

```
window.resizeBy(100, 50)
```

Both parameters are required, but if you only want to adjust the size in one direction, set the other to zero. You may also shrink the window by using negative values for either or both parameters.

You find a greater need for the `resizeTo()` method, especially when you know that on a particular platform the window needs adjustment to a specific width and height to best accommodate that platform's display of form elements. Parameters for the `resizeTo()` method are the actual pixel width and height of the outer dimension of the window — the same as NN's `window.outerWidth` and `window.outerHeight` properties.

To resize the window such that it occupies all screen real estate (except for the Windows Taskbar and Macintosh menubar), use the `screen` object properties that calculate the available screen space:

```
window.resizeBy(screen.availWidth, screen.availHeight)
```

This action, however, is not precisely the same in Windows as maximizing the window. To achieve that same effect, you must move the window to coordinates -4, -4 and add eight to the two parameters of `resizeBy()`:

```
window.moveTo(-4,-4)
window.resizeTo(screen.availWidth + 8, screen.availHeight + 8)
```

This hides the window's own four-pixel wide border, as occurs during OS-induced window maximizing. See also the `screen` object discussion (Chapter 28) for more OS-specific details.

In practice, NN4 does not give reliable results setting a window's size via the `resizeTo()` method. On some platforms, the dimensions are applied to the inner width and height, rather than outer. If a specific outer size is necessary, use the NN-specific `window.outerHeight` and `window.outerWidth` properties instead.

Navigator imposes some security restrictions for maximum and minimum size for a window. For both methods, you are limited to the viewable area of the screen and visible minimums unless the page uses signed scripts (see Chapter 46). With signed scripts and the user's permission, for example, you can adjust windows beyond the available screen borders.

On the CD-ROM

Example (with Listing 16-30) on the CD-ROM

Related Items: `window.outerHeight`, `window.outerWidth` properties; `window.moveTo()`, `window.sizeToContent()` methods.

routeEvent(*event*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

If you turn on NN4-specific event capturing in the window, document, or layer object (via their respective `captureEvents()` methods), the handlers you assign to those events really capture those events, preventing them from ever reaching their intended targets. For some page designs, this is intentional, as it allows the higher-level object to handle all events of a particular type. But if your goal is to perform some preprocessing of events before they reach their destination, you need a way to pass that event along its regular path. That's what the `routeEvent()` method is for.

Perhaps a more common reason for capturing events at the window (or similar) level is to look for special cases, such as when someone Ctrl+clicks on an element. In this case, even though the window event handler receives all `click` events, it performs further processing only when the `event.modifiers` property indicates the Ctrl key is also pressed and the *`eventObj`*`.target` property reveals the item being clicked is a link rather than a button. All other instances of the `click` event are routed on their way to their destinations. The `event` object knows where it's going, so that your `routeEvent()` method doesn't have to worry about that.

The parameter for the `routeEvent()` method is the event object that is passed to the function that processes the high-level event, as shown here:

```
function flashRed(evt) {
   [statements that filter specific events to flash background color red]
   routeEvent(evt)
}
```

The event object, `evt`, comes into the function while passing unmodified to the object that was clicked.

In the W3C DOM event model (as implemented in NN6), a captured event continues onward to the target after event handlers higher up the containment chain finish their work.

On the CD-ROM

Example on the CD-ROM

Related Items: `window.captureEvents()`, `window.releaseEvents()`, `window.handleEvent()` methods; `event` object (Chapter 29).

`scroll(`*`horizontalCoord, verticalCoord`*`)`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `window.scroll()` method was introduced in NN3 and has been implemented in all scriptable browsers since then. But in the meantime, the method has been replaced by the `window.scrollTo()` method, which is in more syntactic alliance with many other window methods. Use the `window.scroll()` method only if your audience is still using NN3; for an audience of NN4+ and IE4+, use the `window.scrollTo()` method instead.

The `window.scroll()` method takes two parameters, the horizontal (x) and vertical (y) coordinates of the document that is to be positioned at the top-left corner of the window or frame. You must realize that the window and document have two similar, but independent, coordinate schemes. From the window's point of view, the top-left pixel (of the content area) is point 0,0. All documents also have a 0,0 point: the very top-left of the document. The window's 0,0 point doesn't move, but the document's 0,0 point can move — via manual or scripted scrolling. Although `scroll()` is a window method, it seems to behave more like a document method, as the document appears to reposition itself within the window. Conversely, you can also think of the window moving to bring its 0,0 point to the designated coordinate of the document.

Although you can set values beyond the maximum size of the document or to negative values, the results vary from platform to platform. For the moment, the best usage of the `window.scroll()` method is as a means of adjusting the scroll to the very top of a document (`window.scroll(0,0)`) when you want the user to be at a base location in the document. For vertical scrolling within a text-heavy document, an HTML anchor may be a better alternative for now (though it doesn't readjust horizontal scrolling).

On the CD-ROM

Example (with Listings 16-31, 16-32, and 16-33) on the CD-ROM

Related Items: `window.scrollBy()`, `window.scrollTo()` methods.

scrollBy(*deltaX*,*deltaY*)
scrollTo(*x*,*y*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

NN4+ and IE4+ provide a related pair of window scrolling methods. The `window.scrollTo()` method is the new version of the `window.scroll()` method. The two work identically to position a specific coordinate point of a document at the top-left corner of the inner window region.

In contrast, the `window.scrollBy()` method allows for relative positioning of the document. Parameter values indicate by how many pixels the document should scroll in the window (horizontally and vertically). Negative numbers are allowed if you want to scroll to the left and/or upward. The `scrollBy()` method comes in handy if you elect to hide the scrollbars of a window or frame and offer other types of scrolling controls for your users. For example, to scroll down one entire screen of a long document, you can use the `window.innerHeight` (in NN) or `document.body.clientHeight` (in IE) properties to determine what the offset from the current position would be:

```
// assign IE body clientHeight to window.innerHeight
if (document.body && document.body.clientHeight) {
    window.innerHeight = document.body.clientHeight
}
window.scrollBy(0, window.innerHeight)
```

Unwanted User Scrolling

Many Windows-compatible personal computers ship with a mouse that includes a scroll wheel that is activated by pressing down on the wheel and spinning the wheel. Be aware that even if your page design loads into frames or new windows that intentionally lack scrollbars, the page will be scrollable via this wheel if the document or its background image are larger than the window or frame. Users may not even be aware that they have scrolled the page (because there are no scrollbar visual clues). If this affects your design, you may need to build in a routine (via `setTimeout()`) that periodically sets the scroll of the window to 0,0.

To scroll upward, use a negative value for the second parameter:

```
window.scrollBy(0, -window.innerHeight)
```

Scrolling the document in the Macintosh exhibits some buggy behavior. At times it appears as though you are allowed to scroll well beyond the document edges. In truth, the document has stopped at the border, but the window or frame may not have refreshed properly.

The window scroll methods are not the ones to use to produce the scrolling effect of a positioned element. That kind of animation is accomplished by adjusting `style` position properties (see Chapter 31).

On the CD-ROM

Example (with Listings 16-34 and 16-35) on the CD-ROM

Related Items: `window.pageXOffset`, `window.pageYOffset` properties; `window.scroll()` method.

setCursor("*cursorType*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 `window.setCursor()` method is an alternative to the `cursor` style sheet attribute. In the meantime, NN6 user interface theme authors have been using it, and you can experiment with it, too.

The method requires one parameter, a string name of one of the accepted cursor types. Recognized cursor types are as follows:

`alias`	`auto`	`cell`
`context-menu`	`copy`	`count-down`
`count-up`	`count-up-down`	`crosshair`
`default`	`e-resize`	`grab`
`grabbing`	`help`	`move`
`n-resize`	`ne-resize`	`nw-resize`
`pointer`	`s-resize`	`se-resize`
`spinning`	`sw-resize`	`text`
`w-resize`	`wait`	

Each operating system provides its own suite of cursor designs, but not all operating systems provide a unique cursor design for each type. Also be aware that setting the cursor via this method does not lock the cursor. If the user rolls the cursor atop form controls (especially text boxes), the cursor reverts to its "auto" setting.

On the CD-ROM

Example on the CD-ROM

Related Item: `style.cursor` property (Chapter 30).

setInterval("*expr*", *msecDelay* [, *language*])
setInterval(*funcRef*, *msecDelay* [, *funcarg1*, ..., *funcargn*])

Returns: Interval ID integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

It is important to understand the distinction between the `setInterval()` and `setTimeout()` methods. Before the `setInterval()` method was part of JavaScript, authors replicated the behavior with `setTimeout()`, but the task often required reworking scripts a bit.

Use `setInterval()` when your script needs to call a function or execute some expression repeatedly with a fixed time delay between calls to that function or expression. The delay is not at all like a wait state in some languages: Other processing does not halt while the delay is in effect. Typical applications include animation by moving an object around the page under controlled speed (instead of letting the JavaScript interpreter whiz the object through its path at CPU-dependent speeds). In a kiosk application, you can use `setInterval()` to advance "slides" that appear in other frames or as layers, perhaps changing the view every ten seconds. Clock displays and countdown timers would also be suitable usage of this method (even though you see examples in this book that use the old-fashioned `setTimeout()` way to perform timer and clock functions).

In contrast, `setTimeout()` is best suited for those times when you need to carry out a function or expression one time in the future — even if that future is only a second or two away. See the discussion of the `setTimeout()` method later in this chapter for details on this application.

While the primary functionality of the `setInterval()` method is the same in both NN and IE, each browser offers some extra possibilities depending on the way you use parameters to the method. For simple invocations of this method, the same parameters work in all browsers that support the method. First, I address the parameters that all browsers have in common.

The first parameter of the `setInterval()` method is the name of the function or expression to run after the interval elapses. This item must be a quoted string. If the parameter is a function, no function arguments are allowed inside the function's parentheses unless the arguments are literal strings (but see the section "Passing Function Parameters").

The second parameter of this method is the number of milliseconds (1,000 per second) that JavaScript should use as the interval between invocations of the function or expression. Even though the measure is in extremely small units, don't rely on 100 percent accuracy of the intervals. Various other internal processing delays may throw off the timing just a bit.

Just as with `setTimeout()`, `setInterval()` returns an integer value that is the ID for the interval process. That ID value lets you turn off the process with the `clearInterval()` method. That method takes the ID value as its sole parameter. This mechanism allows for the setting of multiple interval processes running, while giving your scripts the power to stop individual processes at any time without interrupting the others.

IE4+ uses the optional third parameter to specify the scripting language of the statement or function being invoked in the first parameter. As long as you are scripting exclusively in JavaScript (the same as JScript), there is no need to include this parameter.

Passing function parameters

NN4+ provides a mechanism for easily passing evaluated parameters to a function invoked by `setInterval()`. To use this mechanism, the first parameter of `setInterval()` must not be a string, but rather a reference to the function (no trailing parentheses). The second parameter remains the amount of delay. But beginning with the third parameter, you can include evaluated function arguments as a comma-delimited list:

```
intervalID = setInterval(cycleAnimation, 500, "figure1")
```

The function definition receives those parameters in the same form as any function.

```
function cycleAnimation(elemID) {...}
```

For use with a wider range of browsers, you can also cobble together the ability to pass parameters to a function invoked by `setInterval()`. Because the call to the other function is a string expression, you can use computed values as part of the strings via string concatenation. For example, if a function uses event handling to find the element that a user clicked (to initiate some animation sequence), that element's ID, referenced by a variable, can be passed to the function invoked by `setInterval()`:

```
function findAndCycle() {
    var elemID
    // statements here that examine the event info
    // and extract the ID of the clicked element,
    // assigning that ID to the elemID variable
    intervalID = setInterval("cycleAnimation(" + elemID + ")", 500)
}
```

If you need to pass ever-changing parameters with each invocation of the function from `setInterval()`, look instead to using `setTimeout()` at the end of a function to invoke that very same function again.

On the CD-ROM

Example (with Listings 16-36 and 16-37) on the CD-ROM

Related Items: `window.clearInterval()`, `window.setTimeout()` methods.

setTimeout("*expr*", *msecDelay* [, *language*])
setTimeout(*functionRef*, *msecDelay* [, *funcarg1*, ..., *funcargn*])

Returns: ID value for use with `window.clearTimeout()` method.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The name of this method may be misleading, especially if you have done other kinds of programming involving timeouts. In JavaScript, a *timeout* is an amount of time (in milliseconds) before a stated expression evaluates. A timeout is not a wait or script delay, but rather a way to tell JavaScript to hold off executing a statement or function for a desired amount of time. Other statements following the one containing `setTimeout()` execute immediately.

Say that you have a Web page designed to enable users to interact with a variety of buttons or fields within a time limit (this is a Web page running at a free-standing kiosk). You can turn on the timeout of the window so that if no interaction occurs with specific buttons or fields lower in the document after, say, two minutes (120,000 milliseconds), the window reverts to the top of the document or to a help screen. To tell the window to switch off the timeout after a user does navigate within the allotted time, you need to have any button that the user interacts with call the other side of a `setTimeout()` method — the `clearTimeout()` method — to cancel the current timer. (The `clearTimeout()` method is explained earlier in this chapter.) Multiple timers can run concurrently and are completely independent of each other.

While the primary functionality of the `setTimeout()` method is the same in both NN and IE, each browser offers some extra possibilities depending on the way you use parameters to the method. For simple invocations of this method, the same parameters work in all browsers that support the method. I first address the parameters that all browsers have in common.

The expression that comprises the first parameter of the method `window.setTimeout()` is a quoted string that can contain either a call to any function or method or a standalone JavaScript statement. The expression evaluates after the time limit expires.

Understanding that this timeout does not halt script execution is very important. In fact, if you use a `setTimeout()` method in the middle of a script, the succeeding statements in the script execute immediately; after the delay time, the expression in the `setTimeout()` method executes. Therefore, I've found that the best way to design a timeout in a script is to plug it in as the last statement of a function: Let all other statements execute and then let the `setTimeout()` method appear to halt further execution until the timer goes off. In truth, however, although the timeout is "holding," the user is not prevented from performing other tasks. And after a timeout timer is ticking, you cannot adjust its time. Instead, clear the timeout and start a new one.

If you need to use `setTimeout()` as a delay inside a function, break the function into two parts, using the `setTimeout()` method as a bridge between the two functions. You can see an example of this in Listing 16-26, where IE needs a little delay to finish opening a new window before content can be written for it. If it weren't for the required delay, the HTML assembly and writing would have been accomplished in the same function that opens the new window.

It is not uncommon for a `setTimeout()` method to invoke the very function in which it lives. For example, if you have written a Java applet to perform some extra work for your page and you need to connect to it via LiveConnect, your scripts must wait for the applet to load and carry out its initializations. While an `onLoad` event handler in the document ensures that the applet object is visible to scripts, it doesn't know whether the applet has finished its initializations. A JavaScript function that inspects the applet for a clue might need to poll the applet every 500 milliseconds until the applet sets some internal value indicating all is ready, as shown here:

```
var t
function autoReport() {
    if (!document.myApplet.done) {
        t = setTimeout("autoReport()",500)
    } else {
        clearTimeout(t)
        // more statements using applet data //
    }
}
```

JavaScript provides no built-in equivalent for a `wait` command. The worst alternative is to devise a looping function of your own to trap script execution for a fixed amount of time. In NN3+, you can also use LiveConnect (see Chapter 44) to invoke a Java method that freezes the browser's thread for a fixed amount of time. Unfortunately, both of these practices prevent other processes from being carried out, so you should consider reworking your code to rely on a `setTimeout()` method instead.

NN4+ provides a mechanism for passing parameters to functions invoked by `setTimeout()`. See the section "Passing Parameters" in the discussion of `window.setInterval()` for details on this and passing parameters in other browser versions.

As a note to experienced programmers, neither `setInterval()` nor `setTimeout()` spawn new threads in which to run their invoked scripts. When the timer expires and invokes a function, the process gets at the end of the queue of any pending script processing in the JavaScript execution thread.

On the CD-ROM

Example (with Listing 16-38) on the CD-ROM

Related Items: `window.clearTimeout()`, `window.setInterval()`, `window.clearInterval()` methods.

showHelp("*URL*",["*contextID*"])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `showHelp()` method (not implemented in IE5/Mac) lets a script open a Winhelp window with a particular `.hlp` file. This method is specific to the Win32 operating systems.

If your Winhelp file has context identifiers specified in various places, you can pass the ID as an optional second parameter. This lets the call to showHelp() navigate to a particular area of the `.hlp` file that applies to a specific element on the page.

Example

See the Microsoft Visual Studio authoring environment for details on building Winhelp files.

showModalDialog("*URL*"[, *arguments*] [, *features*]) showModelessDialog("*URL*"[, *arguments*] [, *features*])

Returns: `returnValue` (modal) or `window` object (modeless).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							(✓)	✓	✓

IE4+ provides methods for opening a modal dialog box window, which always stays in front of the main browser window while making the main window inaccessible to the user. In IE5 (but not IE5/Mac), Microsoft added the modeless type of dialog box, which also stays in front, but allows user access to whatever can be seen in the main window. You can load any HTML page or image that you like into the dialog box window, by providing a URL as the first parameter. Optional parameters let you pass data to a dialog box and give you considerable control over the look of the window. Unfortunately, these types of dialog box windows are not available in Navigator. At best, you can simulate modal and modeless dialog box windows, but the job is not for beginners (see `http://developer.netscape.com/viewsource/goodman_modal/goodman_modal.html` for one example).

The windows generated by both methods are (almost) full-fledged `window` objects with some extra properties that are useful for what these windows are intended to do. Perhaps the most important property is the `window.dialogArgument` property. This property lets a script read the data that is passed to the window via the second parameter of both `showModalDialog()` and `showModelessDialog()`. Passed data can be in any valid JavaScript data type, including objects and arrays.

Displaying a modal dialog box has some ramifications for scripts. In particular, script execution in the main window halts at the statement that invokes the `showModalDialog()` method as long as the modal dialog box remains visible. Scripts are free to run in the dialog box window during this time. The instant the user closes the dialog box, execution resumes in the main window. A call to show a modeless dialog box, on the other hand, does not halt processing because scripts in the main page or dialog box window are allowed to communicate "live" with the other window.

Retrieving dialog data

To send data back to the main window's script from a modal dialog box window, a script in the dialog box window can set the `window.returnValue` property to any JavaScript value. It is this value that gets assigned to the variable receiving the returned value from the `setModelDialog()` method, as shown in the following example:

```
var specifications = window.showModalDialog("preferences.html")
```

The makeup and content of the returned data is in the hands of your scripts. No data is automatically returned for you.

Because a modeless dialog box coexists with your live main page window, returning data is not as straightforward as for a modal dialog box. The second parameter of the `showModelessDialog()` method takes on a special task that isn't exactly the same as passing parameters to the dialog box. Instead, if you define a global variable or a function in the main window's script, pass a reference to that variable or function as the second parameter to display the modeless dialog box. A script in the modeless dialog box can then point to that reference as the way to send data back to the main window before the dialog box closes (or when a user clicks something, such as an Apply button). This mechanism even allows for passing data back to a function in the main window. For example, say that the main window has a function defined as the following:

```
function receivePrefsDialogData(a, b, c) {
    // statements to process incoming values //
}
```

Then pass a reference to this function when opening the window:

```
dlog = showModelessDialog("prefs.html", receivePrefsDialogData)
```

A script statement in the dialog box window's document can pick up that reference so that other statements can use it, such as a function for an Apply button's `onClick` event handler:

```
var returnFunc = window.dialogArguments
...
function apply(form) {
    returnFunc(form.color.value, form.style.value, form.size.value)
}
```

While this approach seems to block ways of getting parameters to the dialog box when it opens, you can always reference the dialog box in the main window's script and set form or variable values directly:

```
dlog = showModelessDialog("prefs.html", receivePrefsDialogData)
dlog.document.forms[0].userName.value = GetCookie("userName")
```

Be aware that a dialog box window opened with either of these methods does not maintain a connection to the originating window via the `opener` property. The `opener` property for both dialog box types is undefined.

Dialog window features

Both methods provide an optional third property that lets you specify visible features of the dialog box window. Omitting the property sets all features to their default values. All parameters are to be contained by a single string, and each parameter's name-value pair is in the form of CSS `attribute:value` syntax. Table 16-4 lists all of the window features available for the two window styles. If you are designing for compatibility with IE4, you are restricted to the modal dialog box and a subset of features, as noted in the table. All values listed as Boolean take only the following four values: `yes`, `no`, `1`, `0`.

Table 16-4 IE Dialog Box Window Features

Feature	*Type*	*Default*	*Description*
`center`	Boolean	`yes`	Whether to center dialog box (overridden by `dialogLeft` and/or `dialogTop`).
`dialogHeight`	Length	varies	Outer height of the dialog box window. IE4 default length unit is `em`; IE5 is pixel (`px`).
`dialogLeft`	Integer	varies	Pixel offset of dialog box from left edge of screen.
`dialogTop`	Integer	varies	Pixel offset of dialog box from top edge of screen.
`dialogWidth`	Length	varies	Outer width of the dialog box window. IE4 default length unit is `em`; IE5 is pixel (`px`).
`help`	Boolean	`yes`	Display Help icon in title bar.
`resizable`	Boolean	`no`	Dialog box is resizable (IE5+ only).
`status`	Boolean	varies	Display statusbar at window bottom (IE5+ only). Default is `yes` for untrusted dialog box; `no` for trusted dialog box.

The CSS-type of syntax for these features lets you string multiple features together by separating each pair with a semicolon within the string. For example:

```
var dlogData = showModalDialog("prefs.html", defaultData,
"dialogHeight:300px; dialogWidth:460px; help:no")
```

Although not explicitly listed as one of the window features, scroll bars are normally displayed in the window if the content exceeds the size assigned or available to the dialog box. If you don't want scroll bars to appear, have your dialog box document's script set the `document.body.scroll` property to `false` as the page opens.

Dialog cautions

A potential user problem to watch for is that typically a dialog box window does not open until the HTML file for the dialog box has loaded. Therefore, if there is substantial delay before a complex document loads, the user does not see any action indicating that something is happening. You may want to experiment with setting the `cursor` style sheet property and restoring it when the dialog box's document loads.

One of the reasons I call a dialog box window an (almost) `window` object is that some normal behavior is not available in IE4. For example, if you load a frameset into the dialog box window, scripts in documents within the frames cannot refer back to the parent document to access variables or parent window methods. Thus, a button in a frame of an IE4 modal dialog box cannot issue `parent.close()` to close the dialog box. This anomaly is repaired in IE5.

On the CD-ROM

Example (with Listings 16-39 through 16-42) on the CD-ROM

Related Items: `window.open()` method.

sizeToContent()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 `window.sizeToContent()` method can be a valuable aid in making sure that a window (especially a subwindow) is sized for the optimum display of the window's content. But you must also be cautious with this method, or it will do more harm than good.

Invoking the `sizeToContent()` method resizes the window so that all content is visible. Concerns about variations in OS-specific rendering become a thing of the past. Naturally, you should perform this action only on a window whose content at the most occupies a space smaller than the smallest video monitor running your code (typically 640 × 480 pixels, but conceivably much smaller for future versions of the browser used on handheld computers).

You can get the user in trouble, however, if you invoke the method twice on the same window that contains the resizing script. This action can cause the window to expand to a size that may exceed the pixel size of the user's video monitor. Successive invocations fail to cinch up the window's size to its content again. Multiple invocations are safe, however, on subwindows when the resizing script statement is in the main window.

On the CD-ROM

Example on the CD-ROM

Related Item: `window.resizeTo()` method.

stop()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The Navigator-specific `stop()` method offers a scripted equivalent of clicking the Stop button in the toolbar. Availability of this method allows you to create your own toolbar on your page and hide the toolbar (in the main window with signed scripts or in a subwindow). For example, if you have an image representing the Stop button in your page, you can surround it with a link whose action stops loading, as in the following:

```
<A HREF="javascript: void stop()"><IMG SRC="myStop.gif" BORDER=0></A>
```

A script cannot stop its own document from loading, but it can stop loading of another frame or window. Similarly, if the current document dynamically loads a new image or a multimedia MIME type file as a separate action, the `stop()` method can halt that process. Even though the `stop()` method is a window method, it is not tied to any specific window or frame: Stop means stop.

Related Items: `window.back()`, `window.find()`, `window.forward()`, `window.home()`, `window.print()` methods.

Event handlers

onAfterPrint
onBeforePrint

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Each of these event handlers (not implemented in IE5/Mac) fires after the user has clicked the OK button in IE's Print dialog box. This goes for printing that is invoked manually (via menus and browser shortcut buttons) and the `window.print()` method.

Although printing is usually WYSIWYG, it is conceivable that you may want the printed version of a document to display more or less of the document than is showing at that instant. For example, you may have a special copyright notice that you want printed at the end of a page whenever it goes to the printer. In that case, the element with that content can have its `display` style sheet property set to `none` when the page loads. Before the document is sent to the printer, a script needs to adjust that style property to display the element as a block item; after printing, have your script revert the setting to `none`.

Immediately after the user clicks the OK button in the Print dialog box, the `onBeforePrint` event handler fires. As soon as the page(s) is sent to the printer or spooler, the `onAfterPrint` event handler fires.

On the CD-ROM

Example on the CD-ROM

onBeforeUnload

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Any user or scripted action that normally forces the current page to be unloaded or replaced causes the `onBeforeUnload` event handler to fire (not implemented in IE5/Mac). Unlike the `onUnload` event handler, however, `onBeforeUnload` is a bit better behaved when it comes to allowing complex scripts to finish before the actual unloading takes place. Moreover, you can assign a string value to the `event.returnValue` property in the event handler function. That string becomes part of a message in an alert window that gives the user a chance to stay on the page. If the user agrees to stay, the page does not unload, and any action that caused the potential replacement is cancelled.

On the CD-ROM

Example (with Listing 16-43) on the CD-ROM

Related Items: `onUnload` event handler.

onDragDrop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

With closer integration between the computer desktop and browsers these days, it is increasingly possible that shortcuts (or aliases) to Web URLs can be represented on our desktops and other kinds of documents. With NN4, you can script awareness of dragging and dropping of such items onto the browser window. The window's `dragDrop` event fires whenever a user drops a file or other URL-filled object onto the window.

You can add an `onDragDrop` event handler to the `<BODY>` tag of your document and pass along the event object that has some juicy tidbits about the drop: the object on which the item was dropped and the URL of the item. The function called by the event handler receives the event object information and can process it from there. Because this event is a window event, you don't have to turn on `window.captureEvents()` to get the window to feel the effect of the event.

The juiciest tidbit of the event, the URL of the dropped item, can be retrieved only with a signed script and the user's permission (see Chapter 46). Listing 16-44 shows a simple document that reveals the URL and screen location, as derived from the event object passed with the `dragDrop` event. You must have codebase principals turned on to get the full advantage of this listing, and it works best with Windows.

Listing 16-44: **Analyzing a dragDrop Event**

```
<HTML>
<HEAD>
<TITLE>DragDrop Event</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function reportDrag(e) {
    var msg = "You dropped the file:\n"
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserRead")
    msg += e.data
    netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserRead")
    msg += "\nonto the window object at screen location ("
    msg += e.screenX + "," + e.screenY + ")."
    alert(msg)
    return false
}
</SCRIPT>
</HEAD>
<BODY onDragDrop="return reportDrag(event)">
<B>Drag and Drop a file onto this window</B>
</BODY>
</HTML>
```

The `dragDrop` event is the only one that uses the `data` property of the NN4 event object. That property contains the URL. The `target` property reveals only the `window` object, but you can access the event object's `screenX` and `screenY` properties to get the location of the mouse release.

Related Items: `event` object (Chapter 29).

onError

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

See the discussion of the `window.onerror` property earlier in this chapter.

onHelp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The generic `onHelp` event handler is discussed in Chapter 15, but it also fires when the user activates the context-sensitive help within a modal or modeless dialog box. In the latter case, a user can click the Help icon in the dialog box's title bar, at which time the cursor changes to a question mark. The user can then click on any element in the window. At that second click, the `onHelp` event handler fires, and the `event` object contains information about the element clicked (the `event.srcElement` is a reference to the specific element), allowing a script to supply help about that element.

To prevent the brower's built-in help window from appearing, the event handler must evaluate to `return false` (IE4+) or set the `event.returnValue` property to `false` (IE5).

Example

The following script fragment can be embedded in the IE5-only modeless dialog box code in Listing 16-44 to provide context-sensitive help within the dialog box. Help messages for only two of the form elements are shown here, but in a real application you add messages for the rest.

```
function showHelp() {
    switch (event.srcElement.name) {
        case "bgColor" :
            alert("Choose a color for the main window\'s background.")
            break
        case "name" :
            alert("Enter your first name for a friendly greeting.")
            break
        default :
            alert("Make preference settings for the main page styles.")
    }
    event.returnValue = false
}
window.onhelp = showHelp
```

Because this page's help focuses on form elements, the `switch` construction cases are based on the `name` properties of the form elements. For other kinds of pages, the `id` properties may be more appropriate.

Related Items: `event` object (Chapter 29); `switch` construction (Chapter 39).

onLoad

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `onLoad` event handler fires in the current window at the end of the document loading process (after all text and image elements have been transferred from the source file server to the browser, and after all plug-ins and Java applets have loaded and started running). At that point, the browser's memory contains all the objects and script components in the document that the browser can possibly know about.

The `onLoad` handler is an attribute of a `<BODY>` tag for a single-frame document or of the `<FRAMESET>` tag for the top window of a multiple-frame document. When the handler is an attribute of a `<FRAMESET>` tag, the event triggers only after all frames defined by that frameset have completely loaded.

Use either of the following scenarios to insert an `onLoad` handler into a document:

```
<HTML>
<HEAD>
</HEAD>
<BODY [other attributes] onLoad="statementOrFunction">
[body content]
</BODY>
</HTML>
<HTML>

<HEAD>
</HEAD>
<FRAMESET [other attributes] onLoad="statementOrFunction">
    <FRAME>frame specifications</FRAME>
</FRAMESET>
</HTML>
```

This handler has a special capability when part of a frameset definition: The handler won't fire until the `onLoad` event handlers of all child frames in the frameset have fired. Therefore, if some initialization scripts depend on components existing in other frames, trigger them from the frameset's `onLoad` event handler. This brings up a good general rule of thumb for writing JavaScript: Scripts that execute during a document's loading should contribute to the process of generating the document and its objects. To act immediately on those objects, design additional functions that are called by the `onLoad` event handler for that window.

The type of operations suited for an `onLoad` event handler are those that can run quickly and without user intervention. Users shouldn't be penalized by having to wait for considerable post-loading activity to finish before they can interact with your pages. At no time should you present a modal dialog box as part of an `onLoad` handler. Users who design macros on their machines to visit sites unattended may get hung up on a page that automatically displays an alert, confirm, or prompt dialog box. On the other hand, an operation such as setting the `window.defaultStatus` property is a perfect candidate for an `onLoad` event handler, as are initializing event handlers as properties of element objects in the page.

onLoad Bugs and Anomalies

The `onLoad` event has changed its behavior over the life of JavaScript in Navigator. In Navigator 2, the `onLoad` event handler fired whenever the user resized the window. Many developers considered this a bug because the running of such scripts destroyed data that were carefully gathered since the document originally loaded. From Navigator 3 onward (and including IE3+), a window resize does not trigger a load event.

Two `onLoad` bugs haunt Navigator 3 when used in conjunction with framesets. The first bug affects only Windows versions. The problem is that the frameset's `onLoad` event handler is not necessarily the last one to fire among all the frames. It is possible that one frame's `onLoad` event may still not have processed before the frameset's `onLoad` event handler goes. This can cause serious problems if your frameset's `onLoad` event handler relies on that final frame being fully loaded.

The second bug affects all versions of NN3, but at least a workaround exists. If a frame contains a Java applet, the frameset's `onLoad` event handler will fire before the applet has fully loaded and started. But if you place an `onLoad` event handler in the applet's document (even a dummy `onLoad=""` in the `<BODY>` tag), the frameset's `onLoad` event handler behaves properly.

Related Items: `onUnload` event handler; `window.defaultStatus` property.

onMove

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

If a user drags an NN4 window around the screen, the action triggers a `move` event for the `window` object. When you assign a function to the event (for example, `window.onmove = handleMoves`), the function receives an event object whose `screenX` and `screenY` properties reveal the coordinate point (relative to the entire screen) of the top-left corner of the window after the move.

Related Items: `event` object (Chapter 29).

onResize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

If a user resizes a window, the action causes the `onResize` event handler to fire for the `window` object. When you assign a function to the event (for example, `window.onresize = handleResizes`), the NN event object conveys `width` and `height` properties that reveal the outer width and height of the entire window. A window resize should not reload the document such that an `onLoad` event handler fires (although some early Navigator versions did fire the extra event).

Note: Resizing the Navigator 4 browser window, especially if that window contains positioned elements (as DIV or LAYER elements) causes serious problems not only for the content, but also for scripts in the page. Content can get jumbled, and scripts may disappear. Your only hope is to use an `onResize` event handler to reload the page and get back to a known point. For some ideas on handling this problem, see the article at `http://developer.netscape.com/viewsource/goodman_resize/goodman_resize.html`. One point not covered in the article is that the Windows version of NN4 issues a `resize` event when scroll bars appear in a window. This `resize` event can make any reload-on-resize strategy turn into an infinite loop. To guard against this, you have to inspect the `window.innerWidth` and `window.innerHeight` properties to see if the window has really changed (the property values don't change when the scrollbars appear). Here is an example of script statements that go in the Head script of a page that has to worry about this problem in NN4:

```
var Nav4 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) == 4)
if (Nav4) {
    var loadWidth = window.innerWidth
    var loadHeight = window.innerHeight
}

function restore() {
    if (loadWidth != window.innerWidth || loadHeight != window.innerHeight) {
        history.go(0)
    }
}
if (Nav4) window.onresize = restore
```

Related Items: `event` object (Chapter 29).

onUnload

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

An `unload` event reaches the current window just before a document is cleared from view. The most common ways windows are cleared are when new HTML documents are loaded into them or when a script begins writing new HTML on the fly for the window or frame.

Limit the extent of the `onUnload` event handler to quick operations that do not inhibit the transition from one document to another. Do not invoke any methods that display dialog boxes. You specify `onUnload` event handlers in the same places in an HTML document as the `onLoad` handlers: as a `<BODY>` tag attribute for a single-frame window or as a `<FRAMESET>` tag attribute for a multiframe window. Both `onLoad` and `onUnload` event handlers can appear in the same `<BODY>` or `<FRAMESET>` tag without causing problems. The `onUnload` event handler merely stays safely tucked away in the browser's memory, waiting for the `unload` event to arrive for processing as the document gets ready to clear the window.

Let me pass along one caution about the `onUnload` event handler. Even though the event fires before the document goes away, don't burden the event handler with time-consuming tasks, such as generating new objects or submitting a form. The document will probably go away before the function completes, leaving the function looking for objects and values that no longer exist. The best defense is to keep your `onUnload` event handler processing to a minimum.

Related Items: `onLoad` event handler.

FRAME Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`borderColor`		
`contentDocument`		
`Document`		
`frameBorder`		
`height`		
`longDesc`		
`marginHeight`		
`marginWidth`		
`noResize`		
`scrolling`		
`src`		
`width`		

Syntax

Accessing properties or methods of a FRAME element object from a FRAMESET:

```
(IE4+)     document.all.frameID. property | method([parameters])
(IE5+/NN6) document.getElementById("frameID"). property | method([parameters])
```

Accessing properties of methods of a FRAME element from a frame document:

```
(IE4+)     parent.document.all.frameID. property | method([parameters])
(IE5+/NN6) parent.document.getElementById("frameID"). property |
           method([parameters])
```

About this object

As noted in the opening section of this chapter, a FRAME element object is distinct from the frame object that acts as a `window` object in a document hierarchy. The FRAME element object is available to scripts only when all HTML elements are exposed in the object model, as in IE4+ and NN6.

Because the FRAME element object is an HTML element, it shares the properties, methods, and event handlers of all HTML elements, as described in Chapter 15. By and large, you access the FRAME element object to set or modify an attribute value in the `<FRAME>` tag. If so, you simplify matters if you assign an identifier to the `ID` attribute of the tag. Your tag still needs a `NAME` attribute if your scripts refer to frames through the original object model (a `parent.`*`frameName`* reference). While there is no law against using the same identifier for both `NAME` and `ID` attributes, using different names to prevent potential conflict with references in browsers that recognize both attributes is best.

To modify the dimensions of a frame, you must go the FRAMESET element object that defines the `COLS` and `ROWS` attributes for the frameset. These properties can be modified on the fly in IE4+ and NN6.

Properties

borderColor

Value: Hexadecimal triplet or color name string Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

If a frame displays a border (as determined by the `FRAMEBORDER` attribute of the FRAME element or `BORDER` attribute of the FRAMESET element), it can have a color set separately from the rest of the frames. The initial color (if different from the rest of the frameset) is usually set by the `BORDERCOLOR` attribute of the `<FRAME>` tag. After that, scripts can modify settings as needed.

Modifying a single frame's border can be risky at times, depending on your color combinations. In practice, different browers appear to follow different rules when it comes to negotiating conflicts or defining just how far a single frame's border extends into the border space. Moreover, IE5/Windows exhibits some strange coloration behavior when applying a border color to a single frame. Color changes to individual frame borders do not always render. Verify your designs on as many browsers and operating system variations as you can to test your combinations.

On the CD-ROM

Example on the CD-ROM

Related Items: `FRAME.frameBorder`, `FRAMESET.frameBorder` properties.

contentDocument

Value: `document` object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `contentDocument` property of a FRAME element object is nothing more than a reference to the document contained by that frame. This property bridges the gap between the FRAME element object and the frame object. Both of these objects contain the same `document` object, but from a scripting point of view, references most typically use the frame object to reach the document inside a frame, while the FRAME element is used to access properties equated with the FRAME tag's attributes. But if your script finds that it has a reference to the FRAME element object, you can use the `contentDocument` property to get a valid reference to the document, and therefore any other content of the frame.

On the CD-ROM

Example on the CD-ROM

Related Items: `document` object.

Document

Value: `document` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Because IE4 for Windows implements frames as what are known as ActiveX Web Browser objects, there are times when the properties of the Web Brower object can fill in when the regular object model has a gap. Such is the case when trying to gain access to the `document` object contained by a FRAME element object. Recall (from Chapter 15) that the `document` property of an HTML element refers to the document that contains the current object. In the case of a FRAME element, that would be the framesetting document. But to jump across the normal element node hierarchy from the FRAME element to the document it contains, you can use the `Document` (uppercase "D") property.Even though IE5 no longer uses the Web Browser object for frames, the `Document` property continues to be available.

On the CD-ROM

Example on the CD-ROM

Related Items: `window.document` property.

frameBorder

Value: yes | no | 1 | 0 as strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The frameBorder property offers scripted access to a FRAME element object's FRAMEBORDER attribute setting. IE4+ does not respond well to modifying this property after the page has loaded.

Values for the frameBorder property are strings that substitute for Boolean values. Values yes or 1 mean that the border is (supposed to be) turned on; no or 0 turn off the border.

On the CD-ROM

Example on the CD-ROM

Related Items: FRAMESET.frameBorder properties.

height
width

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+ lets you retrieve the height and width of a FRAME element object. These values are not necessarily the same as the document.body.clientHeight and document.body.clientWidth, because the frame dimensions include chrome associated with the frame, such as scrollbars. These values are read-only. If you need to modify the dimensions of a frame, do so via the FRAMESET element object's rows and/or cols properties. Reading integer values for a frame's height and width properties is much easier than trying to parse the rows and cols string properties.

On the CD-ROM

Example on the CD-ROM

Related Items: FRAMESET object.

longDesc

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The longDesc property is the scripted equivalent of the LONGDESC attribute of the <FRAME> tag. This HTML 4.0 attribute is intended to provide browsers with a URL to a document that contains a long description of the element. Future browsers can use this feature to provide information about the frame for visually impaired site visitors.

marginHeight
marginWidth

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Browsers tend to automatically insert content within a frame by adding a margin between the content and the edge of the frame. These values are represented by the marginHeight (top and bottom edges) and marginWidth (left and right edges) properties. Although the properties are not read-only, changing the values after the frameset has loaded does not alter the appearance of the document in the frame. If you need to alter the margin(s) of a document inside a frame, adjust the document.body.style margin properties.

Also be aware that although the default values of these properties are empty (meaning when no MARGINHEIGHT or MARGINWIDTH attributes are set for the <FRAME> tag), margins are built into the page. The precise pixel count of those margins varies with operating system.

Related Items: style object (Chapter 30).

noResize

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Web designers commonly fix their framesets so that users cannot resize the frames (by dragging any divider border between frames). The noResize property lets you read and adjust that behavior of a frame after the page has loaded. For example, during some part of the interaction with a user on a page, you may allow the user to modify the frame size manually while in a certain mode. Or you may grant the user one chance to resize the frame. When the `onResize` event handler fires, a script sets the `noResize` property of the FRAME element to `false`. If you turn off resizing for a frame, all edges of the frame become non-resizable, regardless of the `noResize` value setting of adjacent frames. Turning off resizability has no effect on the ability of scripts to alter the sizes of frames via the FRAMESET element object's `cols` or `rows` properties.

On the CD-ROM

Example on the CD-ROM

Related Items: `FRAMESET.cols`, `FRAMESET.rows` properties.

scrolling

Value: `yes` | `no` | `1` | `0` as strings — Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `scrolling` property lets scripts turn scrollbars on and off inside a single frame of a frameset. By default, scrolling is turned on unless overridden by the `SCROLL` attribute of the `<FRAME>` tag.

Values for the `scrolling` property are strings that substitute for Boolean values. Values `yes` or `1` mean that scrollbars are visible (provided there is more content than can be viewed without scrolling); `no` or `0` hide scrollbars in the frame. IE4+ also recognizes (and sets as default) the auto value.

Note

This property is partially broken in IE5.5/Windows. While the object records changes to the property, the frame's appearance does not change. NN6 has the same problem, plus some others, such as the property not returning a value unless the `SCROLLING` attribute is specified in the FRAME element's tag.

On the CD-ROM

Example (with Listing 16-45) on the CD-ROM

`src`

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `src` property of a FRAME element object offers an additional way of navigating to a different page within a frame (meaning other than assigning a new URL to the `location.href` property of the frame object). For backward compatibility with older browsers, however, continue using `location.href` for scripted navigation. Remember that the `src` property belongs to the FRAME element object, not the `window` object it represents. Therefore, references to the `src` property must be via the element's ID and/or node hierarchy.

On the CD-ROM

Example on the CD-ROM

Related Items: `location.href` property.

FRAMESET Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`border`		
`borderColor`		
`cols`		
`frameBorder`		
`frameSpacing`		
`rows`		

Syntax

Accessing properties or methods of a FRAMESET element object from a FRAMESET:

```
(IE4+)     document.all.framesetID. property | method([parameters])
(IE5+/NN6) document.getElementById("framesetID"). property |
           method([parameters])
```

Accessing properties of methods of a FRAMESET element from a frame document:

```
(IE4+)     parent.document.all.framesetID. property | method([parameters])
(IE5+/NN6) parent.document.getElementById("framesetID"). property |
           method([parameters])
```

About this object

The FRAMESET element object is the script-accessible equivalent of the element generated via the `<FRAMESET>` tag. This element is different from the parent (window-type) object from the original object model. A FRAMESET element object has properties and methods that impact the HTML element; in contrast, the `window` object referenced from documents inside frames via the `parent` or `top` window references contains a document and all the content that goes along with it.

When framesets are nested in one another, a node parent–child relationship exists between containing and contained framesets. For example, consider the following skeletal nested frameset structure:

```
<FRAMESET ID="outerFrameset" COLS="30%, 70%">
    <FRAME ID="frame1">
    <FRAMESET ID="innerFrameset" ROWS="50%,50%">
        <FRAME ID="frame2">
        <FRAME ID="frame3">
    </FRAMESET>
</FRAMESET>
```

When writing scripts for documents that go inside any of the frames of this structure, references to the framesetting window and frames are a flatter hierarchy than the HTML signifies. A script in any frame references the framesetting window via the `parent` reference; a script in any frame references another frame via the `parent.frameName` reference. In other words, the `window` objects of the frameset defined in a document are all siblings and share the same parent.

Such is not the case when viewing the above structure from the perspective of W3C node terminology. Parent–child relationships are governed by the nesting of HTML elements, irrespective of whatever windows get generated by the browser. Therefore, frame `frame2` has only one sibling, `frame3`. Both of those share one parent, `innerFrameset`. Both `innerFrameset` and `frame1` are children of `outerFrameset`. If your script were sitting on a reference to `frame2`, and you wanted to change the `cols` property of `outerFrameset`, you would have to traverse two generations of nodes:

```
frame2Ref.parentNode.parentNode.cols = "40%,60%"
```

What might confuse matters ever more in practice is that a script belonging to one of the frames must use window object terminology to jump out of the current `window` object to the frameset that generated the frame window for the document. In other words, there is no immediate way to jump directly from a document to the FRAME element object that defines the frame in which the document resides. The document's script accesses the node hierarchy of its frameset via the `parent.document` reference. But this reference is to the `document` object that contains the entire frameset structure. Fortunately, the W3C DOM provides the `getElementById()` method to extract a reference to any node nested within the document. Thus, a document inside one of the frames can access the FRAME element object just as if it were any element in a typical document (which it is):

```
parent.document.getElementById("frame2")
```

No reference to the containing FRAMESET element object is necessary. Or, to make that column width change from a script inside one of the frame windows, the statement would be:

```
parent.document.getElementById("outerFrame").cols = "40%,60%"
```

The inner frameset is equally accessible by the same syntax.

Properties

border

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The border property of a FRAMESET element object lets you read the thickness (in pixels) of the borders between frames of a frameset. If you do not specify a BORDER attribute in the frameset's tag, the property is empty, rather than reflecting the actual border thickness applied by default.

On the CD-ROM

Example on the CD-ROM

Related Items: FRAMESET.frameBorder property.

borderColor

Value: Hexadecimal triplet or color name string Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The borderColor property lets you read the value of the color assigned to the BORDERCOLOR attribute of the frameset's tag. Although the property is read/write, changing the color by script does not alter the border colors rendered in the browser window. Attribute values set as color names are returned as hexadecimal triplets when you read the property value.

Example on the CD-ROM

Related Items: `FRAME.borderColor`, `FRAMESET.frameBorder` properties.

`cols`
`rows`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `cols` and `rows` properties of a FRAMESET element object let you read and modify the sizes of frames after the frameset has loaded. These two properties are defined in the W3C DOM. Values for both properties are strings, which may include percent symbols or asterisks. Therefore if you are trying to increase or decrease the size of a frame column or row gradually, you must parse the string for the necessary original values before performing any math on them (or, in IE4+, use the FRAME element object's `height` and `width` properties to gauge the current frame size in pixels).

IE4+ lets you completely modify the frameset by adjusting these properties. This includes adding or removing columns or rows to the frameset grid. Because a change in the frameset structure could impact scripts by changing the size of the frames array associated with the parent window or unloading documents that contain needed data, be sure to test your scripts with both states of your frameset. If you want to remove a frame from a frameset view, you might be safer to specify the size of zero for that particular row or column in the frameset. Of course a size of zero still leaves a one-pixel frame, but it is essentially invisible if borders are not turned on and the one-pixel frame shares the same background color as the other frames. Another positive by-product of this technique is that you can restore the other frame with its document state identical from when it was hidden.

When you have nested framesets defined in a single document, be sure to reference the desired FRAMESET element object. One object may be specifying the columns, while another (nested) one specifies the rows for the grid. Assign a unique ID to each FRAMESET element so that references can be reliably directed to the proper object.

Example (with Listings 16-46, 16-47, and 16-48) on the CD-ROM

Related Items: FRAME object.

frameBorder

Value: `yes` | `no` | `1` | `0` as strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `frameBorder` property offers scripted access to a FRAMESET element object's FRAMEBORDER attribute setting. IE4+ does not respond well to modifying this property after the page has loaded.

Values for the `frameBorder` property are strings that substitute for Boolean values. Values `yes` or `1` mean that the border is (supposed to be) turned on; `no` or `0` turn off the border.

Example on the CD-ROM

Related Items: `FRAME.frameBorder` properties.

frameSpacing

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `frameSpacing` property of a FRAMESET element object lets you read the spacing (in pixels) between frames of a frameset. If you do not specify a `FRAMESPACING` attribute in the frameset's tag, the property is empty, rather than reflecting the actual border thickness applied by default (usually 2).

Example on the CD-ROM

Related Items: `FRAMESET.border` property.

IFRAME Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
align		
contentDocument		
Document		
frameBorder		
frameSpacing		
hspace		
longDesc		
marginHeight		
marginWidth		
scrolling		
src		
vspace		

Syntax

Accessing properties or methods of an IFRAME element object from a containing document:

```
(IE4+)     document.all.iframeID. property | method([parameters])
(IE4+/NN6) window.frames["iframeName"]. property | method([parameters])
(IE5+/NN6) document.getElementById("iframeID"). property | method([parameters])
```

Accessing properties of methods of an IFRAME element from a document inside the IFRAME element:

```
(IE4+)     parent.document.all.iframeID. property | method([parameters])
(IE5+/NN6) parent.document.getElementById("iframeID"). property |
           method([parameters])
```

About this object

An IFRAME element (IE4+ and NN6) allows HTML content from a separate source to be loaded within the body of another document. In some respects, the NN4 LAYER element was a precursor to the IFRAME concept, but unlike the LAYER, an IFRAME element is not inherently positionable. It is positionable, the same way as any other HTML element, by assigning positioning attributes to a style sheet associated with the IFRAME. Without explicit positioning, an IFRAME element appears in the body of a document in normal source code order of elements. Unlike a frame of a frameset, you can place an IFRAME arbitrarily in the middle of any document. If the FRAME changes size under script control, the surrounding content moves out of the way or cinches up.

What truly separates the IFRAME apart from other HTML elements is its ability to load and display external HTML files and, with the help of scripts, have different pages loaded into the IFRAME without disturbing the rest of the content of the main document. Pages loaded into the IFRAME can also have scripts and any other features that you may like to put into an HTML document (including XML).

The IFRAME element has a rich set of attributes that let the HTML author control the look, size (`HEIGHT` and `WIDTH`), and, to some degree, behavior of the frame. Most of those are accessible to scripts as properties of an IFRAME element object.

It is important to bear in mind that an IFRAME element is in many respects like a FRAME element, especially when it comes to window kinds of relationships. If you plant an IFRAME element in a document of the main window, that element shows up in the main window's object model as a frame, accessible via common frames terminology:

```
window.frames[i]
window.frames[frameName]
```

Within that IFRAME frame object is a document and all its contents. All references to the document objects inside the IFRAME must flow through the "portal" of the IFRAME frame.

Conversely, scripts in the document living inside an IFRAME can communicate with the main document via the `parent` reference. Of course, you cannot replace the content of the main window with another HTML document (using `location.href`, for instance) without destroying the IFRAME that was in the original document.

Properties

align

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property governs how an IFRAME element aligns itself with respect to surrounding content on the page. Two of the possible values (`left` and `right`) position the `IFRAME` along the left and right edge (respectively) of the IFRAME's containing element (usually the BODY). Just as with an image, when an IFRAME is floated along the left and right edges of a container, other content wraps around the element. Table 16-5 shows all possible values and their meanings.

Table 16-5 Values of the align Property

Value	*Description*
`absbottom`	Aligns the bottom of the IFRAME with the imaginary line that extends along character descenders of surrounding text.
`absmiddle`	Aligns the middle of the IFRAME with the center point between the surrounding text's `top` and `absbottom`.
`baseline`	Aligns the bottom of the IFRAME with the baseline of surrounding text.
`bottom`	Same as `baseline` in IE.
`left`	Aligns the IFRAME flush with left edge of the containing element.
`middle`	Aligns the imaginary vertical centerline of surrounding text with the same for the IFRAME element.
`right`	Aligns the IFRAME flush with the right edge of the containing element.
`texttop`	Aligns the top of the IFRAME element with the imaginary line that extends along the tallest ascender of surrounding text.
`top`	Aligns the top of the IFRAME element with the surrounding element's top.

As your script changes the value of the `align` property, the page automatically reflows the content to suit the new alignment.

On the CD-ROM

Example on the CD-ROM

Related Items: `IFRAME.hspace`, `IFRAME.vspace` properties.

contentDocument

Value: `document` object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `contentDocument` property of an IFRAME element object is nothing more than a reference to the document contained by that frame. If your script finds that it has a reference to an IFRAME element object, you can use the `contentDocument` property to get a valid reference to the document, and therefore any other content of the frame.

Example on the CD-ROM

Related Items: `document` object.

Document

Value: `document` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

See the `FRAME.Document` property for details on this property of the ActiveX Web Browser object. You find less need for this property with an IFRAME element, because you can use the `window` object behavior of IFRAMEs to transcend the document object hierarchies of the main window and the IFRAME window.

Related Items: `FRAME.Document` property.

frameBorder

Value: `yes | no | 1 | 0` as strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `frameBorder` property offers scripted access to an IFRAME element object's `FRAMEBORDER` attribute setting. IE4+ does not respond well to modifying this property after the page has loaded.

Values for the `frameBorder` property are strings that substitute for Boolean values. Values `yes` or `1` mean that the border is (supposed to be) turned on; `no` or `0` turn off the border.

Example on the CD-ROM

Related Items: `FRAME.frameBorder` properties.

frameSpacing

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `frameSpacing` property is included in IE5 for backward compatibility to IE4's erroneous inclusion of this property for an IFRAME element. Do not use it.

hspace
vspace

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These IE-specific properties allow for margins to be set around an IFRAME element. In general, `hspace` and `vspace` properties (and their HTML attributes) have been replaced by CSS margins and padding. These properties and their attributes are not recognized by any W3C standard (including HTML 4.0).

Values for these properties are integers representing the number of pixels of padding between the element and surrounding content. The `hspace` value assigns the same number of pixels to the left and right sides of the element; the `vspace` value is applied to both the top and bottom edges. Scripted changes to these values have no effect in IE5/Windows.

On the CD-ROM

Example on the CD-ROM

Related Items: `style.padding` property.

longDesc

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `longDesc` property is the scripted equivalent of the `LONGDESC` attribute of the `<IFRAME>` tag. This HTML 4.0 attribute is intended to provide browsers with a URL to a document that contains a long description of the element. Future browsers can use this feature to provide information about the frame for visually impaired site visitors.

marginHeight
marginWidth

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Browsers tend to automatically insert content within a frame by adding a margin between the content and the edge of the frame. These values are represented by the `marginHeight` (top and bottom edges) and `marginWidth` (left and right edges) properties. Although the properties are not read-only, changing the values after the frameset has loaded does not alter the appearance of the document in the frame. If you need to alter the margin(s) of a document inside a frame, adjust the `document.body.style` margin properties.

Also be aware that although the default values of these properties are empty (that is, when no `MARGINHEIGHT` or `MARGINWIDTH` attributes are set for the `<IFRAME>` tag), margins are built into the page. The precise pixel count of those margins varies with different operating systems.

Related Items: `style` object (Chapter 30).

scrolling

Value: `yes` | `no` | `1` | `0` as strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `scrolling` property lets scripts turn scrollbars on and off inside an IFRAME element. By default, scrolling is turned on unless overridden by the `SCROLL` attribute of the `<IFRAME>` tag.

Values for the `scrolling` property are strings that substitute for Boolean values. Values `yes` or `1` mean that scrollbars are visible (provided there is more content than can be viewed without scrolling); `no` or `0` hide scrollbars in the frame. IE4+ also recognizes (and sets as default) the auto value.

On the CD-ROM

Example on the CD-ROM

Related Items: `FRAME.scrolling` property.

src

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `src` property of an IFRAME element object offers an additional way of navigating to a different page within an inline frame (that is, other than assigning a new URL to the `location.href` property of the frame object). Remember that the `src` property belongs to the IFRAME element object, not the `window` object it represents. Therefore, references to the `src` property must be via the element's ID and/or node hierarchy.

On the CD-ROM

Example on the CD-ROM

Related Items: `location.href` property.

popup Object

Properties	***Methods***	***Event Handlers***
`document`	`hide()`	
`isOpen`	`show()`	

Syntax

Creating a `popup` object:

```
var popupObj = window.createPopup()
```

Accessing properties or methods of a `popup` object from a document in the window that created the pop-up:

```
popupObj.property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

About this object

A popup object is a chrome-less window space, which overlaps the window whose document generates the pop-up. A pop-up also appears in front of any dialog boxes. Unlike the dialog box windows generated via IE's showModalDialog() and showModelessDialog() methods, your scripts must not only create the window, but also put content into it, and then define where on the screen and how big it will be.

Because the pop-up window has no chrome (that is, title bar, resize handles, and so forth), you should populate its content with a border and/or background color so that it stands out from the main window's content. The following statements reflect a typical sequence of creating, populating, and showing a popup object:

```
var popup = window.createPopup()
var popupBody = popup.document.body
popupBody.style.border = "solid 2px black"
popupBody.style.padding = "5px"
popupBody.innerHTML = "<P>Here is some text in a popup window</P>"
popup.show(200,100, 200, 50, document.body)
```

The pop-up window that IE creates is, in fact, a window, but only from the point of view of the document that it contains. In other words, while the number of properties and methods for the popup object is small, the parentWindow property of the document inside the pop-up points to a genuine window property. Even so, be aware that this pop-up does not appear as a distinct window among windows listed in the Windows Taskbar. If a user clicks outside of the pop-up or switches to another application, the pop-up disappears, and you must reinvoke the show() method by script (complete with dimension and position parameters) to force the pop-up to reappear.

When you assign content to a pop-up, you are also responsible for making sure that the content fits the size of the pop-up you specify. If the content runs past the rectangular space (body text word wraps within the pop-up's rectangle), no scrollbars appear.

Properties

document

Value: document object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Use the document property as a gateway to the content of a pop-up window. This property is the only access point available from the script that creates the pop-up to the pop-up itself. The most common application of this property is to set document properties governing the content of the pop-up window. For example, to give the pop-up a border (because the pop-up itself has no window chrome), the script that creates the window can assign values to the `style` property of the document in the pop-up window, as follows:

```
myPopup.document.body.style.border = "solid 3px gray"
```

Beware that the `document` object of a pop-up window may not implement the full flexibility you know about primary window `document` objects. For example, you are not allowed to assign a URL to the `document.URL` property in a pop-up window.

On the CD-ROM

Example on the CD-ROM

Related Items: `document` object.

`isOpen`

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

While a pop-up window is visible, its `isOpen` property returns `true`; otherwise the property returns `false`. Because any user action in the browser causes the pop-up to hide itself, the property is useful only for script statements that are running on their own after the pop-up is made visible.

On the CD-ROM

Example on the CD-ROM

Related Items: `popup.show()` method.

Methods

`hide()`
`show(`*`left, top, width, height`*`[,`*`positioningElementRef`*`])`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

After you have created a popup object with the window.createPopup() method and populated it with content, you must explicitly show the window via the show() method. If the window is hidden because a user clicked the main browser window somewhere, the show() method (and all its parameters) must be invoked again. To have a script hide the window, invoke the hide() method for the popup object.

The first four parameters of the show() method are required and define the pixel location and size of the pop-up window. By default, the coordinate space for the left and top parameters is the video display. Thus, a left and top setting of zero places the pop-up in the upper-left corner of the video screen. But you can also define a different coordinate space by adding an optional fifth parameter. This parameter must be a reference to an element on the page. To confine the coordinate space to the content region of the browser window, specify the document.body object as the positioning element reference.

On the CD-ROM

Example (with Listing 16-49) on the CD-ROM

Related Items: popup.isOpen property, window.createPopup() method.

✦ ✦ ✦

CHAPTER 17

Location and History Objects

✦ ✦ ✦ ✦

In This Chapter

Loading new pages and other media types via the `location` object

Security restrictions across frames

Navigating through the browser history under script control

✦ ✦ ✦ ✦

Not all objects in the document object model are "things" you can see in the content area of the browser window. Each browser window or frame maintains a bunch of other information about the page you are currently visiting and where you have been. The URL of the page you see in the window is called the *location*, and browsers store this information in the `location` object. As you surf the Web, the browser stores the URLs of your past pages in the `history` object. You can manually view what that object contains by looking in the browser menu that enables you to jump back to a previously visited page. This chapter is all about these two nearly invisible, but important, objects.

Not only are these objects valuable to your browser, but they are also valuable to snoopers who might want to write scripts to see what URLs you're viewing in another frame or the URLs of other sites you've visited in the last dozen mouse clicks. As a result, security restrictions built into browsers limit access to some of these objects' properties (unless you use signed scripts in NN4+). For older browsers, these properties simply are not available from a script.

Location Object

Properties	***Methods***	***Event Handlers***
`hash`	`assign()`	None
`host`	`reload()`	
`hostname`	`replace()`	
`href`		
`pathname`		
`port`		
`protocol`		
`search`		

Syntax

Loading a new document into the current window:

```
[window.]location.href = "URL"
```

Accessing `location` object properties or methods:

```
[window.]location.property | method([parameters])
```

About this object

In its place one level below `window`-style objects in the document object hierarchy, the `location` object represents information about the URL of any currently open window or of a specific frame. A multiple-frame window displays the parent window's URL in the Location (or Address) field of the browser. Each frame also has a location associated with it, although you may not see any overt reference to the frame's URL in the browser. To get URL information about a document located in another frame, the reference to the `location` object must include the window frame reference. For example, if you have a window consisting of two frames, Table 17-1 shows the possible references to the `location` objects for all frames comprising the Web presentation.

Note

Scripts cannot alter the URL displayed in the browser's Location/Address box. For security and privacy reasons, that text box cannot display anything other than the URL of a current page or URL in transit.

Table 17-1 Location Object References in a Two-Frame Browser Window

Reference	*Description*
`location` (or `window.location`)	URL of frame displaying the document that runs the script statement containing this reference
`parent.location`	URL information for parent window that defines the <FRAMESET>
`parent.frames[0].location`	URL information for first visible frame
`parent.frames[1].location`	URL information for second visible frame
parent.*otherFrameName*.location	URL information for another named frame in the same frameset

Most properties of a `location` object deal with network-oriented information. This information involves various data about the physical location of the document on the network including the host server, the protocol being used, and other components of the URL. Given a complete URL for a typical WWW page, the `window.location` object assigns property names to various segments of the URL, as shown here:

```
http://www.giantco.com:80/promos/newproducts.html#giantGizmo
```

Property	*Value*
protocol	"http:"
hostname	"www.giantco.com"
port	"80"
host	"www.giantco.com:80"
pathname	"/promos/newproducts.html"
hash	"#giantGizmo"
href	"http://www.giantco.com:80/promos newproducts.html#giantGizmo"

The `window.location` object is handy when a script needs to extract information about the URL, perhaps to obtain a base reference on which to build URLs for other documents to be fetched as the result of user action. This object can eliminate a nuisance for Web authors who develop sites on one machine and then upload them to a server (perhaps at an Internet service provider) with an entirely different directory structure. By building scripts to construct base references from the directory location of the current document, you can construct the complete URLs for loading documents. You don't have to manually change the base reference data in your documents as you shift the files from computer to computer or from directory to directory. To extract the segment of the URL and place it into the enclosing directory, use the following:

```
var baseRef = location.href.substring(0,location.href.lastIndexOf("/") + 1)
```

Caution

Security alert: To allay fears of Internet security breaches and privacy invasions, scriptable browsers prevent your script in one frame from retrieving location object properties from other frames whose domain and server are not your own (unless you use signed scripts in NN4+ or you set the IE browser to trust the site). This restriction puts a damper on many scripters' well-meaning designs and aids for Web watchers and visitors. If you attempt such property accesses, however, you receive an "access denied" (or similar) security warning dialog box.

Setting the value of some `location` properties is the preferred way to control which document gets loaded into a window or frame. Though you may expect to find a method somewhere in JavaScript that contains a plain language "Go" or "Open" word (to simulate what you see in the browser menu bar), you "point your browser" to another URL by setting the `window.location.href` property to that URL, as in

```
window.location.href = "http://www.dannyg.com/"
```

The equals assignment operator (=) in this kind of statement is a powerful weapon. In fact, setting the `location.href` object to a URL of a different MIME type, such as one of the variety of sound and video formats, causes the browser to load those files into the plug-in or helper application designated in your browser's settings. The `location.assign()` method was originally intended for internal use by the browser, but it is available for scripters (although I don't recommend using it for navigation). Internet Explorer's object model includes a `window.navigate()` method that also loads a document into a window, but you can't use it for cross-browser applications.

Two other methods complement the `location` object's capability to control navigation. One method is the script equivalent of clicking Reload; the other method enables you to replace the current document's entry in the history with that of the next URL of your script's choice.

Properties

hash

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The *hash mark* (#) is a URL convention that directs the browser to an anchor located in the document. Any name you assign to an anchor (with the `<A NAME="..."> ...</A>` tag pair) becomes part of the URL after the hash mark. A `location` object's `hash` property is the name of the anchor part of the current URL (which consists of the hash mark and the name).

If you have written HTML documents with anchors and directed links to navigate to those anchors, you have probably noticed that although the destination location shows the anchor as part of the URL (for example, in the Location field), the window's anchor value does not change as the user manually scrolls to positions in the document where other anchors are defined. An anchor appears in the URL only when the window has navigated there as part of a link or in response to a script that adjusts the URL.

Just as you can navigate to any URL by setting the `window.location.href` property, you can navigate to another hash in the same document by adjusting only the `hash` property of the location without the hash mark (as shown in the following example). Such navigation, even within a document, sometimes causes IE to reload the document. No reload occurs in NN3+.

On the CD-ROM

Example (with Listing 17-1) on the CD-ROM

Related Item: `location.href` property.

host

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `location.host` property describes both the hostname and port of a URL. The port is included in the value only when the port is an explicit part of the URL. If you navigate to a URL that does not display the port number in the Location field of the browser, the `location.host` property returns the same value as the `location.hostname` property.

Use the `location.host` property to extract the `hostname:port` part of the URL of any document loaded in the browser. This capability may be helpful for building a URL to a specific document that you want your script to access on the fly.

On the CD-ROM

Example (with Listings 17-2, 17-3, and 17-4) on the CD-ROM

Related Items: `location.port`, `location.hostname` properties.

hostname

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The hostname of a typical URL is the name of the server on the network that stores the document you view in the browser. For most Web sites, the server name includes not only the domain name, but also the `www.` prefix. The hostname does not, however, include the port number if the URL specifies such a number.

On the CD-ROM

Example on the CD-ROM

Related Items: `location.host`, `location.port` properties.

href

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Of all the `location` object properties, `href` (hypertext reference) is probably the one most often called upon in scripting. The `location.href` property supplies a string of the entire URL of the specified `window` object.

Using this property on the left side of an assignment statement is the JavaScript way of opening a URL for display in a window. Any of the following statements can load my Web site's index page into a single-frame browser window:

```
window.location="http://www.dannyg.com"
window.location.href="http://www.dannyg.com"
```

At times, you may encounter difficulty by omitting a reference to a window. JavaScript may get confused and reference the `document.location` property. To prevent this confusion, the `document.location` property was deprecated (put on the no-no list) and replaced by the `document.URL` property. In the meantime, you can't go wrong by always specifying a window in the reference.

Note

You should be able to omit the `href` property name when assigning a new URL to the `location` object (for example, `location = "http://www.dannyg.com"`). While this works in most browsers most of the time, some early browsers (especially IE3) behave more reliably if you assign a URL explicitly to the `location.href` property. I recommend using `location.href` at all times.

Sometimes you must extract the name of the current directory in a script so another statement can append a known document to the URL before loading it into the window. Although the other `location` object properties yield an assortment of a URL's segments, none of them provides the full URL to the current URL's directory. But you can use JavaScript string manipulation techniques to accomplish this task. Listing 17-5 shows such a possibility.

Depending on your browser, the values for the `location.href` property may be encoded with ASCII equivalents of non-alphanumeric characters. Such an ASCII value includes the `%` symbol and the ASCII numeric value. The most common encoded character in a URL is the space: `%20`. If you need to extract a URL and display that value as a string in your documents, you can safely pass all such potentially encoded strings through the JavaScript `unescape()` function. For example, if a URL to one of Giantco's pages is `http://www.giantco.com/product%20list`, you can convert it by passing it through the `unescape()` function, as in the following example.

```
var plainURL = unescape(window.location.href)
    // result = "http://www.giantco.com/product list"
```

The inverse function, `escape()`, is available for sending encoded strings to CGI programs on servers. See Chapter 42 for more details on these functions.

On the CD-ROM

Example (with Listing 17-5) on the CD-ROM

Related Items: `location.pathname`, `document.location` properties; `String` object (Chapter 34).

pathname

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The pathname component of a URL consists of the directory structure relative to the server's root volume. In other words, the root (the server name in an `http:` connection) is not part of the pathname. If the URL's path is to a file in the root directory, then the `location.pathname` property is a single slash (/) character. Any other pathname starts with a slash character, indicating a directory nested within the root. The value of the `location.pathname` property also includes the document name.

On the CD-ROM

Example on the CD-ROM

Related Item: `location.href` property.

port

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

These days, few consumer-friendly Web sites need to include the port number as part of their URLs. You see port numbers mostly in the less-popular protocols, in URLs to sites used for private development purposes, or in URLs to sites that have no assigned domain names. You can retrieve the value with the `location.port` property. If you extract the value from one URL and intend to build another URL with that component, be sure to include the colon delimiter between the server's IP address and port number.

On the CD-ROM

Example on the CD-ROM

Related Item: `location.host` property.

protocol

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The first component of any URL is the protocol used for the particular type of communication. For World Wide Web pages, the Hypertext Transfer Protocol (`http`) is the standard. Other common protocols you may see in your browser include HTTP-Secure (`https`), File Transfer Protocol (`ftp`), File (`file`), and Mail (`mailto`). Values for the `location.protocol` property include not only the name of the protocol, but also the trailing colon delimiter. Thus, for a typical Web page URL, the `location.protocol` property is

```
http:
```

Notice that the usual slashes after the protocol in the URL are not part of the `location.protocol` value. Of all the `location` object properties, only the full URL (`location.href`) reveals the slash delimiters between the protocol and other components.

On the CD-ROM

Example on the CD-ROM

Related Item: `location.href` property.

search

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Perhaps you've noticed the long, cryptic URL that appears in the Location/Address field of your browser whenever you ask one of the WWW search services to look up matches for items you enter into the keyword field. The URL starts the regular way — with protocol, host, and pathname values. But following the more traditional URL are search commands that are submitted to the search engine (a CGI program running on the server). You can retrieve or set that trailing search query by using the `location.search` property.

Each search engine has its own formula for query submissions based on the designs of the HTML forms that obtain details from users. These search queries come in an encoded format that appears in anything but plain language. If you plan to script a search query, be sure you fully understand the search engine's format before you start assembling a string to assign to the `location.search` property of a window.

The most common format for search data is a series of name/value pairs. An equal symbol (=) separates a name and its value. Multiple name/value pairs have ampersands (&) between them. You should use the `escape()` function to convert the data into URL-friendly format, especially when the content includes spaces.

The `location.search` property also applies to any part of a URL after the filename, including parameters being sent to CGI programs on the server.

Passing data among pages via URLs

It is not uncommon to want to preserve some pieces of data that exist in one page so that a script in another page can pick up where the script processing left off in the first page. You can achieve persistence across page loads through one of three techniques: the `document.cookie` (Chapter 18), variables in framesetting documents, and the search string of a URL. That's really what happens when you visit search and e-commerce sites that return information to your browser. Rather than store, say, your search criteria on the server, they spit the criteria back to the browser as part of the URL. The next time you activate that URL, the values are sent to the server for processing (for example, to send you the next page of search results for a particular query).

Passing data among pages is not limited to client/server communication. You can use the search string strictly on the client side to pass data from one page to another. Unless some CGI process on the server is programmed to do something with the search string, a Web server regurgitates the search string as part of the location data that comes back with a page. A script in the newly loaded page can inspect the search string (via the `location.search` property) and tear it apart to gather the data and put it into script variables. The example on the CD-ROM demonstrates a powerful application of this technique.

On the CD-ROM

Example (with Listings 17-6, 17-7, and 17-8) on the CD-ROM

Related Item: `location.href` property.

Methods

assign("*URL*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

In earlier discussions about the `location` object, I said that you navigate to another page by assigning a new URL to the `location` object or `location.href` property. The `location.assign()` method does the same thing. In fact, when you set the `location` object to a URL, JavaScript silently applies the `assign()` method. No particular penalty or benefit comes from using the `assign()` method, except perhaps to make your code more understandable to others. I don't recall the last time I used this method in a production document, but you are free to use it if you like.

Related Item: `location.href` property.

reload(*unconditionalGETBoolean*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `location.reload()` method may be named inappropriately because it makes you think of the Reload/Refresh button in the browser toolbar. The `reload()` method is actually more powerful than the Reload/Refresh button.

Many form elements retain their screen states when you click Reload/Refresh (except in IE3). Text and TEXTAREA objects maintain whatever text is inside them; radio buttons and checkboxes maintain their checked status; SELECT objects remember which item is selected. About the only items the Reload/Refresh button destroys are global variable values and any settable, but not visible, property (for example, the value of a `hidden` INPUT object). I call this kind of reload a *soft reload*.

Browsers are frustratingly irregular about the ways they reload a document in the memory cache. In theory, an application of the `location.reload()` method should retrieve the page from the cache if the page is still available there (while the `history.go(0)` method should be even gentler, preserving form element settings). Adding a `true` parameter to the method is supposed to force an *unconditional GET* to the server, ignoring the cached version of the page. Yet when it is crucial for your application to get a page from the cache (for speed) or from the server (to guarantee a fresh copy), the browser behaves in just the opposite way you want it to behave. Meta tags supposedly designed to prevent caching of a page rarely, if ever, work. Some scripters have had success in reloading the page from the server by setting `location.href` to the URL of the page, plus a slightly different search string (for example, based on a string representation of the `Date` object) so that there is no match for the URL in the cache.

The bottom line is to be prepared to try different schemes to achieve the effect you want. And also be prepared to not get the results you need.

On the CD-ROM

Example (with Listing 17-9) on the CD-ROM

Related Item: `history.go()` method.

`replace("URL")`

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

In a complex Web site, you may have pages that you do not want to appear in the user's history list. For example, a registration sequence may lead the user to one or more intermediate HTML documents that won't make much sense to the user later. You especially don't want users to see these pages again if they use the Back button to return to a previous URL. The `location.replace()` method navigates to another page, but it does not let the current page stay in the queue of pages accessible via the Back button.

Although you cannot prevent a document from appearing in the history list while the user views that page, you can instruct the browser to load another document into the window and replace the current history entry with the entry for the new document. This trick does not empty the history list but instead removes the current item from the list before the next URL is loaded. Removing the item from the history list prevents users from seeing the page again by clicking the Back button later.

On the CD-ROM

Example on the CD-ROM

Related Item: `history` object.

History Object

Properties	Methods	Event Handlers
current	back()	(None)
length	forward()	
next	go()	
previous		

Syntax

Accessing history object properties or methods:

```
[window.]history.property | method([parameters])
```

About this object

As a user surfs the Web, the browser maintains a list of URLs for the most recent stops. This list is represented in the scriptable object model by the history object. A script cannot surreptitiously extract actual URLs maintained in that list unless you use signed scripts (in NN4+ — see Chapter 46) and the user grants permission. Under unsigned conditions, a script can methodically navigate to each URL in the history (by relative number or by stepping back one URL at a time), in which case the user sees the browser navigating on its own as if possessed by a spirit. Good Netiquette dictates that you do not navigate a user outside of your Web site without the user's explicit permission.

One application for the history object and its back() or go() methods is to provide the equivalent of a Back button in your HTML documents. That button triggers a script that checks for any items in the history list and then goes back one page. Your document doesn't have to know anything about the URL from which the user lands at your page.

The behavior of the Back and Forward buttons in Netscape Navigator underwent a significant change between versions 2 and 3. If you script these actions and need to support the older Navigator versions, you should understand how these browsers handle backward and forward navigation.

In Navigator 2, one history list applies to the entire browser window. You can load a frameset into the window and navigate the contents of each frame individually with wild abandon. But if you then click the Back button, Navigator unloads the frameset and takes you back to the page in history prior to that frameset.

In Navigator 3, each frame (window object) maintains its own history list. Thus, if you navigate within a frame, a click of the Back button steps you back out frame by frame. Only after the initial frameset documents appear in the window does the next Back button click unload the frameset. That behavior persists today in all other scriptable browsers.

JavaScript's reaction to the change of behavior over the generations is a bit murky. In Navigator 2, the `history.back()` and `history.forward()` methods act like the toolbar buttons because there is only one kind of history being tracked. In Navigator 3, however, there is a disconnect between JavaScript behavior and what the browser does internally with history: JavaScript fails to connect history entries to a particular frame. Therefore, a reference to `history.back()` built with a given frame name does not prevent the method from exceeding the history of that frame. Instead, the behavior is more like a global back operation, rather than being frame-specific.

For NN4, there is one more sea change in the relationship between JavaScript and these `history` object methods. The behavior of the Back and Forward buttons is also available through a pair of window methods: `window.back()` and `window.forward()`. The `history` object methods are not specific to a frame that is part of the reference. When the `parent.frameName.history.back()` method reaches the end of history for that frame, further invocations of that method are ignored.

IE's history mechanism is not localized to a particular frame of a frameset. Instead, the `history.back()` and `history.forward()` methods mimic the physical act of clicking the toolbar buttons. If you want to ensure cross-browser, if not cross-generational, behavior in a frameset, address references to the `history.back()` and `history.forward()` methods to the parent window.

So much for the history of the `history` object. As the tale of history object method evolution indicates, you must use the `history` object and its methods with extreme care. Your design must be smart enough to "watch" what the user is doing with your pages (for example, by checking the current URL before navigating with these methods). Otherwise, you run the risk of confusing your user by navigating to unexpected places. Your script can also get into trouble because it cannot detect where the current document is in the Back–Forward sequence in history.

Properties

`current`
`next`
`previous`

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		(✓)	✓	✓					

To know where to go when you click the Back and Forward buttons, the browser maintains a list of URLs visited. To someone trying to invade your privacy and see what sites and pages you frequent, this information is valuable. That's why the three NN-specific properties that expose the actual URLs in the history list are restricted to pages with signed scripts and whose visitors have given permission to read sensitive browser data (see Chapter 46).

With signed scripts and permission, you can look through the entire array of history entries in any frame or window. Because the list is an array, you can extract individual items by index value. For example, if the array has 10 entries, you can see the fifth item by using normal array indexing methods:

```
var fifthEntry = window.history[4]
```

No property or method exists that directly reveals the index value of the currently loaded URL, but you can script an educated guess by comparing the values of the current, next, and previous properties of the `history` object against the entire list.

I personally don't like some unknown entity watching over my shoulder while I'm on the Net, so I respect that same feeling in others and therefore discourage the use of these powers unless the user is given adequate warning. The signed script permission dialog box does not offer enough detail about the consequences of revealing this level of information.

Notice that in the above compatibility chart these properties were available in some form in NN3. Access to them required a short-lived security scheme called *data tainting*. That mechanism was never implemented fully and was replaced by signed scripts.

Related Item: `history.length` property.

length

Value: Number Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Use the `history.length` property to count the items in the history list. Unfortunately, this nugget of information is not particularly helpful in scripting navigation relative to the current location because your script cannot extract anything from the place in the history queue where the current document is located. If the current document is at the top of the list (the most recently loaded), you can calculate relative to that location. But users can use the Go/View menu to jump around the history list as they like. The position of a listing in the history list does not change by virtue of navigating back to that document. A `history.length` of `1`, however, indicates that the current document is the first one the user loaded since starting the browser software.

On the CD-ROM

Example (with Listing 17-11) on the CD-ROM

Related Items: None.

Methods

back()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The behavior of the `history.back()` method has changed in Netscape's browsers between versions 3 and 4. Prior to Navigator 4, the method acted identically to clicking the Back button. (Even this unscripted behavior changed between Navigator 2 and 3 to better accommodate frame navigation.) IE3+ follows this behavior. In Navigator 4, however, the `history.back()` method is window/frame-specific. Therefore, if you direct successive `back()` methods to a frame within a frameset, the method is ignored once it reaches the first document to be loaded into that frame. The Back button (and the new `window.back()` method) unload the frameset and continue taking you back through the browser's global history.

If you deliberately lead a user to a dead end in your Web site, you should make sure that the HTML document provides a way to navigate back to a recognizable spot. Because you can easily create a new window that has no toolbar or menu bar (non-Macintosh browsers), you may end up stranding your users because they have no way of navigating out of a cul-de-sac in such a window. A button in your document should give the user a way back to the last location.

Unless you need to perform some additional processing prior to navigating to the previous location, you can simply place this method as the parameter to the event handler attribute of a button definition. To guarantee compatibility across all browsers, direct this method at the parent document when used from within a frameset.

On the CD-ROM

Example (with Listings 17-12 and 17-13) on the CD-ROM

Related Items: `history.forward()`, `history.go()` methods.

forward()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Less likely to be scripted than the `history.back()` action is the method that performs the opposite action: navigating forward one step in the browser's history list. The only time you can confidently use the `history.forward()` method is to balance the use of the `history.back()` method in the same script — where your script closely keeps track of how many steps the script heads in either direction. Use the `history.forward()` method with extreme caution, and only after performing extensive user testing on your Web pages to make sure that you've covered all user possibilities. The same cautions about differences introduced in NN4 for `history.back()` apply equally to `history.forward()`: Forward progress extends only through the history listing for a given window or frame, not the entire browser history list. See Listings 17-12 and 17-13 for a demonstration.

Related Items: `history.back()`, `history.go()` methods.

go(*relativeNumber* | "*URLOrTitleSubstring*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Use the `history.go()` method to script navigation within the history list currently stored in the browser. If you elect to use a URL as a parameter, however, that precise URL must already exist in the history listing. Therefore, do not regard this method as an alternate to setting the `window.location` object to a brand-new URL.

For navigating `n` steps in either direction along the history list, use the *`relativeNumber`* parameter of the `history.go()` method. This number is an integer value that indicates which item in the list to use, relative to the current location. For example, if the current URL is at the top of the list (that is, the Forward button in the toolbar is dimmed), then you need to use the following method to jump to the URL two items backward in the list:

```
history.go(-2)
```

In other words, the current URL is the equivalent of `history.go(0)` (a method that reloads the window). A positive integer indicates a jump that many items forward in the history list. Thus, `history.go(-1)` is the same as `history.back()`, whereas `history.go(1)` is the same as `history.forward()`.

Alternatively, you can specify one of the URLs or document titles stored in the browser's history list (titles appear in the Go/View menu). The method is a bit lenient with the string you specify as a parameter. It compares the string against all listings. The first item in the history list to contain the parameter string is regarded as the match. But, again, no navigation takes place if the item you specify does not appear in the history.

Like most other history methods, your script finds it difficult to manage the history list or the current URL's spot in the queue. That fact makes it even more difficult for your script to intelligently determine how far to navigate in either direction or to which specific URL or title matches it should jump. Use this method only for situations in which your Web pages are in strict control of the user's activity (or for designing scripts for yourself that automatically crawl around sites according to a fixed regimen). Once you give the user control over navigation, you have no guarantee that the history list will be what you expect, and any scripts you write that depend on a `history` object will likely break.

In practice, this method mostly performs a soft reload of the current window using the `0` parameter.

Tip

If you are developing a page for all scriptable browsers, be aware that Internet Explorer's `go()` method behaves a little differently than Netscape's. First, a bug in Internet Explorer 3 causes all invocations of `history.go()` with a non-zero value to behave as if the parameter were `-1`. Second, the string version does not work at all in IE3 (it generates an error alert); for IE4+, the matching string must be part of the URL and not part of the document title, as in Navigator. Finally, the reloading of a page with `history.go(0)` often returns to the server to reload the page rather than reloading from the cache.

On the CD-ROM

Example (with Listing 17-14) on the CD-ROM

Related Items: `history.back()`, `history.forward()`, `location.reload()` methods.

✦ ✦ ✦

CHAPTER 18

The Document and Body Objects

✦ ✦ ✦ ✦

In This Chapter

Accessing arrays of objects contained by the `document` object

Writing new document content to a window or frame

Using the BODY element for IE window measurements

✦ ✦ ✦ ✦

User interaction is a vital aspect of client-side JavaScript scripting, and most of the communication between script and user takes place by way of the `document` object and its components. Understanding the scope of the `document` object within each of the object models you support is key to implementing successful cross-browser applications.

Review the `document` object's place within the original object hierarchy. Figure 18-1 clearly shows that the `document` object is a pivotal point for a large percentage of JavaScript objects.

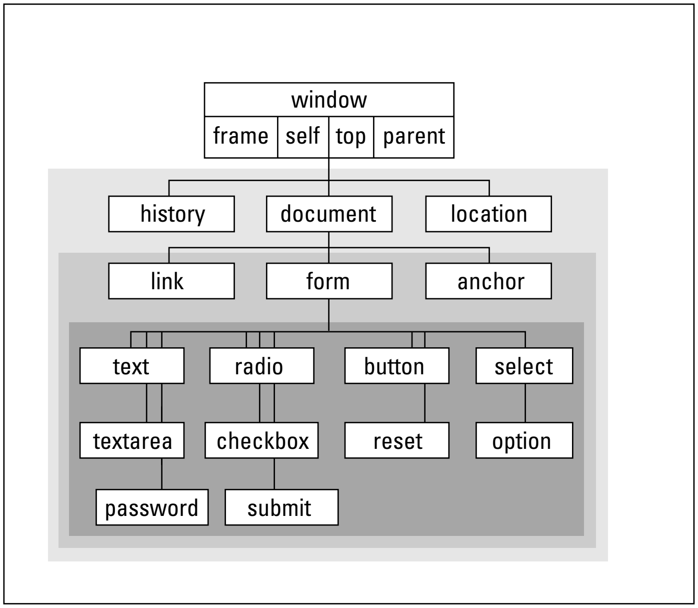

Figure 18-1: The basic document object model hierarchy

In fact, the document object and all that it contains is so big that I have divided its discussion into many chapters, each focusing on related object groups. This chapter looks at the document object and body object (which have conceptual relationships), while each of the succeeding chapters in this part of the book details objects contained by the document object.

I must stress at the outset that many newcomers to JavaScript have the expectation that they can, on the fly, modify sections of a loaded page's content with ease: replace some text here, change a table cell there. However, understanding that these capabilities — an important part of what is called Dynamic HTML — are available only in more recent browsers, specifically IE4+ and NN6+, is very important. Not only do these browsers expose every HTML element to script languages, but they also automatically reflow the page when the size of content changes under script control. Pages on all previous browsers are limited to a small set of modifiable objects, such as images and form elements. (NN4 also has a layer object that is useful for DHTML, but that object is unique to NN4 only.)

If your application requires compatibility with all scriptable browsers, you will be limited to changing only a handful of other invisible properties after the page loads. If these compatible pages need to modify their contents based on user input or timed updates, consider designing your pages so that scripts write the contents; then let the scripts rewrite the entire page with your new settings.

Document Object

Properties	***Methods***	***Event Handlers***
activeElement	attachEvent()†	onActivate†
alinkColor	captureEvents()	onBeforeCut†
all†	clear()	onBeforeDeactivate†
anchors	clearAttributes()†	onBeforeEditFocus†
applets	close()	onBeforePaste†
attributes†	createAttribute()	onClick†
bgColor	createElement()	onContextMenu†
body	createEventObject()	onControlSelect†
charset	createStyleSheet()	onCut†
characterSet	createTextNode()	onDblClick†
childNodes†	detachEvent()†	onDrag†
cookie	elementFromPoint()	onDragEnd†
defaultCharset	execCommand()	onDragEnter†
designMode	focus()†	onDragLeave†
doctype	getElementById()	onDragOver†

Properties	*Methods*	*Event Handlers*
documentElement	getElementsByName()	onDragStart†
domain	getElementsByTagName()†	onDrop†
embeds	getSelection()	onHelp†
expando	handleEvent()	onKeyDown†
fgColor	hasFocus()†	onKeyPress†
fileCreatedDate	mergeAttributes()†	onKeyUp†
fileModifiedDate	open()	onMouseDown†
fileSize	queryCommandEnabled()	onMouseMove†
firstChild†	queryCommandIndterm()	onMouseOut†
forms	queryCommandState()	onMouseOver†
frames	queryCommandSupported()	onMouseUp†
height	queryCommandText()	onPaste†
ids	queryCommandValue()	onPropertyChange†
images	recalc()	onReadyStateChange†
implementation	releaseCapture()†	onResizeEnd†
lastChild†	releaseEvents()	onResizeStart†
lastModified	routeEvent()	onSelectionChange
layers	setActive()†	onStop
linkColor	write()	
links	writeln()	
location		
media		
mimeType		
namespaces		
namespaceURI		
nextSibling†		
nodeName†		
nodeType†		
ownerDocument†		
parentNode†		

Continued

Properties	*Methods*	*Event Handlers*
`parentWindow`		
`plugins`		
`previousSibling`†		
`protocol`		
`readyState`†		
`referrer`		
`scripts`		
`security`		
`selection`		
`styleSheets`		
`tags`		
`title`		
`uniqueID`†		
`URL`		
`URLUnencoded`		
`VlinkColor`		
`width`		

†See Chapter 15.

Syntax

Accessing `document` object properties or methods:

```
[window.]document.property | method([parameters])
```

About this object

A `document` object encompasses the totality of what exists inside the content region of a browser window or window frame (excluding toolbars, status lines, and so on). The document is a combination of the content and interface elements that make the Web page worth visiting. In more recent browsers, which treat HTML elements as nodes of a hierarchical tree, the `document` object is the root node—that from which all other nodes grow.

Because the `document` object isn't explicitly represented in an HTML document by tags or any other notation, the original designers of JavaScript and object models decided to make the `document` object the portal to many settings that were represented in HTML as belonging to the BODY element. That element's tag contains attributes for document-wide attributes, such as background color (`BGCOLOR`) and link colors in various states (`ALINK`, `LINK`, and `VLINK`). The BODY element also served as an HTML container for forms, links, and anchors. The `document` object, therefore, assumed a majority of the role of the BODY element. But even then, the `document` object became the most convenient place to bind some properties that extend beyond the BODY element, such as the TITLE element and the URL of the link that referred the user to the page. When viewed within the context of the HTML source code, the original `document` object is somewhat schizophrenic. Even so, the `document` object has worked well as the basis for references to original object model objects, such as forms, images, and applets.

This, of course, was before every HTML element, including the BODY element, was exposed as an object via modern object models. Amazingly, even with the IE4+ object model and W3C DOM — both of which treat the BODY element as an object separate from the `document` object — script compatibility with the original object model is quite easily accomplished. The `document` object has assumed a new schizophrenia, splitting its personality between the original object model and the one that places the `document` object at the root of the hierarchy, quite separate from the BODY element object it contains. The object knows which "face" to put on based on the rest of the script syntax that follows it. This means that quite often there are multiple ways to achieve the same reference. For example, you can use the following statement in all scriptable browsers to get the number of form objects in a document:

```
document.forms.length
```

In IE4+, you can also use

```
document.tags["FORM"].length
```

And in the W3C DOM as implemented in IE5+ and NN6, you can use

```
document.getElementsByTagName("FORM").length
```

The more modern versions provide generic ways of accessing elements (the `tags` array in IE4+ and the `getElementsByTagName()` method in the W3C DOM) to meet the requirements of object models that expose every HTML (and XML) element as an object.

Promoting the BODY element to the ranks of exposed objects presented its own challenges to the new object model designers. The BODY element is the true "owner" of some properties that the original `document` object had to take on by default. Most properties that had belonged to the original `document` object were renamed in their transfer to the BODY element. For example, the original `document.alinkColor` property is the `body.aLink` property in the new model. But the `bgColor` property has not been renamed. For the sake of code compatibility, the current versions of browsers recognize both properties, even though the W3C DOM (in an effort to push the development world ahead) has removed the old versions as properties of what it conceives as the `document` object.

As confusing as all of this may sound on the surface, understanding when to refer to the original `document` object and when to use the new syntax doesn't take long. It all depends on what you hang off the right edge of the reference. Original properties and methods are recognized as using the original `document` object; new properties and methods summon the powers of the new `document` object. It's all quite automatic. Thankfully.

Properties

activeElement

Value: Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In IE4+, a script can examine the `document.activeElement` property to see which element currently has focus. The value returned is an element object reference. You can use any of the properties and methods listed in Chapter 15 to find out more about the object. Be aware that not all elements in all operating systems receive focus. For example, buttons in IE4 for the Macintosh do not receive focus.

Although the element used to generate a mouse or keyboard event will most likely have focus (except for IE4/Mac buttons), don't rely on the `activeElement` property to find out which element generated an event. The IE `event.srcElement` property is far more reliable.

On the CD-ROM

Example on the CD

Related Items: `event.srcElement` property.

alinkColor
bgColor
fgColor
linkColor
vlinkColor

Value: Hexadecimal triplet or color name string Mostly Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

These five properties are the script equivalent of the `<BODY>` tag attributes of the same name (although the property names are case-sensitive). All five settings can be read via scripting, but the ability to change some or all of these properties varies widely with browser and client platform. Table 18-1 shows a summary of which browsers and platforms can set which of the color properties.

Table 18-1 Setting Document Colors on the Fly (Browser Versions)

	Navigator			Internet Explorer		
Color Property	***Windows***	***Mac***	***UNIX***	***Windows***	***Mac***	***UNIX***
bgColor	All	4+	4+	All	All	4+
All others	6	6	6	All	All	4+

If you experiment with setting `document.bgColor` on Mac or UNIX versions of Navigator 2 and 3, you may be fooled into thinking that the property is being set correctly. While the property value may stick, these platforms do not refresh their windows properly: If you change the color after all content is rendered, the swath of new color obscures the content until a reload of the window. The safest, backward-compatible scripted way of setting document color properties is to compose the content of a frame or window by script and set the `<BODY>` tag color attributes dynamically when `document.write()` puts the content into the window.

Values for all color properties can be either the common HTML hexadecimal triplet value (for example, `"#00FF00"`) or any of the Netscape color names. Internet Explorer recognizes these plain language color names, as well. But also be aware that some colors work only when the user has the monitor set to 16- or 24-bit color settings.

If you are scripting exclusively for IE4+ and NN6, you should use the `document.body` object to access these properties.

On the CD-ROM

Example on the CD with Listing 18-1

Related Items: `body.aLink`, `body.bgColor`, `body.link`, `body.text`, `body.vLink` properties.

anchors

Value: Array of anchor objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Anchor objects (described in Chapter 21) are points in an HTML document marked with `<A NAME="">` tags. Anchor objects are referenced in URLs by a hash value between the page URL and anchor name. Like other object properties that contain a list of nested objects, the `document.anchors` property (notice the plural) delivers an indexed array of anchors in a document. Use the array references to pinpoint a specific anchor for retrieving any anchor property.

Anchor arrays begin their index counts with 0: The first anchor in a document, then, has the reference `document.anchors[0]`. And, as is true with any built-in array object, you can find out how many entries the array has by checking the length property. For example

```
var anchorCount = document.anchors.length
```

The `document.anchors` property is read-only. To script navigation to a particular anchor, assign a value to the `window.location` or `window.location.hash` object, as described in Chapter 17's `location` object discussion.

On the CD-ROM

Example on the CD with Listing 18-2

Related Items: `anchor`, `location` objects; `document.links` property.

applets

Value: Array of applet objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `applets` property refers to Java applets defined in a document by the `<APPLET>` tag. An applet is not officially an object in the document until the applet loads completely.

Most of the work you do with Java applets from JavaScript takes place via the methods and variables defined inside the applet. Although you can reference an applet according to its indexed array position within the `applets` array, you will more likely use the applet object's name in the reference to avoid any confusion. Note that applets are not accessible to JavaScript in IE/Mac. For more details, see the discussion of the applet object in Chapter 32 and the LiveConnect discussion in Chapter 44.

On the CD-ROM

Example on the CD

Related Items: `applet` object.

bgColor

See `alinkColor`

body

Value: BODY Element Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `document.body` property is a shortcut reference to the BODY element object in modern object models. As you can see in the discussion of the BODY element object later in this chapter, that object has many key properties that govern the look of the entire page. Because the `document` object is the root of all references within any window or frame, the `document.body` property is easier to use to get to the BODY properties, rather than longer references normally used to access HTML element objects in both the IE4+ and W3C object models.

On the CD-ROM

Example on the CD

Related Items: BODY element object.

charset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `charset` property reveals the character set used by the browser to render the current document (the NN6 version of this property is called `characterSet`). You can find possible values for this property at

`ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`

Each browser and operating system has its own default character set. Values may also be set via a `<META>` tag.

On the CD-ROM

Example on the CD

Related Items: `characterSet`, `defaultCharset` properties.

characterSet

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `characterSet` property reveals the character set used by the browser to render the current document (the IE4+ version of this property is called `charset`). You can find possible values for this property at

`ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`

Each browser and operating system has its own default character set. Values may also be set via a `<META>` tag.

On the CD-ROM

Example on the CD

Related Items: `charset` property.

cookie

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The cookie mechanism in a Web browser lets you store small pieces of information on the client computer in a reasonably secure manner. In other words, when you need some tidbit of information to persist at the client level while either loading diverse HTML documents or moving from one session to another, the cookie mechanism saves the day. You can find Netscape's technical documentation (much of which is written from the perspective of a server writing to a cookie) on the Web at `http://www.netscape.com/newsref/std/cookie_spec.html`.

The cookie is commonly used as a means to store the username and password you enter into a password-protected Web site. The first time you enter this information into a CGI-governed form, the CGI program has Navigator write the information back to a cookie on your hard disk (usually after encrypting the password). Rather than bothering you to enter the username and password the next time you access the site, the server searches the cookie data stored for that particular server and extracts the username and password for automatic validation processing behind the scenes.

Other applications of the cookie include storing user preferences and information about the user's previous visit to the site. Preferences may include font styles or sizes and whether the user prefers viewing content inside a frameset or not. As shown in Chapter 54, a time stamp of the previous visit can allow a coded HTML page to display highlighted images next to content that has changed since the user's last visit, even if you have updated the page several times in the interim. Rather than hard-wiring "New" flags for *your* last visit, the scripts highlight what's new for the visitor.

Note

I cover the technical differences between Navigator and Internet Explorer cookies later in this section. But for IE3, be aware that the browser neither reads nor writes cookies when the document accessing the cookie is on the local hard disk. IE4+ works with cookies generated by local files.

The cookie file

Allowing some foreign CGI program to read from and write to your hard disk may give you pause, but browser cookie mechanisms don't just open up your drive's directory for the world to see (or corrupt). Instead, the cookie mechanism provides access to just one special text file (Navigator) or type of text file (Internet Explorer) located in a platform-specific spot on your drive.

In Windows versions of Navigator 4, for example, the cookie file is named `cookies.txt` and is located in a directory reserved for a user's Navigator preferences; Mac users can find the `MagicCookie` file inside the Netscape folder, which is located within the System Folder:Preferences folder. Internet Explorer for Windows uses a different filing system: all cookies for each domain saved in a domain-specific file inside a `Cookies` directory within system directories. File names include the user name and domain of the server that wrote the cookie.

A cookie file is a text file (but because NN's Macintosh MagicCookie file's type is not TEXT, Mac users can open it only via applications capable of opening any kind of file). If curiosity drives you to open a cookie file, I recommend you do so only with a copy saved in another directory or folder. Any alteration to the existing file can mess up whatever valuable cookies are stored there for sites you regularly visit. The data format for NN and IE differs, in line with the different methodologies used for filing cookies. Inside the Netscape file (after a few comment lines warning you not to manually alter the file) are lines of tab-delimited text. Each return-delimited line contains one cookie's information. The cookie file is just like a text listing of a database. In each of the IE cookie files, the same data points are stored for a cookie as for Navigator, but the items are in a return-delimited list. The structure of these files is of no importance to scripting cookies, because both browsers utilize the same syntax for reading and writing cookies through the `document.cookie` property.

Note

As you experiment with browser's cookies, you will be tempted to look into the cookie file after a script writes some data to the cookie. The cookie file will not contain the newly written data, because cookies are transferred to disk only when the user quits the browser; conversely, the cookie file is read into the browser's memory when it is launched. While you read, write, and delete cookies during a browser session, all activity is performed in memory (to speed up the process) to be saved later.

A cookie record

Among the "fields" of each cookie record are the following (not necessarily in this order):

- ✦ Domain of the server that created the cookie
- ✦ Information on whether you need a secure HTTP connection to access the cookie
- ✦ Pathname of URL(s) capable of accessing the cookie
- ✦ Expiration date of the cookie
- ✦ Name of the cookie entry
- ✦ String data associated with the cookie entry

Notice that cookies are domain-specific. In other words, if one domain creates a cookie, another domain cannot access it through the browser's cookie mechanism behind your back. That reason is why it's generally safe to store what I call *throw-away passwords* (the username/password pairs required to access some free registration-required sites) in cookies. Moreover, sites that store passwords in a cookie usually do so as encrypted strings, making it more difficult for someone to hijack the cookie file from your unattended PC and figure out what your personal password scheme may be.

Cookies also have expiration dates. Because some browsers may allow no more than a fixed number of cookies (300 in NN), the cookie file can get pretty full over the years. Therefore, if a cookie needs to persist past the current browser session, it should have an expiration date established by the cookie writer. Browsers automatically clean out any expired cookies.

Not all cookies have to last beyond the current session, however. In fact, a scenario in which you use cookies temporarily while working your way through a Web site is quite typical. Many shopping sites employ one or more temporary cookie records to behave as the shopping cart for recording items you intend to purchase. These items are copied to the order form at checkout time. But after you submit the order form to the server, that client-side data has no particular value. As it turns out, if your script does not specify an expiration date, the browser keeps the cookie fresh in memory without writing it to the cookie file. When you quit the browser, that cookie data disappears as expected.

JavaScript access

Scripted access of cookies from JavaScript is limited to setting the cookie (with a number of optional parameters) and getting the cookie data (but with none of the parameters).

The original object model defines cookies as properties of documents, but this description is somewhat misleading. If you use the default path to set a cookie (that is, the current directory of the document whose script sets the cookie in the first place), then all documents in that same server directory have read and write access to the cookie. A benefit of this arrangement is that if you have a scripted application that contains multiple documents, all documents served from the same directory can share the cookie data. NN and IE, however, impose a limit of 20 named cookie entries for any domain; IE3 imposes an even more restrictive limit of one cookie (that is, one name/value pair) per domain. If your cookie requirements are extensive, then you need to fashion ways of concatenating cookie data (I do this in the Decision Helper application in Chapter 55).

Saving cookies

To write cookie data to the cookie file, you use a simple JavaScript assignment operator with the `document.cookie` property. But the formatting of the data is crucial to achieving success. Here is the syntax for assigning a value to a cookie (optional items are in brackets):

```
document.cookie = "cookieName=cookieData
            [; expires=timeInGMTString]
            [; path=pathName]
            [; domain=domainName]
            [; secure]"
```

Examine each of the properties individually.

Name/Data

Each cookie must have a name and a string value (even if that value is an empty string). Such name/value pairs are fairly common in HTML, but they look odd in an assignment statement. For example, if you want to save the string "Fred" to a cookie named "userName," the JavaScript statement is

```
document.cookie = "userName=Fred"
```

If the browser sees no existing cookie in the current domain with this name, it automatically creates the cookie entry for you; if the named cookie already exists, the browser replaces the old data with the new data. Retrieving `document.cookie` at this point yields the following string:

```
userName=Fred
```

You can omit all the other cookie-setting properties, in which case the browser uses default values, as explained in a following section. For temporary cookies (those that don't have to persist beyond the current browser session), the name/value pair is usually all you need.

The entire name/value pair must be a single string with no semicolons, commas, or character spaces. To take care of spaces between words, preprocess the value with the JavaScript `escape()` function, which URL-encodes the spaces as `%20` (and then be sure to `unescape()` the value to restore the human-readable spaces when you retrieve the cookie later).

You cannot save a JavaScript array or object to a cookie. But with the help of the `Array.join()` method, you can convert an array to a string; use `String.split()` to re-create the array after reading the cookie at a later time. These two methods are available in NN3+ and IE4+.

Expires

Expiration dates, when supplied, must be passed as Greenwich Mean Time (GMT) strings (see Chapter 36 about time data). To calculate an expiration date based on today's date, use the JavaScript `Date` object as follows:

```
var exp = new Date()
var oneYearFromNow = exp.getTime() + (365 * 24 * 60 * 60 * 1000)
exp.setTime(oneYearFromNow)
```

Then convert the date to the accepted GMT string format:

```
document.cookie = "userName=Fred; expires=" + exp.toGMTString()
```

In the cookie file, the expiration date and time is stored as a numeric value (seconds) but, to set it, you need to supply the time in GMT format. You can delete a cookie before it expires by setting the named cookie's expiration date to a time and date earlier than the current time and date. The safest expiration parameter is

```
expires=Thu, 01-Jan-70 00:00:01 GMT
```

Omitting the expiration date signals the browser that this cookie is temporary. The browser never writes it to the cookie file and forgets it the next time you quit the browser.

Path

For client-side cookies, the default path setting (the current directory) is usually the best choice. You can, of course, create a duplicate copy of a cookie with a separate path (and domain) so that the same data is available to a document located in another area of your site (or the Web).

Domain

To help synchronize cookie data with a particular document (or group of documents), the browser matches the domain of the current document with the domain values of cookie entries in the cookie file. Therefore, if you were to display a list of all cookie data contained in a `document.cookie` property, you would get back all the name/value cookie pairs from the cookie file whose domain parameter matches that of the current document.

Unless you expect the document to be replicated in another server within your domain, you can usually omit the `domain` parameter when saving a cookie. Default behavior automatically supplies the domain of the current document to the cookie file entry. Be aware that a domain setting must have at least two periods, such as

```
.mcom.com
.hotwired.com
```

Or, you can write an entire URL to the domain, including the `http://` protocol.

SECURE

If you omit the `SECURE` parameter when saving a cookie, you imply that the cookie data is accessible to any document or CGI program from your site that meets the other domain- and path-matching properties. For client-side scripting of cookies, you should omit this parameter when saving a cookie.

Retrieving cookie data

Cookie data retrieved via JavaScript is contained in one string, including the whole name-data pair. Even though the cookie file stores other parameters for each cookie, you can retrieve only the name-data pairs via JavaScript. Moreover, when two or more (up to a maximum of 20) cookies meet the current domain criteria, these cookies are also lumped into that string, delimited by a semicolon and space. For example, a `document.cookie` string may look like this:

```
userName=Fred; password=NikL2sPacU
```

In other words, you cannot treat named cookies as objects. Instead, you must parse the entire cookie string, extracting the data from the desired name-data pair.

When you know that you're dealing with only one cookie (and that no more will ever be added to the domain), you can customize the extraction based on known data, such as the cookie name. For example, with a cookie name that is seven characters long, you can extract the data with a statement such as this:

```
var data = unescape(document.cookie.substring(7,document.cookie.length))
```

The first parameter of the `substring()` method includes the equals sign to separate the name from the data.

A better approach is to create a general-purpose function that can work with single- or multiple-entry cookies. Here is one I use in some of my pages:

```
function getCookieData(labelName) {
    var labelLen = labelName.length
    // read cookie property only once for speed
    var cookieData = document.cookie
    var cLen = cookieData.length
    var i = 0
    var cEnd
    while (i < cLen) {
        var j = i + labelLen
        if (cookieData.substring(i,j) == labelName) {
            cEnd = cookieData.indexOf(";",j)
            if (cEnd == -1) {
                cEnd = cookieData.length
            }
            return unescape(cookieData.substring(j+1, cEnd))
        }
        i++
    }
    return ""
}
```

Calls to this function pass the label name of the desired cookie as a parameter. The function parses the entire cookie string, chipping away any mismatched entries (through the semicolons) until it finds the cookie name.

If all of this cookie code still makes your head hurt, you can turn to a set of functions devised by experienced JavaScripter and Web site designer Bill Dortch of hIdaho Design. His cookie functions provide generic access to cookies that you can use in all of your cookie-related pages. Listing 18-3 shows Bill's cookie functions, which include a variety of safety nets for date calculation bugs that appeared in some versions of Netscape Navigator 2. Don't be put off by the length of the listing: Most of the lines are comments. Updates to Bill's functions can be found at `http://www.hidaho.com/cookies/cookie.txt`.

Listing 18-3: Bill Dortch's Cookie Functions

```
<html>
<head>
<title>Cookie Functions</title>
</head>
<body>
<script language="javascript">
<!-- begin script
//
//  Cookie Functions -- "Night of the Living Cookie" Version (25-Jul-96)
//
//  Written by:  Bill Dortch, hIdaho Design <bdortch@hidaho.com>
//  The following functions are released to the public domain.
//
//  This version takes a more aggressive approach to deleting
//  cookies.  Previous versions set the expiration date to one
//  millisecond prior to the current time; however, this method
//  did not work in Netscape 2.02 (though it does in earlier and
//  later versions), resulting in "zombie" cookies that would not
//  die.  DeleteCookie now sets the expiration date to the earliest
//  usable date (one second into 1970), and sets the cookie's value
//  to null for good measure.
//
//  Also, this version adds optional path and domain parameters to
//  the DeleteCookie function.  If you specify a path and/or domain
//  when creating (setting) a cookie**, you must specify the same
//  path/domain when deleting it, or deletion will not occur.
//
//  The FixCookieDate function must now be called explicitly to
//  correct for the 2.x Mac date bug.  This function should be
//  called *once* after a Date object is created and before it
//  is passed (as an expiration date) to SetCookie.  Because the
//  Mac date bug affects all dates, not just those passed to
//  SetCookie, you might want to make it a habit to call
//  FixCookieDate any time you create a new Date object:
//
//    var theDate = new Date();
//    FixCookieDate (theDate);
//
//  Calling FixCookieDate has no effect on platforms other than
//  the Mac, so there is no need to determine the user's platform
//  prior to calling it.
//
//  This version also incorporates several minor coding improvements.
//
//  **Note that it is possible to set multiple cookies with the same
//  name but different (nested) paths.  For example:
//
//    SetCookie ("color","red",null,"/outer");
//    SetCookie ("color","blue",null,"/outer/inner");
```

```
//
//  However, GetCookie cannot distinguish between these and will return
//  the first cookie that matches a given name.  It is therefore
//  recommended that you *not* use the same name for cookies with
//  different paths.  (Bear in mind that there is *always* a path
//  associated with a cookie; if you don't explicitly specify one,
//  the path of the setting document is used.)
//
//  Revision History:
//
//    "Toss Your Cookies" Version (22-Mar-96)
//      - Added FixCookieDate() function to correct for Mac date bug
//
//    "Second Helping" Version (21-Jan-96)
//      - Added path, domain and secure parameters to SetCookie
//      - Replaced home-rolled encode/decode functions with Netscape's
//        new (then) escape and unescape functions
//
//    "Free Cookies" Version (December 95)
//
//
//  For information on the significance of cookie parameters,
//  and on cookies in general, please refer to the official cookie
//  spec, at:
//
//      http://www.netscape.com/newsref/std/cookie_spec.html
//
//******************************************************************
//
// "Internal" function to return the decoded value of a cookie
//
function getCookieVal (offset) {
  var endstr = document.cookie.indexOf (";", offset);
  if (endstr == -1)
    endstr = document.cookie.length;
  return unescape(document.cookie.substring(offset, endstr));
}
//
//  Function to correct for 2.x Mac date bug.  Call this function to
//  fix a date object prior to passing it to SetCookie.
//  IMPORTANT:  This function should only be called *once* for
//  any given date object!  See example at the end of this document.
//
function FixCookieDate (date) {
  var base = new Date(0);
  var skew = base.getTime(); // dawn of (Unix) time - should be 0
  if (skew > 0)  // Except on the Mac - ahead of its time
    date.setTime (date.getTime() - skew);
}
//
//  Function to return the value of the cookie specified by "name".
//    name - String object containing the cookie name.
```

Continued

Listing 18-3 *(continued)*

```
//    returns - String object containing the cookie value, or null if
//      the cookie does not exist.
//
function GetCookie (name) {
  var arg = name + "=";
  var alen = arg.length;
  var clen = document.cookie.length;
  var i = 0;
  while (i < clen) {
    var j = i + alen;
    if (document.cookie.substring(i, j) == arg)
      return getCookieVal (j);
    i = document.cookie.indexOf(" ", i) + 1;
    if (i == 0) break;
  }
return null;
}
//
//  Function to create or update a cookie.
//    name - String object containing the cookie name.
//    value - String object containing the cookie value.  May contain
//      any valid string characters.
//    [expires] - Date object containing the expiration data of the cookie.  If
//      omitted or null, expires the cookie at the end of the current session.
//    [path] - String object indicating the path for which the cookie is valid.
//      If omitted or null, uses the path of the calling document.
//    [domain] - String object indicating the domain for which the cookie is
//      valid. If omitted or null, uses the domain of the calling document.
//    [secure] - Boolean (true/false) value indicating whether cookie
transmission
//      requires a secure channel (HTTPS).
//
//  The first two parameters are required.  The others, if supplied, must
//  be passed in the order listed above.  To omit an unused optional field,
//  use null as a place holder.  For example, to call SetCookie using name,
//  value and path, you would code:
//
//      SetCookie ("myCookieName", "myCookieValue", null, "/");
//
//  Note that trailing omitted parameters do not require a placeholder.
//
//  To set a secure cookie for path "/myPath", that expires after the
//  current session, you might code:
//
//      SetCookie (myCookieVar, cookieValueVar, null, "/myPath", null, true);
//
function SetCookie (name,value,expires,path,domain,secure) {
  document.cookie = name + "=" + escape (value) +
    ((expires) ? "; expires=" + expires.toGMTString() : "") +
    ((path) ? "; path=" + path : "") +
```

```
    ((domain) ? "; domain=" + domain : "") +
    ((secure) ? "; secure" : "");
}

//  Function to delete a cookie. (Sets expiration date to start of epoch)
//   name -   String object containing the cookie name
//    path -   String object containing the path of the cookie to delete.  This
MUST
//             be the same as the path used to create the cookie, or
null/omitted if
//             no path was specified when creating the cookie.
//    domain - String object containing the domain of the cookie to delete.
This MUST
//             be the same as the domain used to create the cookie, or
null/omitted if
//             no domain was specified when creating the cookie.
//
function DeleteCookie (name,path,domain) {
  if (GetCookie(name)) {
    document.cookie = name + "=" +
      ((path) ? "; path=" + path : "") +
      ((domain) ? "; domain=" + domain : "") +
      "; expires=Thu, 01-Jan-70 00:00:01 GMT";
  }
}

//
//  Examples
//
var expdate = new Date ();
FixCookieDate (expdate); // Correct for Mac date bug - call only once for given
Date object!
expdate.setTime (expdate.getTime() + (24 * 60 * 60 * 1000)); // 24 hrs from now
SetCookie ("ccpath", "http://www.hidaho.com/colorcenter/", expdate);
SetCookie ("ccname", "hIdaho Design ColorCenter", expdate);
SetCookie ("tempvar", "This is a temporary cookie.");
SetCookie ("ubiquitous", "This cookie will work anywhere in this
domain",null,"/");
SetCookie ("paranoid", "This cookie requires secure
communications",expdate,"/",null,true);
SetCookie ("goner", "This cookie must die!");
document.write (document.cookie + "<br>");
DeleteCookie ("goner");
document.write (document.cookie + "<br>");
document.write ("ccpath = " + GetCookie("ccpath") + "<br>");
document.write ("ccname = " + GetCookie("ccname") + "<br>");
document.write ("tempvar = " + GetCookie("tempvar") + "<br>");
// end script -->
</script>
</body>
</html>
```

Extra batches

You may design a site that needs more than 20 cookies for a given domain. For example, in a shopping site, you never know how many items a customer may load into the shopping cart cookie.

Because each named cookie stores plain text, you can create your own text-based data structures to accommodate multiple pieces of information per cookie. (But also watch out for a practical limit of 2,000 characters per name/value pair within the 4,000 character maximum for any domain's combined cookies.) The trick is determining a delimiter character that won't be used by any of the data in the cookie. In Decision Helper (in Chapter 55), for example, I use a period to separate multiple integers stored in a cookie.

With the delimiter character established, you must then write functions that concatenate these "subcookies" into single cookie strings and extract them on the other side. It's a bit more work, but well worth the effort to have the power of persistent data on the client.

On the CD-ROM

Example on the CD

Related Items: String object methods (Chapter 34).

defaultCharset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `defaultCharset` property reveals the character set used by the browser to render the current document. You can find possible values for this property at

`ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`

Each browser and operating system has its own default character set. Values may also be set via a `<META>` tag. The difference between the `defaultCharset` and `charset` properties is not clear, especially because both are read/write (although modifying the `defaultCharset` property has no visual effect on the page). However, if your scripts temporarily modify the `charset` property, you can use the `defaultCharset` property to return to the original character set:

```
document.charset = document.defaultCharset
```

On the CD-ROM

Example on the CD

Related Items: `charset`, `characterSet` properties.

designMode

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `designMode` property is applicable only when IE5 technology is being used as a component in another application. More information can be found at `http://msdn.microsoft.com/workshop/browser/default.asp`. The property controls whether the browser module is being used for HTML editing. Modifying the property from within a typical HTML page in the IE5 browser has no effect.

doctype

Value: `DocumentType` object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `doctype` property comes from the W3C Core DOM and returns a `DocumentType` object — a representation of the DTD information for the document. In IE5.5 and NN6, the `DocumentType` object (even if one is not explicitly defined in the source code) is the first child node of the root document node (and is thus a sibling to the HTML element).

As of NN6, only a couple of properties of this still-evolving W3C DOM specification are implemented. Table 18-2 shows the typical `DocumentType` object property list and values for a generic HTML page. Future DOM specifications will allow these properties to be read/write.

Table 18-2 DocumentType Object in NN6

Property	*Value*
`entities`	`null`
`internalSubset`	(empty)
`name`	`HTML`
`notations`	`null`
`publicId`	`-//W3C//DTD HTML 3.2 Final//EN`
`systemId`	(empty)

Related Items: Node object (Chapter 14).

documentElement

Value: HTML or XML element object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `documentElement` property returns a reference to the HTML (or XML) element object that contains all of the content of the current document. The naming of this property is a bit misleading, because the root document node is not an element, but its only child node is the HTML (or XML) element for the page. At best, you can think of this property as providing scripts with an "element face" to the `document` object and document node associated with the page currently loaded in the browser.

On the CD-ROM

Example on the CD

Related Items: `ownerDocument` property (Chapter 15).

domain

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Security restrictions can get in the way of sites that have more than one server at their domain. Because some objects, especially the `location` object, prevent access to properties of other servers displayed in other frames, legitimate access to those properties are blocked. For example, it's not uncommon for popular sites to have their usual public access site on a server named something such as `www.popular.com`. If a page on that server includes a front end to a site search engine located at `search.popular.com`, visitors who use browsers with these security restrictions are denied access.

To guard against that eventuality, a script in documents from both servers can instruct the browser to think both servers are the same. In the preceding example, you would set the `document.domain` property in both documents to `popular.com`. Without specifically setting the property, the default value includes the server name as well, thus causing a mismatch between host names.

Before you start thinking that you can spoof your way into other servers, be aware that you can set the `document.domain` property only to servers with the same domain (following the "two-dot" rule) as the document doing the setting.

Therefore, documents originating only from `xxx.popular.com` can set their `document.domain` properties to `popular.com` server.

Related Items: `window.open()` method; `window.location` object; security (Chapter 46).

embeds

Value: Array of EMBED element objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Whenever you want to load data that requires a plug-in application to play or display, you use the `<EMBED>` tag. The `document.embeds` property is merely one way to determine the number of such tags defined in the document:

```
var count = document.embeds.length
```

For controlling those plug-ins in Navigator, you can use the LiveConnect technology, described in Chapter 44.

Related Items: EMBED element object (Chapter 32).

expando

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Microsoft calls any custom property that is not a native property of the `document` object an *expando* property. By default, most objects in recent generations of browsers allow scripts to add new properties of objects as a way to temporarily store data without explicitly defining global variables. For example, if you want to maintain an independent counter of how often a function is invoked, you can create a custom property of the `document` object and use it as the storage facility:

```
document.counter = 0
```

IE4+ lets you control whether the `document` object is capable of accepting `expando` properties. The default value of the `document.expando` property is `true`, thus allowing custom properties. But the potential downside to this permissiveness, especially during the page construction phase, is that a misspelled native property name is gladly accepted by the `document` object. You may not be aware of why the title bar of the browser window doesn't change when you assign a new string to the `document.Title` property (which, in the case-sensitive world of JavaScript, is distinct from the native `document.title` property).

On the CD-ROM Example on the CD

Related Items: `prototype` property of custom objects (Chapter 41).

fgColor

See `alinkColor`.

fileCreatedDate
fileModifiedDate
fileSize

Value: String, Integer (`fileSize`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These three IE-specific properties return information about the file that holds the current document. Two of the properties (not implemented in IE5/Mac) reveal the dates on which the current document's file was created and modified. For an unmodified file, its creation and modified dates are the same. The `fileSize` property reveals the number of bytes of the file.

Date values returned for the first two properties are formatted differently between IE4 and IE5. The former provides a full readout of the day and date; the latter in a format similar to mm/dd/yyyy. Note, however, that the values contain only the date and not the time. In any case, you can use the values as the parameter to a `new Date()` constructor function. You can then use date calculations for such information as the number of days between the current day and the most recent modification.

Not all servers may provide the proper date or size information about a file or in a format that IE can interpret. Test your implementation on the deployment server to ensure compatibility.

Also, be aware that these properties can be read only for a file that is loaded in the browser. JavaScript by itself cannot get this information about files that are on the server but not loaded in the browser.

IE5.5 exposes a property called `fileUpdatedDate`, but the property does not return any data. This property may be a phantom property left over from a prerelease version.

On the CD-ROM Example on the CD with Listing 18-4

Related Items: `lastModified` property.

forms

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

As I show in Chapter 23, which is dedicated to the form object, an HTML form (anything defined inside a `<FORM>...</FORM>` tag pair) is a JavaScript object unto itself. You can create a valid reference to a form according to its name (assigned via a form's `NAME` attribute). For example, if a document contains the following form definition

```
<FORM NAME="phoneData">
    input item definitions
</FORM>
```

your scripts can refer to the form object by name:

```
document.phoneData
```

However, a `document` object also tracks its forms in another way: as an array of Form objects. The first item of a `document.forms` array is the form that loaded first (it was first from the top of the HTML code). If your document defines one form, the forms property is an array one entry in length; with three separate forms in the document, the array is three entries long.

Use standard array notation to reference a particular form from the `document.forms` array. For example, the first form in a document (the "zeroth" entry of the `document.forms` array) is referenced as

```
document.forms[0]
```

Any of the form object's properties or methods are available by appending the desired property or method name to the reference. For example, to retrieve the value of an input text field named `homePhone` from the second form of a document, the reference you use is

```
document.forms[1].homePhone.value
```

One advantage to using the `document.forms` property for addressing a form object or element instead of the actual form name is that you may be able to generate a library of generalizable scripts that know how to cycle through all available forms in a document and hunt for a form that has some special element and property. The following script fragment (part of a *repeat loop* described more fully in Chapter 39) uses a loop-counting variable (i) to help the script check all forms in a document:

```
for (var i = 0; i < document.forms.length; i++) {
    if (document.forms[i]. ... ) {
        statements
    }
}
```

One more variation on forms array references lets you substitute the name of a form (as a string) for the `forms` array index. For example, the form named `phoneData` can be referenced as

```
document.forms["phoneData"]
```

If you use a lot of care in assigning names to objects, you will likely prefer the `document.`*`formName`* style of referencing forms. In this book, you see both indexed array and form name style references. The advantage of using name references is that even if you redesign the page and change the order of forms in the document, references to the named forms will still be valid, whereas the index numbers of the forms will have changed. See also the discussion in Chapter 23 of the form object and how to pass a form's data to a function.

On the CD-ROM

Example on the CD with Listing 18-5

Related Items: `form` object (Chapter 23).

frames

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `document.frames` property is similar to the `window.frames` property, but its association with the `document` object may seem a bit illogical at times. The objects contained by the array returned from the property are window objects, which means they are the window objects of any FRAME elements (from a framesetting document) or IFRAME elements (from a plain HTML document) defined for the document. Distinguishing the window objects from the element objects is important. Window objects have different properties and methods than the FRAME and IFRAME element objects. The latter's properties typically represent the attributes for those element's tags. If a document contains no IFRAME elements, the `frames` array length is zero.

While you can access an individual frame object via the typical array syntax (for example, `document.frames[0]`), you can also use alternate syntax that Microsoft provides for collections of objects. The index number can also be placed inside parentheses, as in

```
document.frames(0)
```

Moreover, if the frames have values assigned to their `NAME` attributes, you can use the name (in string form) as a parameter:

```
document.frames("contents")
```

And if the collection of frames has more than one frame with the same name, you must take special care. Using the duplicated name as a parameter forces the reference to return a collection of frame objects that share that name. Or, you can limit the returned value to a single instance of the duplicate-named frames by specifying an optional second parameter indicating the index. For example, if a document has two IFRAME elements with the name `contents`, a script could reference the second `window` object as

```
document.frames("contents", 1)
```

For the sake of cross-browser compatibility, my preference for referencing frame window objects is via the `window.frames` property.

On the CD-ROM

Example on the CD

Related Items: `window.frames` property.

height
width

Value: Integer — Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The `height` and `width` properties of the NN4+ `document` object provide the pixel dimensions of the content within the current window (or frame). If the document's content is smaller than the size of the browser's content region, the dimensions returned by these properties include the blank space to the right and/or bottom edges of the content area of the window. But if the content extends beyond the viewable edges of the content region, the dimensions include the unseen content as well. The corresponding measures in IE4+ are the `document.body.scrollHeight` and `document.body.scrollWidth` properties.

On the CD-ROM

Example on the CD

Related Items: `document.body.scrollHeight`, `document.body.scrollWidth` properties.

ids

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The NN4-specific `ids` property is used in the browser's alternative, JavaScript-based style sheet syntax. Deployment of JavaScript style sheets is exceedingly rare. In some ways, the `document.ids` property behaves similarly to the IE4+ `document.all` property, but `document.ids` cannot be used in regular scripts to access element objects.

Related Items: `tags` property.

images

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	(✓)		✓	✓	✓

With images treated as first-class objects beginning with NN3 and IE4 (and IE version 3.01 on the Mac), it's only natural for a document to maintain an array of all the image tags defined on the page (just as it does for links and anchors). The prime importance of having images as objects is that you can modify their content (the source file associated with the rectangular space of the image) on the fly. You can find details about the image object in Chapter 22.

Use image array references to pinpoint a specific image for retrieval of any image property or for assigning a new image file to its `src` property. Image arrays begin their index counts with 0: The first image in a document has the reference `document.images[0]`. And, as with any array object, you can find out how many images the array contains by checking the length property. For example:

```
var imageCount = document.images.length
```

Images can also have names, so if you prefer, you can refer to the image object by its name, as in

```
var imageLoaded = document.imageName.complete
```

or

```
var imageLoaded = document.images[imageName].complete
```

The `document.images` array is a useful guide to knowing whether a browser supports swappable images. Any browser that treats an IMG element as an object always forms a `document.images` array in the page. If no images are defined in the page, the array is still there, but its length is zero. The array's existence, however, is the clue about image object compatibility. Because the `document.images` array evaluates to an array object when present, the expression can be used as a condition expression for branching to statements that involve image swapping:

```
if (document.images) {
    // image swapping or precaching here
}
```

Earlier browsers that don't have this property evaluate `document.images` as `undefined` and thus the condition is treated as a `false` value.

On the CD-ROM

Example on the CD

Related Items: `Image` object (Chapter 22).

implementation

Value: Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The Core W3C DOM defines the `document.implementation` property as an avenue to let scripts find out what DOM features (that is, modules of the DOM standard) are implemented for the current environment. While the object returned by the property (a `DOMImplementation` object) has no properties, it has a method, `hasFeature()`, which lets scripts find out, for example, whether the environment supports HTML or just XML. The first parameter of the `hasFeature()` method is the feature in the form of a string. The second parameter is a string form of the version number. The method returns a Boolean value.

A section of the W3C DOM specification, called "Conformance," governs the module names (the standard also allows browser-specific features to be tested via the `hasFeature()` method). Module names include strings such as `HTML`, `XML`, `MouseEvents`, and so on.

Version numbering for W3C DOM modules corresponds to the W3C DOM level. Thus, the version for the XML DOM module in DOM Level 2 is known as `2.0`. Note that versions refer to DOM modules and not, for instance, the separate HTML standard.

NN6 reports that it conforms to many modules defined in the W3C DOM Level 2, as shown in Table 18-3. But the indicated support may be misleading. According to the W3C standard, conformance for a module and version should indicate support for "all the interfaces for that module and the associated semantics." In some cases, however, NN6 has merely reserved placeholders for objects, properties, and methods that are not yet implemented. As a result, it is risky to use the `hasFeature()` method as a substitute for object detection in scripts. For now, you can trust the reported conformance only as a coarse indication of feature support.

Table 18-3 NN6 document.implementation.hasFeature() Support

Feature	*Versions*
`XML`	`1.0, 2.0`
`HTML`	`1.0, 2.0`
`Views`	`2.0`
`StyleSheets`	`2.0`
`CSS`	`2.0`
`Events`	`2.0`
`MouseEvents`	`2.0`
`HTMLEvents`	`2.0`
`Range`	`2.0`

On the CD-ROM

Example on the CD

`lastModified`

Value: Date String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Every disk file maintains a modified timestamp, and most (but not all) servers are configured to expose this information to a browser accessing a file. This information is available by reading the `document.lastModified` property. If your server supplies this information to the client, you can use the value of this property to present this information for readers of your Web page. The script automatically updates the value for you, rather than requiring you to hand-code the HTML line every time you modify the home page.

If the value returned to you displays itself as a date in 1969, it means that you are positioned somewhere west of GMT, or Greenwich Mean Time (some number of time zones west of GMT at 1 January 1970), and the server is not providing the proper data when it serves the file. Sometimes server configuration can fix the problem, but not always.

The returned value is not a date object (Chapter 36) but rather a straight string consisting of time and date, as recorded by the document's file system. The format of the string varies from browser to browser and version to version. You can, however, usually convert the date string to a JavaScript date object and use the date object's methods to extract selected elements for recompilation into readable form. Listing 18-6 shows an example.

Note

Some browser versions running in Windows 95 may return a two-digit year, which will lead to Y2K problems when generating a date object.

Even local file systems don't necessarily provide the correct data for every browser to interpret. For example, in Navigator of all generations for the Macintosh, dates from files stored on local disks come back as something from the 1920s (although Internet Explorer manages to reflect the correct date). But put that same file on a UNIX or NT Web server, and the date appears correctly when accessed via the Net.

On the CD-ROM

Example on the CD with Listing 18-6

Related Items: `Date` object (Chapter 36).

layers

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The layer object (Chapter 31) is the NN4 way of exposing positioned elements to the object model. Thus, the `document.layers` property is an array of positioned elements in the document. But due to the nonstandard way that NN4 implements positioned elements, not every positioned element is represented in the `document.layers` array. More deeply nested positioned elements must be referenced through a hierarchy of layers.

Note

The layer object and `document.layers` property are orphaned in NN4, and their importance diminishes as the installed base of NN4 shrinks. The remaining discussion is included only for those Web authors who must support positioned elements in NN4. In NN6, the layer is represented by any HTML element whose style sheet definition includes a `position` attribute. References to such elements can be made through the `document.getElementById()` method or shortcuts described in Chapter 14.

A Netscape layer is a container for content that can be precisely positioned on the page. Layers can be defined with the NN4-specific `<LAYER>` tag or with W3C standard style sheet positioning syntax, as explained in Chapter 31. Each layer contains a `document` object — the true holder of the content displayed in that layer.

Layers can be nested within each other, but a reference to `document.layers` reveals only the first level of layers defined in the document. Consider the following HTML skeleton.

```
<HTML>
<BODY>
<LAYER NAME="Europe">
    <LAYER NAME="Germany"></LAYER>
    <LAYER NAME="Netherlands"></LAYER>
</LAYER>
</BODY>
</HTML>
```

From the point of view of the primary document, there is one layer (Europe). Therefore, the length of the `document.layers` array is 1. But the Europe layer has a document, in which two more layers are nested. A reference to the array of those nested layers is

```
document.layers[1].document.layers
```

or

```
document.Europe.document.layers
```

The length of this nested array is two: The Germany and Netherlands layers. No property exists that reveals the entire set of nested arrays in a document, but you can create a `for` loop to crawl through all nested layers (shown in Listing 18-7).

On the CD-ROM

Example on the CD with Listing 18-7

Related Items: layer object (Chapter 31).

linkColor

See `alinkColor`.

links

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `document.links` property is similar to the `document.anchors` property, except that the objects maintained by the array are link objects — items created with `<A HREF="">` tags. Use the array references to pinpoint a specific link for retrieving any link property, such as the target window specified in the link's HTML definition.

Link arrays begin their index counts with 0: The first link in a document has the reference `document.links[0]`. And, as with any array object, you can find out how many entries the array has by checking the `length` property. For example:

```
var linkCount = document.links.length
```

Entries in the `document.links` property are full-fledged `location` objects.

On the CD-ROM

Example on the CD

Related Items: link object; `document.anchors` property.

location
URL

Value: String Read/Write and Read-Only (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	(✓)	(✓)	✓	✓	✓

The fact that JavaScript frequently reuses the same terms in different contexts may be confusing to the language's newcomers. Such is the case with the `document.location` property. You may wonder how this property differs from the `location` object (Chapter 17). In practice, many scripts also get the two confused when references don't include the `window` object. As a result, a new property name, `document.URL`, was introduced in NN3 and IE4 to take the place of `document.location`. You can still use `document.location`, but the term may eventually disappear from the object model vocabulary. To help you get into the future mindset, the rest of this discussion refers to this property as `document.URL`.

The remaining question is how the `window.location` object and `document.URL` property differ. The answer lies in their respective data types.

A `location` object, you may recall from Chapter 17, consists of a number of properties about the document currently loaded in a window or frame. Assigning a new URL to the `location` object (or `location.href` property) tells the browser to load the page from that URL into the frame. The `document.URL` property, on the other hand, is simply a string (read-only in Navigator) that reveals the URL of the current document. The value may be important to your script, but the property does not have the "object power" of the `window.location` object. You cannot change (assign another value to) this property value because a document has only one URL: its location on the Net (or your hard disk) where the file exists, and what protocol is required to get it.

This may seem like a fine distinction, and it is. The reference you use (`window.location` object or `document.URL` property) depends on what you are trying to accomplish specifically with the script. If the script is changing the content of a window by loading a new URL, you have no choice but to assign a value to the `window.location` object. Similarly, if the script is concerned with the component parts of a URL, the properties of the `location` object provide the simplest avenue to that information. To retrieve the URL of a document in string form (whether it is in the current window or in another frame), you can use either the `document.URL` property or the `window.location.href` property.

On the CD-ROM

Example on the CD with Listings 18-8, 18-9, and 18-10

Related Items: `location` object; `location.href`, `URLUnencoded` properties.

media

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

At its introduction in IE5.5, the `document.media` property is limited to one value besides the default value of empty: `print`. Details of this property are sketchy, but the intention appears to be to provide a way to use scripting to set the equivalent of the CSS2 `@media` rule (one of the so-called “at” rules because of the at symbol). This style sheet rule allows browsers to assign separate styles for each type of output device on which the page is rendered (for example, perhaps a different font for a printer versus the screen). In practice, however, this property is not modifiable in IE5.5.

Related Items: None.

mimeType

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Although this property is readable in IE5+, its value is not strictly speaking a MIME type, or at least not in traditional MIME format. Moreover, the results are inconsistent between IE5 and IE5.5. Perhaps this property will be of more use in an XML, rather than HTML, document environment. In any case, this property in no way exposes supported MIME types in the current browser.

namespaces

Value: Array of namespace objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

A `namespace` object (new in IE5.5) can dynamically import an XML-based IE Element Behavior. The `namespaces` property returns an array of all `namespace` objects defined in the current document. For more details on how to utilize Element Behaviors and ViewLinks (custom controls devised out of HTML and scripting) in IE5.5, visit `http://msdn.microsoft.com/workshop/author/behaviors/overview/identityb_ovw.asp`.

Related Items: None.

parentWindow

Value: `window` object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `document.parentWindow` property returns a reference to the `window` object containing the current document. The value is the same as any reference to the current window.

On the CD-ROM

Example on the CD

Related Items: `window` object.

plugins

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `document.plugins` property returns the same array of EMBED element objects that you get from the `document.embeds` property. This property appears to have been deprecated in favor of `document.embeds`.

Related Items: `document.embeds` property.

protocol

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `document.protocol` property returns the plain-language version of the protocol that was used to access the current document. For example, if the file is accessed from a Web server, the property returns `Hypertext Transfer Protocol`. This property differs from the `location.protocol` property, which returns the portion of the URL that includes the often more cryptic protocol abbreviation (for example, `http:`). As a general rule, you want to hide all of this stuff from a Web application user.

On the CD-ROM

Example on the CD

Related Items: `location.protocol` property.

referrer

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

When a link from one document leads to another, the second document can, under JavaScript control, reveal the URL of the document containing the link. The `document.referrer` property contains a string of that URL. This feature can be a useful tool for customizing the content of pages based on the previous location the user was visiting within your site. A referrer contains a value only when the user reaches the current page via a link. Any other method of navigation (such as through the history, bookmarks, or by manually entering a URL) sets this property to an empty string.

Note

The `document.referrer` property is broken in Windows versions of IE3 and IE4. In the Windows version, the current document's URL is given as the referrer; the proper value is returned in the Macintosh versions. For IE5+, the property returns empty when the referrer document is accessed via the `file:` protocol.

On the CD-ROM

Example on the CD with Listings 18-11 and 18-12

Related Items: link object.

scripts

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `document.scripts` property returns an array of all SCRIPT element objects in the current document. You can reference an individual SCRIPT element object to read not only the properties it shares with all HTML element objects (Chapter 15) but also script-specific properties, such as `defer`, `src`, and `htmlFor`. The actual scripting is accessible either through the `innerText` or `text` properties for any SCRIPT element object.

While the `document.scripts` array is read-only, many properties of individual SCRIPT `element` objects are modifiable. Adding or removing SCRIPT elements impacts the length of the `document.scripts` array. Don't forget, too, that if your scripts need to access a specific SCRIPT element object, you can assign an `ID` attribute to it and reference the element directly.

This property is an IE-specific convenience property that is the same as the IE4+ and NN6 expression `document.getElementsByTagName("SCRIPT")`, which returns an array of the same objects.

On the CD-ROM

Example on the CD

Related Items: SCRIPT element object (Chapter 20).

security

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `security` property reveals information about a security certificate, if one is associated with the current document. As of this writing, the property is not formally documented by Microsoft, so its range of possibilities is not clear for now. For a standard document, the value of the property is `This type of document does not have a security certificate.`

selection

Value: Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `document.selection` property returns a `selection` object whose content is represented in the browser window as a body text selection. That selection can be explicitly performed by the user (by clicking and dragging across some text) or created under script contol via the IE/Windows `TextRange` object (see Chapter 19). Because script action on a selection (for example, finding the next instance of selected text) is performed via the `TextRange` object, converting a selection to a `TextRange` object using the `document.selection.createRange()` method is common practice. See the `selection` object in Chapter 19 for more details.

Be aware that you cannot script interaction with text selections through user interface elements, such as buttons. Clicking a button gives focus to the button and deselects the selection. Use other events, such as `document.onmouseup` to trigger actions on a selection.

On the CD-ROM

Example on the CD

Related Items: `selection`, `TextRange` objects.

styleSheets

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `document.styleSheets` array consists of references to all STYLE element objects in the document. Not included in this array are style sheets that are assigned to elements by way of the `STYLE` attribute inside a tag or linked in via LINK elements. See Chapter 30 for details about the `styleSheet` object.

Related Items: `styleSheet` object (Chapter 30).

tags

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The NN4-specific `tags` property is used in the browser's alternate, JavaScript-based style sheet syntax. Deployment of JavaScript style sheets is exceedingly rare. In some ways, the `document.tags` property behaves like the IE4+ and NN5 `document.getElementsByTagName()` method, but `document.tags` cannot be used in regular scripts to access element objects.

Related Items: `ids` property.

title

Value: String Read-Only and Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A document's title is the text that appears between the `<TITLE>...</TITLE>` tag pair in an HTML document's Head portion. The title usually appears in the title bar of the browser window in a single-frame presentation. Only the title of the top-most framesetting document appears as the title of a multiframe window. Even so, the `title` property for an individual document within a frame is available via scripting. For example, if two frames are available (`UpperFrame` and `LowerFrame`), a script in the document occupying the `LowerFrame` frame can reference the `title` property of the other frame's document, such as this:

```
parent.UpperFrame.document.title
```

This property is read-only in browsers prior to IE4 and NN6.

The `document.title` property is a holdover from the original document object model. HTML elements in recent browsers have an entirely different application of the `title` property (see Chapter 15). In IE4+ and NN6, you should address the document's title by way of the TITLE element object directly.

Note

UNIX versions of Navigator 2 fail to return the `document.title` property value. Also, in Navigator 4 for the Macintosh, if a script creates the content of another frame, the `document.title` property for that dynamically written frame returns the filename of the script that wrote the HTML, even when it writes a valid `<TITLE>` tag set.

Related Items: `history` object.

URL

See `location`.

URLUnencoded

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `document.URL` property returns a URL-encoded string, meaning that non-alphanumeric characters in the URL are converted to URL-friendly characters (for example, a space becomes `%20`). You can always use the `unescape()` function on the value returned by the `document.URL` property, but the `URLUnencoded` property does that for you. If there are no URL-encoded characters in the URL, then both properties return identical strings.

Related Items: `document.URL` property.

vlinkColor

See `alinkColor`.

width

See `height`.

Methods

captureEvents(*eventTypeList*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

In Navigator 4 only, the natural propagation of an event is downward from the `window` object, through the `document` object, and eventually reaching its target. For example, if you click a button, the `click` event first reaches the `window` object; then it goes to the `document` object; if the button is defined within a layer, the event also filters through that layer; eventually (in a split second) the event reaches the button, where an `onClick` event handler is ready to act on that click.

The NN4 mechanism allows `window`, `document`, and layer objects to intercept events and process them prior to reaching their intended targets (or preventing them from reaching their destinations entirely). But for an outer container to grab an event, your script must instruct it to capture the type of event your application is interested in preprocessing. If you want the `document` object to intercept all events of a particular type, use the `document.captureEvents()` method to turn that facility on.

Note

Event capture with different syntax has been standardized in the W3C DOM and is implemented in NN6. See the `addEventListener()` method in Chapter 15 for the W3C counterpart to the NN4 `captureEvents()` method. Also, see Chapter 29 for more details on the combination of event capture and event bubbling in the W3C DOM.

The `document.captureEvents()` method takes one or more event types as parameters. An event type is a constant value built inside the NN4 `Event` object. One event type exists for every kind of event handler that you see in all of the document objects of NN4. The syntax consists of a reference to the `Event` object and the event name in all uppercase letters. For example, if you want the document to intercept all `click` events, the statement is

```
document.captureEvents(Event.CLICK)
```

For multiple events, add them as parameters, separated by the pipe (|) character:

```
document.captureEvents(Event.MOUSEDOWN | Event.KEYPRESS)
```

After the `document` object is set to capture an event type, it must have a function ready to deal with the event. For example, perhaps the function looks through all `Event.MOUSEDOWN` events and looks to see if the right mouse button is the one that triggers the event and what form element (if any) is the intended target. The goal is perhaps to display a pop-up menu (as a separate layer) for a right-click. If the click comes from the left mouse button, then the event is routed to its intended target.

To associate a function with a particular event type captured by a `document` object, assign a function to the event. For example, to assign a custom `doClickEvent()` function to click events captured by the `wdocument` object, use the following statement:

```
document.onclick=doClickEvent
```

Notice that the function name is assigned only as a reference name, unlike an event handler within a tag. The function, itself, is like any function, but it has the added benefit of automatically receiving the event object as a parameter. To turn off event capture for one or more event types, use the `document.releaseEvent()` method. See Chapter 29 for details of working with NN4 events.

Note

Capturing events at the `window`, `document`, or layer level in NN4 does not always work the way you may want, which is especially true if your page contains tables. For example, capturing mouse events has no effect in the Windows version of NN4 unless the cursor is atop a cell border. Event capture works most reliably when a scriptable object has an event handler defined for it (even if the handler is an empty string), and the element is the target of the event (for example, you are about to type into a text field). For all other elements, event capture may simply not be captured at the `document` or `window` level.

On the CD-ROM

Example on the CD

Related Items: `document.handleEvent()`, `document.releaseEvents()`, `document.routeEvent()` methods; parallel `window` object event methods.

clear()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Ever since NN2, the `document.clear()` method was intended to clear the current document from the browser window. This method is quite impractical, because you typically need some further scripts to execute after you clear the document, but if the scripts are gone, nothing else happens.

In practice, the `document.clear()` method never did what it was supposed to do (and in earlier browsers easily caused browser crashes). I recommend against using `document.clear()`, including in preparation for generating a new page's content with `document.write()`. The `document.write()` method clears the original document from the window before adding new content. If you truly want to empty a window or frame, then use `document.write()` to write a blank HTML document or to load an empty HTML document from the server.

Related Items: `document.close()`, `document.write()`, `document.writeln()` methods.

close()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Whenever a layout stream is opened to a window via the `document.open()` method or either of the document writing methods (which also open the layout stream), you must close the stream after the document is written. This causes the `Layout:Complete` and `Done` messages to appear in the status line (although you may experience some bugs in the status message on some platforms). The document closing step is very important to prepare the window for the next potential round of replenishment with new script-assembled HTML. If you don't close the document, subsequent writing is appended to the bottom of the document.

Fixing the Sticky Wait Cursor

IE4+ frequently fails to restore the cursor to normal after `document.write()` and `document.close()` (and some other content-modifying scripts). The cursor stubbornly remains in the wait mode when, in truth, all processing has been completed. One, albeit ugly, workaround that I have found effective is to force an extra `document.close()` via a `javascript:` pseudo-URL (just adding another `document.close()` to your script doesn't do the trick). For use within a frameset, the `javascript:` URL must be directed to the top of the frameset hierarchy, while the `document.close()` is aimed at the frame that had its content changed. For example, if the change is made to a frame named `content`, create a function, such as the following:

```
function recloseDoc() {
    if (isIE) {
        top.location.href="javascript:void (parent.content.document.close())"
    }
}
```

This assumes, of course, that you have browser-sniffing working in the script that sets the `isIE` global variable to `true` when the browser is running in IE. If you place this function in the framesetting document, scripts that modify the content frame can invoke this script after any operation that prevents the normal cursor from appearing.

Some or all of the data specified for the window won't display properly until you invoke the `document.close()` method, especially when images are being drawn as part of the document stream. A common symptom is the momentary appearance and then disappearance of the document parts. If you see such behavior, look for a missing `document.close()` method after the last `document.write()` method.

On the CD-ROM

Example on the CD

Related Items: `document.open()`, `document.clear()`, `document.write()`, `document.writeln()` methods.

createAttribute("*attributeName*")

Returns: Attribute object reference

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `document.createAttribute()` method generates an attribute node object (formally known as an `Attr` object in W3C DOM terminology) and returns a reference to the newly created object. Invoking the method assigns only the name of the attribute, so it is up to your script to assign a value to the object's `nodeValue` property and then plug the new attribute into an existing element via that element's `setAttributeNode()` method (described in Chapter 15). The following sequence generates an attribute that becomes an attribute of a TABLE element:

```
var newAttr = document.createAttribute("width")
newAttr.nodeValue = "80%"
document.getElementById("myTable").setAttributeNode(newAttr)
```

Attributes do not always have to be attributes known to the HTML standard, because the method also works for XML elements, which have custom attributes.

On the CD-ROM

Example on the CD

Related Items: `setAttributeNode()` method (Chapter 15).

createElement("*tagName*")

Returns: Element object reference

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `document.createElement()` method generates an element object for whatever HTML (or XML) tag name you pass as the parameter. This object is not officially part of the current document object model because it has not yet been placed into the document. But this method is the way you begin assembling an element object that eventually gets inserted into the document.

The returned value is a reference to the object. Properties of that object include all properties (set to default values) that the browser's object model defines for that element object. Your scripts can then address the object via this reference to set the object's properties. Typically you do this before the object is inserted into the document, especially because otherwise read-only properties can be modified before the element is inserted into the document.

After the object is inserted into the document, the original reference (for example, a global variable used to store the value returned from the `createElement()` method) still points to the object, even while it is in the document and being displayed for the user. To demonstrate this effect, consider the following statements that create a simple paragraph element containing a text node:

```
var newText = document.createTextNode("Four score and seven years ago...")
var newElem = document.createElement("P")
newElem.id = "newestP"
newElem.appendChild(newText)
document.body.appendChild(newElem)
```

At this point, the new paragraph is visible in the document. But you can now modify, for example, the style of the paragraph by addressing either the element in the `document` object model or the variable that holds the reference to the object you created:

```
newElem.style.fontSize = "20pt"
```

or

```
document.getElementById("newestP").style.fontSize = "20pt"
```

The two references are inextricably connected and always point to the exact same object. Therefore, if you want to use a script to generate a series of similar elements (for example, a bunch of LI elements), then you can use `createElement()` to make the first one and set all properties that the items have in common. Then use `cloneNode()` to make a new copy, which you can then treat as a separate element (and probably assign unique IDs to each one).

Scripting in the W3C DOM environment (to the extent that it is supported in both IE5 and NN6), you may rely on `document.createElement()` frequently to generate new content for a page or portion thereof (unless you prefer to use the convenience `innerHTML` property to add content in the form of strings of HTML). In a strict W3C DOM environment, creating new elements is not a matter of assembling HTML strings, but rather creating genuine element (and text node) objects.

On the CD-ROM

Example on the CD

Related Items: `document.createTextNode()` method.

createEventObject([*eventObject*])

Returns: event Object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The IE-specific `createEventObject()` method creates an `event` object, which can then be passed as a parameter to the `fireEvent()` method of any element object. The `event` object created by this event is just like an `event` object created by a user or system action.

An optional parameter lets you base the new event on an existing `event` object. In other words, the properties of the newly created `event` object pick up all the properties of the `event` object passed as a parameter, which lets you then modify properties of your choice. If you provide no parameter to the method, then you must fill the essential properties manually. For more about the properties of an `event` object, see Chapter 29.

On the CD-ROM

Example on the CD

Related Items: `fireEvent()` method (Chapter 15); `event` object (Chapter 29).

createStyleSheet(["*URL*"[, *index*]])

Returns: `styleSheet` object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `createStyleSheet()` method creates a `styleSheet` object, a type of object that includes STYLE element objects as well as style sheets that are imported into a document via the LINK element. Thus you can dynamically load an external style sheet even after a page has loaded. Note that this method does not work in IE4 for the Macintosh.

Unlike the other "create" methods entering W3C DOM usage, the `createStyleSheet()` method not only creates the style sheet, but it inserts the object into the document object model immediately. Thus, any style sheet rules that belong (or are assigned to) that object take effect on the page right away. If you'd rather create a style sheet and delay its deployment, you should use the `createElement()` method and element object assembly techniques.

If you don't specify any parameters to the method, an empty `styleSheet` object is created. It is assumed that you will then use `styleSheet` object methods, such as `addRule()` (not implemented in IE5/Mac) to add the details to the style sheet. To link in an external style sheet file, assign the file's URL to the first parameter of the method. The newly imported style sheet is appended to the end of the `document.styleSheets` array of `styleSheet` objects. An optional second parameter lets you specify precisely where in the sequence of style sheet elements the newly linked style sheet should be inserted. A style sheet rule for any given selector is overridden by a style sheet for the same selector that appears later in the sequence of style sheets in a document.

On the CD-ROM

Example on the CD with Listing 18-13

Related Items: `styleSheet` object (Chapter 30).

createTextNode("*text*")

Returns: Text node object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

A text node is a W3C DOM object that contains body text without any HTML (or XML) tags, but is usually contained by (meaning, is a child of) an HTML (or XML) element. Without the IE `innerText` convenience property for modifying the text of an element, the W3C DOM relies on the node hierarchy of a document (NN6 exceeds the W3C DOM by providing an `innerHTML` property, which you can use to replace text in an element). To insert or replace text inside an HTML element in the W3C DOM way, you create the text node and then use methods of the parent element (for example, `appendChild()`, `insertBefore()`, and `replaceChild()`, all described in Chapter 15) to modify the document's content. To generate a fresh text node, use `document.createTextNode()`.

The sole parameter of the `createTextNode()` method is a string whose text becomes the `nodeValue` of the text node object returned by the method. You can also create an empty text node (passing an empty string) and assign a string to the `nodeValue` of the object later. As soon as the text node is present in the document object model, scripts can simply change the `nodeValue` property to modify text of an existing element. For more details on the role of text nodes in the W3C DOM, see Chapter 14.

On the CD-ROM

Example on the CD

Related Items: `document.createElement()` method.

elementFromPoint(*x*, *y*)

Returns: Element object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `elementFromPoint()` method returns a reference to whatever element object occupies the point whose integer coordinates are supplied as parameters to the method. The coordinate plane is that of the document, whose top-left corner is at point 0,0. This coordinate plane can be very helpful in interactive designs that need to calculate collision detection between positioned objects or mouse events.

When more than one object occupies the same point (for example, one element is positioned atop another), the element with the highest z-index value is returned. A positioned element always wins when placed atop a normal body-level element. And if multiple overlapping positioned elements have the same z-index value (or none by default), the element that comes last in the source code order is returned for the coordinate that they share in common.

On the CD-ROM

Example on the CD with Listing 18-14

Related Items: `event.clientX`, `event.clientY` properties; positioned objects (Chapter 31).

execCommand("*commandName*"[, *UIFlag*] [, *param*])

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+ includes a large set of commands that are outside of the methods defined for objects in the object model. These commands are also accessible to programmers who build an Internet Explorer ActiveX control into their applications. The `execCommand()` method (not implemented in IE5/Mac) is the JavaScript gateway to those commands. A series of related methods (`queryCommandEnable()` and others) also facilitate management of these commands.

The syntax for the `execCommand()` method requires at least one parameter, a string version of the command name. Command names are not case-sensitive. An optional second parameter is a Boolean flag to instruct the command to display any user interface artifacts that may be associated with the command. The default is `false`. For the third parameter, some commands require that an attribute value be passed for the command to work. For example, to set the font size of a text range, the syntax is

```
myRange.execCommand("FontSize", true, 5)
```

The `execCommand()` method returns Boolean `true` if the command is successful; `false` if not successful; `undefined` in IE5/Mac. Some commands can return values (for example, finding out the font name of a selection), but those are accessed through the `queryCommandValue()` method.

Most of these commands operate on body text selections that are `TextRange` objects. As described in Chapter 19, a `TextRange` object must be created under script control. But a `TextRange` object can be done in response to a user selecting some text in the document. Because a `TextRange` object is independent of the element hierarchy (indeed, a `TextRange` can spread across multiple nodes), it cannot respond to style sheet specifications. Thus, many of the commands that can operate on a `TextRange` object have to do with formatting or modifying the text. For a list of commands that work exclusively on `TextRange` objects, see the `TextRange.execCommand()` method in Chapter 19.

While many of the commands intended for the `TextRange` also work when invoked from the `document` object, in this section the focus is on those commands that have scope over the entire document. Table 18-4 lists those few commands that work with the document. Also listed are many commands that work exclusively on text selections in the document, whether the selections are made manually by the user or with the help of the `TextRange` object (see Chapter 19).

Table 18-4 document.execCommand() Commands

Command	***Parameter***	***Description***
`Refresh`	None	Reloads the page.
`SelectAll`	None	Selects entire page content.
`Unselect`	None	Unselects any page selection.
`BackColor`	Color String	Encloses the current selection with a FONT element whose `STYLE` attribute sets the `background-color` style to the parameter value.
`CreateBookmark`	Anchor String	Encloses the current selection (or text range) with an anchor element whose `NAME` attribute is set to the parameter value.
`CreateLink`	URL String	Encloses the current selection with an A element whose `HREF` attribute is set to the parameter value.
`FontName`	Font Face(s)	Encloses the current selection with a FONT element whose `FACE` attribute is set to the parameter value.
`FontSize`	Size String	Encloses the current selection with a FONT element whose `SIZE` attribute is set to the parameter value.
`FontColor`	Color String	Encloses the current selection with a FONT element whose `COLOR` attribute is set to the parameter value.
`Indent`	None	Indents the current selection.
`JustifyCenter`	None	Centers the current selection.
`JustifyFull`	None	Full-justifies the current selection.
`JustifyLeft`	None	Left-justifies the current selection.
`JustifyRight`	None	Right-justifies the current selection.
`Outdent`	None	Outdents the current selection.
`RemoveFormat`	None	Removes formatting for the current selection.

Continued

Table 18-4 *(continued)*

Command	***Parameter***	***Description***
`SelectAll`	None	Selects all text of the document.
`UnBookmark`	None	Removes anchor tags that surround the current selection.
`Unlink`	None	Removes link tags that surround the current selection.
`Unselect`	None	Deselects the current selection anywhere in the document.

On the CD-ROM

Example on the CD

Related Items: `queryCommandEnabled()`, `queryCommandIndterm()`, `queryCommandState()`, `queryCommandSupported()`, `queryCommandText()`, `queryCommandValue()` methods.

getElementById("*elementID*")

Returns: Element object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `document.getElementById()` method is the W3C DOM syntax for retrieving a reference to any element in a document that has a unique identifier assigned to its `ID` attribute. If the document contains more than one instance of an ID, the method returns a reference to the first element in source code order with that ID. Because this method is such an important avenue to writing references to objects that are to be modified under script control, you can see how important it is to assign unique IDs to elements.

This method's name is quite a finger twister for scripters, especially compared to the IE4+ convention of letting a reference to any element begin simply with the object's ID. But unless you utilize the `document.all` normalization trick for NN6 as described in Chapter 15, the `getElementById()` method is the cross-browser way of gaining an element's reference for IE5+ and NN6+. When you type this method, be sure to use a lowercase "d" as the last character of the method name.

Unlike some other element-oriented methods (for example, `getElementsByTagName()`), which can be invoked on any element in a document, the `getElementById()` method works exclusively with the `document` object.

On the CD-ROM

Example on the CD

Related Items: `getElementsByTagName()` method (Chapter 15).

getElementsByName("*elementName*")

Returns: Array.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `document.getElementsByName()` method returns an array of references to objects whose `NAME` attribute is assigned the element name passed as the method's attribute. Although NN6 recognizes `NAME` attributes even for elements that don't have them by default, IE5+ does not. Therefore, for maximum cross-browser compatibility, use this method only to locate elements that have `NAME` attributes defined for them by default, such as form control elements. If the element does not exist in the document, the method returns an array of zero length.

For the most part, you are best served by using IDs on elements and the `getElementById()` method to unearth references to individual objects. But some elements, especially the INPUT element of type radio, use the `NAME` attribute to group elements together. In that case, a call to `getElementsByName()` returns an array of all elements that share the name—facilitating perhaps a `for` loop that inspects the `checked` property of a radio button group. Thus, instead of using the old-fashioned (although entirely backward compatible) approach by way of the containing form object

```
var buttonGroup = document.forms[0].radioGroupName
```

you can go more directly:

```
var buttonGroup = document.getElementsByName(radioGroupName)
```

In the latter case, you operate independently of the containing form object's index number or name. This assumes, of course, that a group name is not shared elsewhere on the page.

On the CD-ROM

Example on the CD

Related Items: `document.getElementsById()`, `getElementsByTagName()` methods.

getSelection()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Many Web browser users aren't aware that they can select and copy body text in a document for pasting into other application documents. Even so, NN4+ offers a scripted way of capturing the text selected by a user in a page. The `document.getSelection()` method returns the string of text selected by the user. If nothing is selected, an empty string is the result. Returned values consist only of the visible text on the page and not the underlying HTML or style of the text.

The IE4+ equivalent involves the `document.selection` property, which returns an IE `selection` object (not implemented in IE5/Mac). To derive the text from this object, you must create a `TextRange` object from it and then inspect the `text` property:

```
var selectedText = document.selection.createRange().text
```

On the CD-ROM

Example on the CD with Listing 18-15

Related Items: `document.selection` property.

handleEvent(*event*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

When you explicitly capture NN4 events in the `window`, `document`, or layer object (by invoking the `captureEvents()` method for that object), you can control where the events go after their initial capture. To let an event continue to its original target (for example, a button that is clicked by a user), you use the `routeEvent()` method. But if you want to redirect an event (or class of events) to a particular event handler elsewhere in the document, use the `handleEvent()` method.

See the discussion of the `handleEvent()` method for the `window` object in Chapter 16. The behavior of the `handleEvent()` method for all objects is the same.

Related Items: `document.captureEvents()`, `document.releaseEvents()`, `document.routeEvent()` methods; `event` object (Chapter 29).

open(["*mimeType*"] [, *replace*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Opening a document is different from opening a window. In the case of a window, you're creating a new object, both on the screen and in the browser's memory. Opening a document, on the other hand, tells the browser to get ready to accept some data for display in the window named or implied in the reference to the `document.open()` method. (For example, `parent.frames[1].document.open()` may refer to a different frame in a frameset, whereas `document.open()` implies the current window or frame.) Therefore, the method name may mislead newcomers because the `document.open()` method has nothing to do with loading documents from the Web server or hard disk. Rather, this method is a prelude to sending data to a window via the `document.write()` or `document.writeln()` methods. In a sense, the `document.open()` method merely opens the valve of a pipe; the other methods send the data down the pipe like a stream, and the `document.close()` method closes that valve as soon as the page's data has been sent in full.

The `document.open()` method is optional because a `document.write()` method that attempts to write to a closed document automatically clears the old document and opens the stream for a new one. Whether or not you use the `document.open()` method, be sure to use the `document.close()` method after all the writing has taken place.

An optional parameter to the `document.open()` method lets you specify the nature of the data being sent to the window. A MIME (Multipurpose Internet Mail Extension) type is a specification for transferring and representing multimedia data on the Internet (originally for mail transmission, but now applicable to all Internet data exchanges). You've seen MIME depictions in the list of helper applications in your browser's preferences settings. A pair of data type names separated by a slash represent a MIME type (such as `text/html` and `image/gif`). When you specify a MIME type as a parameter to the `document.open()` method, you're instructing the browser about the kind of data it is about to receive, so that it knows how to render the data. Common values that most browsers accept are

```
text/html
text/plain
image/gif
image/jpeg
image/xbm
```

If you omit the parameter, JavaScript assumes the most popular type, `text/html` — the kind of data you typically assemble in a script prior to writing to the window. The `text/html` type includes any images that the HTML references. Specifying any of the image types means that you have the raw binary representation of the image that you want to appear in the new document — possible, but unlikely.

Another possibility is to direct the output of a `write()` method to a plug-in. For the `mimeType` parameter, specify the plug-in's MIME type (for example, `application/x-director` for Shockwave). Again, the data you write to a plug-in must be in a form that it knows how to handle. The same mechanism also works for writing data directly to a helper application.

Note

IE3 does not accept any parameters for the `document.open()` method. IE4 accepts only the `text/html` MIME type parameter.

NN4+ and IE5+ include a second, optional parameter to the method: `replace`. This parameter does for the `document.open()` method what the `replace()` method does for the `location` object. For `document.open()`, it means that the new document you are about to write replaces the previous document in the window or frame from being recorded to that window or frame's history.

Tip

Avoid `document.open()` entirely for NN2 in the same window or frame as the one containing the script that invokes the `document.open()` method. Attempting to reopen the script's own document with this method in Navigator 2 usually leads to a crash of the browser.

On the CD-ROM

Example on the CD

Related Items: `document.close()`, `document.clear()`, `document.write()`, `document.writeln()` methods.

queryCommandEnabled("*commandName*")
queryCommandIndterm("*commandName*")
queryCommandCommandState("*commandName*")
queryCommandSupported("*commandName*")
queryCommandText("*commandName*")
queryCommandValue("*commandName*")

Returns: Various values.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These six methods (not implemented in IE5/Mac) lend further support to the `execCommand()` method for `document` and `TextRange` objects. If you choose to use the `execCommand()` method to achieve some stylistic change on a text selection, you can use some of these query methods to make sure the browser supports the desired command and to retrieve any returned values. Table 18-5 summarizes the purpose and returned values for each of the methods.

Table 18-5 IE Query Commands

queryCommand	*Returns*	*Description*
`Enabled`	Boolean	Reveals whether the `document` or `TextRange` object is in a suitable state to be invoked.
`Indterm`	Boolean	Reveals whether the command is in an indeterminate state.
`CommandState`	Boolean | `null`	Reveals whether the command has been completed (`true`), is still working (`false`), or is in an indeterminate state (`null`).
`Supported`	Boolean	Reveals whether the command is supported in the current browser.
`Text`	String	Returns any text that may be returned by a command.
`Value`	Varies	Returns whatever value (if any) is returned by a command.

Because the `execCommand()` method cannot be invoked on a page while it is still loading, any such invocations that may collide with the loading of a page should check with `queryCommandEnabled()` prior to invoking the command. Validating that the browser version running the script supports the desired command (especially for commands that have been introduced after IE4) is also a good idea. Therefore, you may want to wrap any command call with the following conditional structure:

```
if (queryCommandEnabled(commandName) && queryCommandSupported(commandName)) {...}
```

When using a command to read information about a selection, use the `queryCommandText()` or `queryCommandValue()` methods to catch that information (recall that the `execCommand()` method itself returns a Boolean value regardless of the specific command invoked).

On the CD-ROM

Example on the CD

Related Items: `TextRange` object (Chapter 19); `execCommand()` method.

recalc([*allFlag*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

IE5 introduced the concept of dynamic properties. With the help of the `setExpression()` method of all elements and the `expression()` style sheet value, you can establish dependencies between object properties and potentially dynamic properties, such as a window's size or a draggable element's location. After those dependencies are established, the `document.recalc()` method causes those dependencies to be recalculated — usually in response to some user action, such as resizing a window or dragging an element.

The optional parameter is a Boolean value. The default value, `false`, means that the recalculations are performed only on expressions for which the browser has detected any change since the last recalculation. If you specify `true`, however, all expressions are recalculated whether they have changed or not.

On the CD-ROM

Example on the CD

Related Items: `getExpression()`, `removeExpression()`, `setExpression()` methods (Chapter 15).

releaseEvents(*eventTypeList*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

If your NN4 scripts have enabled event capture for the `document` object (or `window` or layer, for that matter), you can turn off that capture with the `releaseEvents()` method. This method does not inhibit events from reaching their intended target. In fact, by releasing capture from a higher object, released events don't bother stopping at those higher objects anymore.

See the discussion of the `releaseEvents()` method for the `window` object in Chapter 16. The behavior of the `releaseEvents()` method for all objects is the same.

Related Items: `document.captureEvents()`, `document.routeEvent()` methods.

routeEvent(*event*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

If you turn on NN4 event capturing in the `window`, `document`, or layer object (via their respective `captureEvents()` methods), the event handler you assign to those events really captures those events, preventing them from ever reaching their intended targets. For some page designs, this capturing is intentional, for it allows the higher-level object to handle all events of a particular type. But if your goal is to perform some preprocessing of events before they reach their destination, you need a way to pass that event along its regular path, which is what the `routeEvent()` method is for.

See the discussion of the `routeEvent()` method for the `window` object in Chapter 16. The behavior of the `routeEvent()` method for all objects is the same.

Related Items: document.captureEvents(), document.releaseEvents() methods.

write("*string1*" [,"*string2*" ... [, "*stringn*"]])
writeln("*string1*" [,"*string2*" ... [, "*stringn*"]])

Returns: Boolean `true` if successful.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Both of these methods send text to a document for display in its window. The only difference between the two methods is that `document.writeln()` appends a carriage return to the end of the string it sends to the document. This carriage return is helpful for formatting source code when viewed through the browser's source view window. For new lines in rendered HTML that is generated by these methods, you must still write a `<BR>` to insert a line break.

Note

Not all browsers and versions display the source code that is dynamically generated by a client-side script when you attempt to view the source. In NN3 and NN4, the browser frequently shows the source code of such a page to have a `wysiwyg:` protocol, meaning that the document exists only in memory. Don't fool yourself into believing that this is a way to hide scripts from nosey visitors. Other browsers or versions (perhaps on a different operating system) are able to view the rendered source without any problem. Plus, a browser with scripting turned off is able to view the page that dynamically generated the code in the first place. See the section "Hiding scripts entirely?" in Chapter 13.

A common, incorrect conclusion that many JavaScript newcomers make is that these methods enable a script to modify the contents of an existing document, which is not true. As soon as a document has loaded into a window (or frame), the only fully backward compatible text that you can modify without reloading or rewriting the entire page is the content of text and TEXTAREA objects. In IE4+, you can modify HTML and text via the `innerHTML`, `innerText`, `outerHTML`, and `outerText` properties of any element. For NN6 and IE5+, you can modify an element's text by setting its `nodeValue` or `innerHTML` properties; strict adherence to the W3C DOM requires creating and inserting or replacing new elements, as described in Chapter 15.

The two safest ways to use the `document.write()` and `document.writeln()` methods are to

✦ Write some or all of the page's content by way of scripts embedded in the document

✦ Send HTML code either to a new window or to a separate frame in a multi-frame window

For the first case, you essentially interlace script segments within your HTML. The scripts run as the document loads, writing whatever scripted HTML content you like. This task is exactly what you did in `script1.htm` in Chapter 3. This task is also how you can have one page generate browser-specific HTML when a particular class of browser requires unique syntax.

In the latter case, a script can gather input from the user in one frame and then algorithmically determine the layout and content destined for another frame. The script assembles the HTML code for the other frame as a string variable (including all necessary HTML tags). Before the script can write anything to the frame, it can optionally open the layout stream (to close the current document in that frame) with the `parent.frameName.document.open()` method. In the next step, a `parent.frameName.document.write()` method pours the entire string into the other frame. Finally, a `parent.frameName.document.close()` method ensures that the total data stream is written to the window. Such a frame looks just the same as if it were created by a source document on the server rather than on the fly in memory. The `document` object of that window or frame is a full citizen as a standard `document` object. You can, therefore, even include scripts as part of the HTML specification for one of these temporary HTML pages.

NN2 has some nasty bugs when you use `document.write()` to write to the current window, but in NN3+ and IE3+, you can write to the current window without problems. Even so, you should be prepared for the consequences. After an HTML document (containing the script that is going to do the writing) loads completely, the page's incoming stream closes automatically. If you then attempt to apply a series of `document.write()` statements, the first `document.write()` method completely removes all vestiges of the original document. That includes all of its objects and scripted variable values. Therefore, if you try to assemble a new page with a series of `document.write()` statements, the script and variables from the original page will be gone before the second `document.write()` statement executes. To get around this potential problem, assemble the content for the new screen of content as one string variable and then pass that variable as the parameter to a single `document.write()` statement. Also be sure to include a `document.close()` statement in the next line of script.

Assembling HTML in a script to be written via the `document.write()` method often requires skill in concatenating string values and nesting strings. A number of JavaScript String object shortcuts facilitate the formatting of text with HTML tags (see Chapter 34 for details).

If you are writing to a different frame or window, you are free to use multiple `document.write()` statements if you like. Whether your script sends lots of small strings via multiple `document.write()` methods or assembles a larger string to be sent via one `document.write()` method depends partly on the situation and partly on your own scripting style. From a performance standpoint, a fairly standard procedure is to do more preliminary work in memory and place as few I/O (input/output) calls as possible. On the other hand, making a difficult-to-track mistake is easier in string concatenation when you assemble longer strings. My personal preference is to assemble longer strings, but you should use the system that's most comfortable for you.

You may see another little-known way of passing parameters to these methods. Instead of concatenating string values with the plus (+) operator, you can also bring string values together by separating them with commas. For example, the following two statements produce the same results:

```
document.write("Today is " + new Date())
document.write("Today is ",new Date())
```

Neither form is better than the other, so use the one that feels more comfortable to your existing programming style.

Note

Dynamically generating scripts requires an extra trick, especially in NN. The root of the problem is that if you try code, such as `document.write("<SCRIPT></SCRIPT>")`, the browser interprets the end script tag as the end of the script that is doing the writing. You have to trick the browser by separating the end tag into a couple of components. Escaping the forward slash also helps. For example, if you want to load a different `.js` file for each class of browser, the code looks similar to the following:

```
// variable 'browserVer' is a browser-specific string and
// 'page' is the HTML your script is accumulating for document.write()
page += "<SCRIPT LANGUAGE='JavaScript' SRC='" + browseVer + ".js'><" +
"\/SCRIPT>"
```

Using the `document.open()`, `document.write()`, and `document.close()` methods to display images in a document requires some small extra steps. First, any URL assignments that you write via `document.write()` must be complete (not relative) URL references (especially for users of Navigator 2). Alternatively, you can write the `<BASE>` tag for the dynamically generated page so that its `HREF` attribute value matches that of the file that is writing the page.

The other image trick is to be sure to specify `HEIGHT` and `WIDTH` attributes for every image, scripted or otherwise. Navigator 2 requires these attributes (as does the HTML 4.0 specification), and document-rendering performance is improved on all platforms, because the values help the browser lay out elements even before their details are loaded.

In addition to the `document.write()` example that follows (see Listings 18-16 through 18-18), you can find fuller implementations that use this method to assemble images and bar charts in many of the applications in Chapters 48 through 57. Because you can assemble any valid HTML as a string to be written to a window or frame, a customized, on-the-fly document can be as elaborate as the most complex HTML document that you can imagine.

On the CD-ROM

Example on the CD with Figure 18-2 and Listings 18-16, 18-17, and 18-18

Related Items: `document.open()`; `document.close()`; `document.clear()` methods.

Event handlers

onSelectionChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `onSelectionChange` event can be triggered by numerous user actions, although all of those actions occur on elements that are under the influence of the IE5.5/Windows edit mode.

Related Items: `onControlSelect` event handler.

onStop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `onStop` event fires in IE5 when the user clicks the browser's Stop button. Use this event handler to stop potentially runaway script execution on a page, because the Stop button does not otherwise control scripts after a page has loaded. If you are having a problem with a runaway repeat loop during development, you can temporarily use this event handler to let you stop the script for debugging.

On the CD-ROM

Example on the CD with Listing 18-19

Related Items: Repeat loops (Chapter 39).

BODY Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`alink`	`createControlRange()`	`onAfterPrint`
`background`	`createTextRange()`	`onBeforePrint`
`bgColor`	`doScroll()`	`onScroll`
`bgProperties`		
`bottomMargin`		
`leftMargin`		
`link`		
`noWrap`		
`rightMargin`		
`scroll`		
`scrollLeft`		
`scrollTop`		
`text`		
`topMargin`		
`vLink`		

Syntax

Accessing BODY element object properties or methods:

`[window.] document.body.`*`property`*` | `*`method`*`([`*`parameters`*`])`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

In object models that reveal HTML element objects, the BODY element object is the primary container of the content that visitors see on the page. The BODY contains all rendered HTML. This special place in the node hierarchy gives the BODY object some special powers, especially in the IE object model.

As if to signify the special relationship, both the IE and W3C object models provide the same shortcut reference to the BODY element: `document.body`. As a first-class HTML element object (as evidenced by the long lists of properties, methods, and event handlers covered in Chapter 15), you are also free to use other syntaxes to reach the BODY element.

You are certainly familiar with several BODY element attributes that govern body-wide content appearance, such as link colors (in three states) and background (color or image). But IE and NN (and the W3C so far) have some very different ideas about the BODY element's role in scripting documents. Many methods and properties that NN considers to be the domain of the window (for example, scrolling, inside window dimensions, and so forth), IE puts into the hands of the BODY element object. Therefore, while NN scrolls the window (and whatever it may contain), IE scrolls the body (inside whatever window it lives). And because the BODY element fills the entire viewable area of a browser window or frame, that viewable rectangle is determined in IE by the body's `scrollHeight` and `scrollWidth` properties, whereas NN4+ features `window.innerHeight` and `window.innerWidth` properties. This distinction is important to point out because when you are scripting window- or document-wide appearance factors, you may have to look for properties and methods for the `window` or BODY element object, depending on your target browser(s).

Note

Use caution when referencing the document.body object while the page is loading. The object may not officially exist until the page has completely loaded. If you need to set some initial properties via scripting, do so in response to the onLoad event handler located in the <BODY> tag. Attempts at setting BODY element object properties in immediate scripts inside the HEAD element may result in error messages about the object not being found.

Properties

`aLink`
`bgColor`
`link`
`text`
`vLink`

Value: Hexadecimal triplet or color name string Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `aLink`, `link`, and `vLink` properties are the new versions of the `document` properties `alinkColor`, `linkColor`, and `vlinkColor`. The `bgColor` is the same as the old `document.bgColor` property, while the `text` property is the new version of the `document.fgColor` property. These new properties are the scripted equivalents of the HTML attributes for the BODY element — the property names more closely align themselves with the HTML attributes than the old property names.

Link colors that are set via pseudo-class selectors in style sheets (as `STYLE` attributes of the BODY element) must be accessed via the `style` property for the BODY object. Over time, these properties will likely fall into disuse as style sheets become more common.

On the CD-ROM

Example on the CD

Related Items: `document.alinkColor`, `document.bgColor`, `document.fgColor`, `document.linkColor`, `document.vlinkColor` properties.

background

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `background` property lets you set or get the URL for the background image (if any) assigned to the BODY element. A BODY element's background image overlays the background color in case both attributes or properties are set. To remove an image from the document's background, set the `document.body.background` property to an empty string.

On the CD-ROM

Example on the CD

Related Items: `body.bgColor`, `body.bgProperties` properties.

bgColor

See `aLink`

bgProperties

Value: String constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `bgProperties` property is an alternative way of adjusting whether the background image should remain fixed when the user scrolls the document or if it should scroll with the document. Initial settings for this behavior should be done via the `background-attachment` CSS attribute and modified under script control by way of the BODY element's `style.backgroundAttachment` property.

No matter which way you reference this property, the only allowable values are string constants `scroll` (the default) or `fixed`.

On the CD-ROM

Example on the CD

Related Items: `body.background` property.

bottomMargin
leftMargin
rightMargin
topMargin

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The four IE-specific margin properties are alternatives to setting the corresponding four margin style sheet attributes for the BODY element (`body.style.marginBottom`, and so on). Style sheet margins represent blank space between the edge of an element's content and its next outermost container. In the case of the BODY element, that container is an invisible document container.

Of the four properties, only the one for the bottom margin may be confusing if the content does not fill the vertical space of a window or frame. The margin value is not automatically increased to accommodate the extra blank space.

Different versions and operating system implementations of IE4+ offer a variety of default integer values for these properties. But be aware that their values are not necessarily returned by these properties unless they are explicitly set in the IE-proprietary BODY element attributes of the same name. Therefore, even though a default BODY has a visible margin, the property does not return that default value.

Example on the CD

Related Items: `style` object.

leftMargin

See `bottomMargin`.

link

See `aLink`.

noWrap

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `noWrap` property lets you modify the BODY element behavior normally set via the `NOWRAP` attribute. Because the property name is a negative, the Boolean logic needed to control it can get confusing.

The default behavior for a BODY element is for text to wrap within the width of the window or frame. This behavior occurs when the value of `noWrap` is its default value of `false`. By turning `noWrap` to `true`, a line of text continues to render past the right edge of the window or frame until the HTML contains a line break (or end of paragraph). If the text continues on past the right edge of the window, the window (or frame) gains a horizontal scrollbar (of course, not if a frame is set to not scroll).

By and large, users don't like to scroll in any direction if they don't have to. Unless you have a special need to keep single lines intact, let the default behavior rule the day.

Example on the CD

Related Items: None.

rightMargin

See `bottomMargin`.

scroll

Value: Constant String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `scroll` property provides scripted access to the IE-specific `SCROLL` attribute of a BODY element. By default, an IE BODY element displays a vertical scrollbar even if the height of the content does not warrant it; a horizontal scrollbar appears only when the content is forced to be wider than the window or frame. You can make sure that both scrollbars are hidden by setting the `SCROLL` attribute to "no" or changing it via script. Possible values for this property are the constant strings `yes` and `no`.

Other than `frame` attributes and NN4+ signed scripts, other browsers do not provide facilities for turning off scrollbars under script control. You can generate a new window (via the `window.open()` method) and specify that its scrollbars be hidden.

On the CD-ROM

Example on the CD

Related Items: `window.scrollbars` property; `window.open()` method.

scrollLeft
scrollTop

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Even though the `scrollLeft` and `scrollTop` properties of the BODY object are the same as those for generic HTML element objects, they play an important roll in determining the position of positioned elements (described more fully in Chapter 31). Because the mouse event and element position properties tend to be relative to the visible content region of the browser window, you must take the scrolling values of the `document.body` object into account when assigning an absolute position. Values for both of these properties are integers representing pixels.

On the CD-ROM

Example on the CD with Listing 18-20

Related Items: `window.pageXOffset`, `window.pageYOffset` properties.

text

See `aLink`.

topMargin

See `bottomMargin`.

vLink

See `aLink`.

Methods

createControlRange()

Returns: Array.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

This method is listed here for the sake of completeness. Microsoft has so far provided few clues as to when or how to use a `controlRange` object, except that it has something to do with a document in edit mode. In regular document view mode, the `createControlRange()` method (not implemented in IE5/Mac) returns an empty array.

createTextRange()

Returns: `TextRange` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The BODY element object is the most common object to use to generate a `TextRange` object in IE4+, especially when the text you are about to manipulate is part of the document's body text. The initial `TextRange` object returned from the `createTextRange()` method (not implemented in IE5/Mac) encompasses the entire BODY element's HTML and body text. Further action on the returned object is required to set the start and end point of the range. See Chapter 19's discussion of the `TextRange` object for more details.

On the CD-ROM

Example on the CD

Related Items: `TextRange` object (Chapter 19).

doScroll(["*scrollAction*"])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Use the `doScroll()` method (not implemented in IE5/Mac) to simulate user action on the scrollbars inside a window or frame that holds the current document. This method comes in handy if you are creating your own scrollbars in place of the standard system scrollbars. Scrolling is instantaneous, however, rather than with animation even if the Display control panel is set for animated scrolling. The parameter for this method is one of the string constant values shown in Table 18-6. In practice, occasionally the longer scroll action names more closely simulate an actual click on the scrollbar component, whereas the shortcut versions may scroll at a slightly different increment.

Table 18-6 document.body.doScroll() Parameters

Long Parameter	*Short Parameter*	*Scroll Action Simulates*
`scrollbarDown`	`down`	Clicking the down arrow.
`scrollbarHThumb`	n/a	Clicking the horizontal scrollbar thumb (no scrolling action).
`scrollbarLeft`	`left`	Clicking the left arrow.
`scrollbarPageDown`	`pageDown`	Clicking the page down area or pressing PgDn (default).
`scrollbarPageLeft`	`pageLeft`	Clicking the page left area.
`scrollbarPageRight`	`pageRight`	Clicking the page right area.
`scrollbarPageUp`	`pageUp`	Clicking the page up area or pressing PgUp.
`scrollbarVThumb`	n/a	Clicking the vertical scrollbar thumb (no scrolling action).

Unlike scrolling to a specific pixel location (by setting the BODY element's `scrollTop` and `scrollLeft` properties), the `doScroll()` method depends entirely on the spatial relationship between the body content and the window or frame size. Also, the `doScroll()` method triggers the `onScoll` event handler for the BODY element object.

Be aware that scripted modifications to body content can alter these spatial relationships. IE is prone to being sluggish in updating all of its internal dimensions after content has been altered. Should you attempt to invoke the `doScroll()` method after such a layout modification, the scroll may not be performed as expected. You may find the common trick of using `setTimeout()` to delay the invocation of the `doScroll()` method by a fraction of a second.

On the CD-ROM

Example on the CD

Related Items: `body.scroll`, `body.scrollTop`, `body.scrollLeft` properties; `window.scroll()`, `window.scrollBy()`, `window.scrollTo()` methods.

Event handlers

onAfterPrint
onBeforePrint

See the `onAfterPrint` event handler for the `window` object, Chapter 16.

onScroll

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onScroll` event handler fires for the BODY element object as the result of manual scrolling of the document (via scrollbars or navigation keyboard keys) and scripted scrolling via the `doScroll()` method, `scrollIntoView()` method, or adjusting the `scrollTop` and/or `scrollLeft` properties of the BODY element object. For manual scrolling and scrolling by `doScroll()`, the event seems to fire twice in succession. Moreover, the `event.srcElement` property is `null`, even when the BODY element is handling the `onScroll` event handler.

On the CD-ROM

Example on the CD with Listing 18-21

Related Items: `body.scrollTop`, `body.scrollLeft` properties; `srcollIntoView()`, `body.doScroll()` methods.

✦ ✦ ✦

CHAPTER 19

Body Text Objects

✦ ✦ ✦ ✦

In This Chapter

Objects that display running body text in documents

Using the NN `Range` and IE `TextRange` objects

Scripting search and replace actions

✦ ✦ ✦ ✦

A large number of HTML elements fall into a catchall category of elements whose purposes are slightly more targeted than contextual elements covered in Chapter 15. In this group are some very widely used elements, such as the H1 through H6 header elements, plus several elements that are not yet widely used because their full support may be lacking in even some of the most modern browsers. In this chapter, you find all sorts of text-related objects, excluding those objects that act as form controls (text boxes and such, which are covered in Chapter 25). For the most part, properties, methods, and event handlers of this chapter's objects are the generic ones covered in Chapter 15. Only those items that are unique to each object are covered in this chapter (as will be the case in all succeeding chapters).

Beyond the HTML element objects covered in this chapter, you also meet the `TextRange` object, first introduced in IE4, and the corresponding `Range` object from the W3C DOM implemented in NN6. This object is a very powerful one for scripters because it allows scripts to work very closely with body content — not in terms of, for example, the `innerText` or `nodeValue` properties of elements, but rather in terms of the text as it appears on the page in what users see as paragraphs, lists, and the like. The `TextRange` and `Range` objects essentially give your scripts cursor control over running body text for functions, such as cutting, copying, pasting, and applications that extend from those basic operations — search and replace, for instance. Bear in mind that everything you read in this chapter requires in the least the dynamic object models of IE4+ and NN6+; some items require IE5+. Unfortunately, the IE `TextRange` object is not implemented in IE5/Mac.

BLOCKQUOTE and Q Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
`cite`		

Syntax

Accessing BLOCKQUOTE or Q element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About these objects

The BLOCKQUOTE element is a special-purpose text container. Browsers typically start the content on its own line in the body and indent on both the left and right margins approximately 40 pixels. An inline quotation can be encased inside a Q element, which does not force the quoted material to start on the next line.

From an object point of view, the only property that distinguishes these two objects from any other kind of contextual container is the `cite` property, which comes from the HTML 4.0 `CITE` attribute. This attribute simply provides a URL reference for the citation and does not act as an `SRC` or `HREF` attribute to load an external document.

Property

`cite`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility					✓				

The `cite` property can contain a URL (as a string) that points to the source of the quotation in the BLOCKQUOTE or Q element. Future browsers may provide some automatic user interface link to the source document, but none of the browsers that support the `cite` property do anything special with this information.

Related Items: None.

BR Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
clear		

Syntax

Accessing BR element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

The BR element forces a carriage return and line feed for rendered content on the page. This element does not provide the same kind of vertical spacing that goes between paragraphs in a series of P elements. Only one attribute (`CLEAR`) distinguishes this element from generic HTML elements and objects.

Property

clear

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `clear` property defines how any text in an element following the BR element wraps around a floating element (for example, an image set to float along the right margin). While recent browsers expose this property, the attribute on which it is based is deprecated in the HTML 4.0 specification in an effort to encourage the use of the `clear` style sheet attribute for a BR element.

Values for the `clear` property can be one of the following strings: `all`, `left`, or `right`.

Related Items: `clear` stylesheet property.

FONT Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
color		
face		
size		

Syntax

Accessing FONT element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

In a juxtaposition of standards implementations, for the first time the FONT element is exposed as an object only in browsers that also support Cascading Style Sheets as the preferred way to control font faces, colors, and sizes. This change doesn't mean that you shouldn't use FONT elements in your page with the newer browsers — using this element may be necessary for a single page that needs to be backward-compatible with older browsers. But it does present a quandary for scripters who want to use scripts to modify font characteristics of body text after the page has loaded. A good rule of thumb to follow is to use the FONT element (and script the FONT-HTML element object's properties) when the page must work in all browsers; use style sheets (and their scriptable properties) on pages that will be running exclusively in IE4+ and NN6+.

Properties

color

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A FONT object's text color can be controlled via the `color` property. Values can be either hexadecimal triplets (for example, #`FFCCFF`) or the plain-language color names recognized by most browsers. In either case, the values are case-insensitive strings.

On the CD-ROM

Example (with Listing 19-1) on the CD-ROM

Related Items: `color` stylesheet attribute.

face

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A FONT object's font face is controllable via the `face` property. Just as the `FACE` attribute (and the corresponding `font-family` style sheet attribute), you can specify one or more font names in a comma-delimited string. Browsers start with the leftmost font face and look for a match in the client computer's system. The first matching font face that is found in the client system is applied to the text surrounded by the FONT element. You should list the most specific fonts first, and generally allow the generic font faces (`sans-serif`, `serif`, and `monospace`) to come last; that way you exert at least some control over the look of the font on systems that don't have your pretty fonts. If you know that Windows displays a certain font you like and the Macintosh has something that corresponds to that font but with a different name, you can specify both names in the same property value. The browser skips over font face names not currently installed on the client.

On the CD-ROM

Example on the CD-ROM

Related Items: `font-family` style sheet attribute.

size

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The size of text contained by a FONT element can be controlled via the `size` property. Unlike the more highly recommended `font-size` style sheet attribute, the `size` property of the FONT element object (and its corresponding `SIZE` attribute) are restricted to the relative font size scale imposed by early HTML implementations: a numbering scale from 1 to 7.

Values for the `size` property are strings, even though most of the time they are single numeral values. You can also specify a size relative to the default value by including a plus or minus sign before the number. For example, if the default font size (as set by the browser's user preferences) is 3, then you can bump up the size of a text segment by encasing it inside a FONT element and then setting its `size` property to `"+2"`.

For more accurate font sizing using units, such as pixels or points, use the `font-size` style sheet attribute.

On the CD-ROM

Example on the CD-ROM

Related Items: `font-size` style sheet attribute.

H1...H6 Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align`		

Syntax

Accessing H1 through H6 element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About these objects

The so-called "heading" elements (denoted by H1, H2, H3, H4, H5, and H6) provide shortcuts for formatting up to six different levels of headings and subheadings. While you can simulate the appearance of these headings with P elements and style sheets, the heading elements very often contain important contextual information about the structure of the document. With the IE5+ and NN6+ powers of inspecting the node hierarchy of a document, a script can generate its own table of contents or outline of a very long document by looking for elements whose `nodeName` properties are in the H*n* family. Therefore, it is a good idea to continue using these elements for contextual purposes, even if you intend to override the default appearance by way of style sheet templates.

As for the scriptable aspects of these six objects, they are essentially the same as the generic contextual objects with the addition of the `align` property. Because each H*n* element is a block-level element, you can use style sheets to set their alignment rather than the corresponding attribute or property. The choice is up to you.

Property

align

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

String values of the `align` property control whether the heading element is aligned with the left margin (`left`), center of the page (`center`), or right margin (`right`). The corresponding `ALIGN` attribute is deprecated in HTML 4.0 in favor of the `text-align` style sheet attribute.

Related Items: `text-align` style sheet attribute.

HR Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align`		
`color`		
`noShade`		
`size`		
`width`		

Syntax

Accessing HR element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

The HR element draws a horizontal rule according to size, dimension, and alignment characteristics normally set by the attributes of this element. Style sheets can also specify many of those settings, the latter route being recommended for pages that will be loaded exclusively in pages that support CSS. In IE4+ and NN6+, your scripts can modify the appearance of an HR element either directly through element object properties or through style sheet properties. To reference a specific HR element by script, you must assign an `ID` attribute to the element — a practice that you are probably not accustomed to observing.

Properties

`align`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

An HR object's horizontal alignment can be controlled via the `align` property. String values enable you to set it to align with the left margin (`left`), the center of the page (`center`), or right margin (`right`). By default, the element is centered.

On the CD-ROM

Example (with Listing 19-2) on the CD-ROM

Related Items: `text-align` style sheet attribute.

`color`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

An HR object's color can be controlled via the `color` property. Values can be either hexadecimal triplets (for example, #`FFCCFF`) or the plain-language color names recognized by most browsers. In either case, the values are case-insensitive strings. If you change the color from the default, the default shading (3-D effect) of the rule disappears. I have yet to find the magic value that lets you return the color to the browser default after it has been set to another color.

On the CD-ROM

Example on the CD-ROM

Related Items: `color` style sheet attribute.

noShade

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A default HR element is displayed with a kind of three-dimensional effect, called *shading*. You can turn shading off under script control by setting the `noShade` property to `true`. But be aware that in IE4+, the `noShade` property is a one-way journey: You cannot restore shading after it is removed. Moreover, default shading is lost if you assign a different color to the rule.

On the CD-ROM

Example on the CD-ROM

Related Items: `color` style sheet attribute.

size

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The size of an HR element is its vertical thickness, as controlled via the `size` property. Values are integers, representing the number of pixels occupied by the rule.

On the CD-ROM

Example on the CD-ROM

Related Items: None.

width

Value: Integer or String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The width of an HR element is controlled via the `width` property. By default, the element occupies the entire width of its parent container (usually the BODY).

You can specify width as either an absolute number of pixels (as an integer) or as a percentage of the width of the parent container. Percentage values are strings that include a trailing percent character (%).

On the CD-ROM

Example on the CD-ROM

Related Items: `width` style sheet attribute.

LABEL Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`accessKey`		
`form`		
`htmlFor`		

Syntax

Accessing LABEL element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

The LABEL element lets you assign a contextual relationship between a form control (text field, radio button, select list, and so on) and the otherwise freestanding text that is used to label the control on the page. This element does not control the rendering or physical relationship between the control and the label — the HTML source code order does that. Wrapping a form control label inside a LABEL element is important if scripts will be navigating the element hierarchy of a page's content and the relationship between a form control and its label is important to the results of the document parsing.

Properties

accessKey

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

For most other HTML element objects, the `accessKey` property description is covered in the generic element property descriptions of Chapter 15. The function of the property for the LABEL object is the same as the IE implementation for all other elements. The single-character string value is the character key to be used in concert with the OS- and browser-specific modifier key (for example, `Ctrl` in IE for Windows) to bring focus to the form control associated with the label. This value is best set initially via the `ACCESSKEY` attribute for the LABEL element.

Related Items: `accessKey` property of generic elements.

form

Value: Form object reference Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `form` property of a LABEL element object returns a reference to the form object that contains the form control with which the label is associated. This property can be useful in a node parsing script that wants to retrieve the form container from the perspective of the label rather than from the form control. The form object reference returned from the LABEL element object is the same form object reference returned by the `form` property of any form control object.

Related Items: `form` property of INPUT element objects.

htmlFor

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `htmlFor` property is a string that contains the ID of the form control element with which the label is associated. This value is normally set via the `HTMLFOR` attribute in the LABEL element's tag. Modifying this property does not alter the position or rendering of the label, but it does change the relationships between label and control.

Related Items: None.

MARQUEE Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
behavior	start()	onBounce
bgColor	stop()	onFinish
direction		onStart
height		
hspace		
loop		
scrollAmount		
scrollDelay		
trueSpeed		
vspace		
width		

Syntax

Accessing MARQUEE element object properties or methods:

```
(IE4+)   [window.]document.all.elemID.property | method([parameters])
```

About this object

The MARQUEE element is a Microsoft proprietary element that displays scrolling text within a rectangle specified by the `WIDTH` and `HEIGHT` attributes of the element. Text that scrolls in the element goes between the element's `start` and `end` tags. The IE4+ object model exposes the element and many properties to the object model for control by script.

Properties

behavior

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `behavior` property controls details in the way scrolled text moves within the scrolling space. Values for this property are one of the following three strings:

alternate, scroll, and slide. When set to alternate, scrolling alternates between left and right (or up and down, depending on the direction property setting). A value of scroll means that the text marches completely to and through the space before appearing again. And a value of slide causes the text to march into view until the last character is visible. When the slide value is applied as a property (instead of as an attribute value in the tag), the scrolling stops when the text reaches an edge of the rectangle. Default behavior for the MARQUEE element is the equivalent of scroll.

On the CD-ROM

Example (with Listing 19-3) on the CD-ROM

Related Items: direction property of MARQUEE object.

bgColor

Value: Hexadecimal triplet or color name string Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The bgColor property determines the color of the background of the MARQUEE element's rectangular space. To set the color of the text, either surround the MARQUEE element with a FONT element or apply the color style sheet attribute to the MARQUEE element. Values for all color properties can be either the common HTML hexadecimal triplet value (for example, "#00FF00") or any of the Netscape color names (a list is available at http://developer.netscape.com/docs/manuals/htmlguid/colortab.htm).

On the CD-ROM

Example on the CD-ROM

direction

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The direction property lets you get or set the horizontal or vertical direction in which the scrolling text moves. Four possible string values are left, right, down, up. The default value is left.

On the CD-ROM

Example on the CD-ROM

Related Items: `behavior` property of MARQUEE object.

height
width

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `height` and `width` properties enable you to get or set the pixel size of the rectangle occupied by the element. You can adjust each property independently of the other, but like most attribute-inspired properties of IE objects, if no `HEIGHT` or `WIDTH` attributes are defined in the element's tag, you cannot use these properties to get the size of the element as rendered by default.

Related Items: None.

hspace
vspace

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `hspace` and `vspace` properties let you get or set the amount of blank margin space surrounding the MARQUEE element. Adjustments to the `hspace` property affect both the left and right (horizontal) margins of the element; `vspace` governs both top and bottom (vertical) margins. Margin thicknesses are independent of the height and width of the element.

Related Items: None.

loop

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `loop` property allows you to discover the number of times the MARQUEE element was set to repeat its scrolling according to the `LOOP` attribute. Although this property is read/write, modifying it by script does not cause the text to loop only that number of times more before stopping. Treat this property as read-only.

Related Items: None.

scrollAmount
scrollDelay

Value: Integers Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `scrollAmount` and `scrollDelay` properties control the perceived speed and scrolling smoothness of the MARQUEE element text. The number of pixels between redrawings of the scrolling text is controlled by the `scrollAmount` property. The smaller the number, the less jerky the scrolling is (the default value is `6`). At the same time, you can control the time in milliseconds between each redrawing of the text with the `scrollDelay` property. The smaller the number, the more frequently redrawing is performed (the default value is 85 or 90, depending on the operating system). Thus, a combination of low `scrollAmount` and `scrollDelay` property values presents the smoothest (albeit slow) perceived scrolling.

On the CD-ROM

Example on the CD-ROM

Related Items: `trueSpeed` property of MARQUEE object.

trueSpeed

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE has a built-in regulator that prevents `SCROLLDELAY` attribute or `scrollDelay` property settings below 60 from causing the MARQUEE element text to scroll too quickly. But if you genuinely want to use a speed faster than 60 (meaning, a value lower than 60), then also set the `trueSpeed` property to `true`.

Related Items: `scrollDelay` property of MARQUEE object.

Methods

start()
stop()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Scripts can start or stop (pause) a MARQUEE element via the `start()` and `stop()` methods. Neither method takes parameters, and you are free to invoke them as often as you like after the page loads. Be aware that the `start()` method does not trigger the `onStart` event handler for the object.

On the CD-ROM

Example on the CD-ROM

Event Handlers

onBounce

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onBounce` event handler fires only when the MARQUEE element has its behavior set to `alternate`. In that back-and-forth mode, each time the text reaches a boundary and is about to start its return trip, the `onBounce` event fires. If you truly want to annoy your users, you could have the `onBounce` event handlers play a sound at each bounce (I'm kidding — please don't do this).

Related Items: `behavior` property of MARQUEE object.

onFinish

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onFinish` event handler fires only when the MARQUEE element has its loop set to a specific value of `1` or greater. After the final text loop has completed, the `onFinish` event fires.

Related Items: `loop` property of MARQUEE object.

onStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓✓

The `onStart` event handler fires as the MARQUEE element begins its scrolling, but only as a result of the page loading. The `start()` method does not trigger this event handler.

Related Items: `start()` method of MARQUEE object.

Range Object

Properties	*Methods*	*Event Handlers*
`collapsed`	`cloneContents()`	
`commonAncestorContainer`	`cloneRange()`	
`endContainer`	`collapse()`	
`endOffset`	`compareBoundaryPoints()`	
`startContainer`	`createContextualFragment()`	
`startOffet`	`deleteContents()`	
	`detach()`	
	`extractContents()`	
	`insertNode()`	
	`isValidFragment()`	
	`selectNode()`	
	`selectNodeContents()`	
	`setEnd()`	
	`setEndAfter()`	
	`setEndBefore()`	
	`setStart()`	
	`setStartAfter()`	
	`setStartBefore()`	
	`surroundContents()`	
	`toString()`	

Syntax

Creating a `Range` object:

```
var rangeRef = document.createRange()
```

Accessing `Range` object properties or methods:

```
(NN6+)    rangeRef.property | method([parameters])
```

About this object

Note

The first release of NN6 suffers from several bugs and omissions with respect to the `Range` object. Discussions about the NN6 `Range` object throughout this chapter cover some features that may not be implemented or fixed until a later version of the NN6 browser. I mention specific bugs and omissions found in the early NN6 whenever the description here does not yet match the browser implementation. Even some of the example listings do not work correctly (or at all) with the first release of NN6. In time, however, everything described in this section will be a part of the Netscape browser.

The `Range` object is the W3C DOM (Level 2) version of what Microsoft had implemented earlier as its `TextRange` object. A number of important differences (not the least of which is an almost entirely different property and method vocabulary) distinguish the behaviors and capabilities of these two similar objects. Although Microsoft participated in the W3C DOM Level 2 working groups, no participant from the company is credited on the DOM specification chapter regarding the `Range` object. Because the W3C version has not been implemented as of IE5.5, it is unknown if IE will eventually implement the W3C version. In the meantime, see the IE/Windows `TextRange` object section later in this chapter for comparisons between the two objects. Neither the W3C DOM `Range` nor Microsoft `TextRange` objects are implemented in IE5/Mac.

The purpose of the W3C DOM `Range` object is to provide hooks to a different "slice" of content (most typically a portion of a document's content) that is not necessarily restricted to the node hierarchy (tree) of a document. While a `Range` object can be used to access and modify nodes and elements, it can also transcend node and element boundaries to encompass arbitrary segments of a document's content. The content contained by a range is sometimes referred to as a *selection*, but this does not mean that the text is highlighted on the page, such as a user selection. Instead, the term "selection" here means a segment of the document's content that can be addressed as a unit, separate from the node tree of the document. As soon as the range is created, a variety of methods let scripts examine, modify, remove, replace, and insert content on the page.

A range object (meaning, an instance of the static `Range` object) has a start point and an end point, which together define the boundaries of the range. The points are defined in terms of an offset count of positions within a container. These counts are usually character positions within text nodes (ignoring any HTML tag or attribute characters), but when both boundaries are at the edges of the same node, the offsets may also be counts of nodes within a container that surrounds both the start and end points. An example helps clarify these concepts.

Consider the following simplified HTML document:

```
<HTML>
<BODY>
<P>This paragraph has an <EM>emphasized</EM> segment.</P>
</BODY>
</HTML>
```

You can create a range that encompasses the text inside the EM element from several points of view, each with its own offset counting context:

1. *From the EM element's only child node (a text node).* The offset of the start point is zero, which is the location of the insertion point in front of the first character (lowercase "e"); the end point offset is 10, which is the character position (zero-based) following the lowercase "d".
2. *From the EM element.* The point of view here is that of the child text node inside the EM element. Only one node exists here, and the offset for the start point is 0, while the offset for the end point is 1.
3. *From the P element's child nodes (two text nodes and an element node).* You can set the start point of a range to the very end (counting characters) of the first child text node of the P element; you can then set the end point to be in front of the first character of the last child text node of the P element. The resulting range encompasses the text within the EM element.
4. *From the P element.* From the point of view of the P element, the range can be set with an offset starting with 1 (the second node nested inside the P element) and ending with 2 (the start of the third node).

While these different points of view provide a great deal of flexibility, they also can make it more difficult to imagine how you can use this power. The W3C vocabulary for the `Range` methods, however, helps you figure out what kind of offset measure to use.

A range object's start point could be in one element, and its end point in another. For example, consider the following HTML:

```
<P>And now to introduce our <EM>very special</EM> guest:</P>
```

If the text shown in boldface indicates the content of a range object, you can see that the range crosses element boundaries in a way that would make HTML element or node object properties difficult to use for replacing that range with some other text. The W3C specification provides guidelines for browser makers on how to handle the results of removing or inserting HTML content that crosses node borders.

An important aspect of the `Range` object is that the size of a range can be zero or more characters. Start and end points always position themselves between characters. When the start point and end point of a range are at the same location, the range acts like a text insertion pointer.

Working with ranges

To create a range object, use the `document.createRange()` method and assign the range object returned by this method to a variable that you can use to control the range:

```
var rng = document.createRange()
```

Note The first release of NN6 requires that a newly created range be more explicitly defined (as described in a moment) before scripts can access the range's properties. The W3C DOM, however, suggests that a new range has as its containing node the `document` node (which encompasses all content of the page, including the `<HTML>` tag set). Moreover, the start and end points are set initially to zero, meaning that the initial range is collapsed at the very beginning of the document.

With an active range stored in a variable, you can use many of the object's methods to adjust the start and end points of the range. If the range is to consist of all of the contents of a node, you have two convenience methods that do so from different points of view: `selectNode()` and `selectNodeContents()`. The sole parameter passed with both methods is a reference to the node whose contents you want to turn into a range. The difference between the two methods is how the offset properties of the range are calculated as a result (see the discussion about these methods later in the chapter for details). Another series of methods (`setStartBefore()`, `setStartAfter()`, `setEndBefore()`, and `setEndAfter()`)let you adjust each end point individually to a position relative to a node boundary. For the most granular adjustment of boundaries, the `setStart()` and `setEnd()` methods let you specify a reference node (where to start counting the offset) and the offset integer value.

If you need to select an insertion point (for example, to insert some content into an existing node), you can position either end point where you want it, and then invoke the `collapse()` method. A parameter determines whether the collapse should occur at the range's start or end point.

A suite of other methods lets your scripts work with the contents of a range directly. You can copy (`cloneContents()`), delete (`deleteContents()`, `extractContents()`), insert a node (`insertNode()`), and even surround a range's contents with a new parent node (`surroundContents()`). Several properties let your scripts examine information about the range, such as the offset values, the containers that hold the offset locations, whether the range is collapsed, and a reference to the next outermost node that contains both the start and end points.

Netscape adds a proprietary method to the `Range` object (which is actually a method of an object that is built around the `Range` object) called `createContextualFragment()`. This method lets scripts create a valid node (of type `DocumentFragment`) from arbitrary strings of HTML content — a feature that the W3C DOM does not (yet) offer. This method was devised at first as a substitute for what eventually became the NN6 `innerHTML` property.

Using the `Range` object can be a bit tedious, because it often requires a number of script statements to execute an action. Three basic steps are generally required to work with a `Range` object:

1. Create the text range.
2. Set the start and end points.
3. Act on the range.

As soon as you are comfortable with this object, you will find it provides a lot of flexibility in scripting interaction with body content. For ideas about applying the `Range` object in your scripts, see the examples that accompany the descriptions of individual properties and methods in the following sections.

Properties

`collapsed`

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `collapsed` property reports whether a range has its start and end points set to the same position in a document. If the value is `true`, then the range's start and end containers are the same and the offsets are also the same. You can use this property to verify that a range is in the form of an insertion pointer just prior to inserting a new node:

```
if (rng.collapsed) {
    rng.insertNode(someNewNodeReference)
}
```

On the CD-ROM

Example on the CD-ROM

Related Items: `endContainer`, `endOffset`, `startContainer`, `startOffset` properties; `Range.collapse()` method.

`commonAncestorContainer`

Value: Node object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `commonAncestorContainer` property returns a reference to the document tree node that both the start and end points have in common. It is not uncommon for a range's start point to be in one node and the end point to be in another. Yet a more encompassing node most likely contains both of those nodes, perhaps even the `document.body` node. The W3C DOM specification also calls the shared ancestor node the *root node* for the range (a term that may make more sense to you).

Example on the CD-ROM

Related Items: `endContainer`, `endOffset`, `startContainer`, `startOffset` properties; all "set" and "select" methods of the Range object.

endContainer
startContainer

Value: Node object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `endContainer` and `startContainer` properties return a reference to the document tree node that contains the range's end point and start point, respectively. Be aware that the object model calculates the container, and the container may not be the reference you used to set the start and end points of a range. For example, if you use the `selectNode()` method to set the start and end points of a range to encompass a particular node, the containers of the end points are most likely the next outermost nodes. Thus, if you want to expand a range to the start of the node that contains the current range's start point, you can use the value returned by the `startContainer` property as a parameter to the `setStartBefore()` method:

```
rng.setStartBefore(rng.startContainer)
```

Example on the CD-ROM

Related Items: `commonAncestor`, `endOffset`, `startOffset` properties; all "set" and "select" methods of the Range object.

endOffset
startOffset

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `endOffset` and `startOffset` properties return an integer count of the number of characters or nodes for the location of the range's end point and start point, respectively. These counts are relative to the node that acts as the container node for the position of the boundary (see `Range.endContainer` and `Range.startContainer` properties earlier in this chapter).

When a boundary is at the edge of a node (or perhaps "between" nodes is a better way to say it), the integer returned is the offset of nodes (zero-based) within the boundary's container. But when the boundary is in the middle of a text node, the integer returned is an index of the character position within the text node. The fact that each boundary has its own measuring system (nodes versus characters, relative to different containers) can get confusing if you're not careful, because conceivably the integer returned for an end point could be smaller than that for the start point. Consider the following nested elements:

```
<P>This paragraph has an <EM>emphasized</EM> segment.</P>
```

The next script statements set the start of the range to a character within the first text node and the end of the range to the end of the EM node:

```
var rng = document.createRange()
rng.setStart(document.getElementById("myP").firstChild, 19)
rng.setEndAfter(document.getElementById("myEM"))
```

Using bold face to illustrate the body text that is now part of the range and the pipe (|) character to designate the boundaries as far as the nodes are concerned, here is the result of the above script execution:

```
<P ID="myP">This paragraph has |an <EM ID="myEM">emphasized</EM>| segment.</P>
```

Because the start of the range is in a text node (the first child of the P element), the range's `startOffset` value is 19, which is the zero-based character position of the "a" of the word "an." The end point, however, is at the end of the EM element. The system recognizes this point as a node boundary, and thus counts the `endOffset` value within the context of the end container: the P element. The `endOffset` value is 2 (the P element's text node is node index 0; the EM element is node index 1; and the position of the end point is at the start of the P element's final text node, at index 2).

For the `endOffset` and `startOffset` values to be of any practical use to a script, you must also use the `endContainer` and `startContainer` properties to read the context for the offset integer values.

On the CD-ROM

Example on the CD-ROM

Related Items: `endContainer`, `startContainer` properties; all "set" and "select" methods of the `Range` object.

Methods

cloneContents()
cloneRange()

Returns: `DocumentFragment` node reference; Range object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `cloneContents()` method (not implemented in NN6.0, but expected in a future release) takes a snapshot copy of the contents of a `Range` object and returns a reference to that copy. The copy is stored in the browser's memory, but is not part of the document tree. The `cloneRange()` method (available in NN6.0) performs the same action on an entire range and stores the range copy in the browser's memory. A range's contents can consist of portions of multiple nodes and may not be surrounded by an element node; that's why its data is of the type `DocumentFragment` (one of the W3C DOM's node types). Because a `DocumentFragment` node is a valid node, it can be used with other document tree methods where nodes are required as parameters. Therefore, you can clone a text range to insert a copy elsewhere in the document.

In contrast, the `cloneRange()` method deals with range objects. While you are always free to work with the contents of a range object, the `cloneRange()` method returns a reference to a range object, which acts as a kind of wrapper to the contents (just as it does when the range is holding content in the main document). You can use the `cloneRange()` method to obtain a copy of one range to compare the end points of another range (via the `Range.compareBoundaryPoints()` method).

On the CD-ROM

Example on the CD-ROM

Related Items: `compareBoundaryPoints()`, `extractContents()` methods.

collapse([*startBoolean*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Use the `collapse()` method to shrink a range from its current size down to a single insertion point between characters. Collapsing a range becomes more important than you may think at first, especially in a function that is traversing the body or large chunk of text. For example, in a typical looping word-counting script, you create a text range that encompasses the body fully. To begin counting words, you can first collapse the range to the insertion point at the very beginning of the range. Next, use the `expand()` method to set the range to the first word of text (and increment the counter if the `expand()` method returns `true`). At that point, the text range extends around the first word. You want the range to collapse at the end of the current range so that the search for the next word starts after the current one. Use `collapse()` once more, but this time with a twist of parameters.

The optional parameter of the `collapse()` method is a Boolean value that directs the range to collapse itself either at the start or end of the current range. The default behavior is the equivalent of a value of `true`, which means that unless otherwise directed, a `collapse()` method shifts the text range to the point in front of the current range. This method works great at the start of a word-counting script, because you want the text range to collapse to the start of the text. But for subsequent movements through the range, you want to collapse the range so that it is after the current range. Thus, you include a `false` parameter to the `collapse()` method.

On the CD-ROM

Example on the CD-ROM

Related Items: `Range.setEnd()`, `Range.setStart()` methods.

compareBoundaryPoints(*typeInteger*, *sourceRangeRef*)

Returns: Integer (`-1`, `0`, or `1`).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Generating multiple range objects and assigning them to different variables is not a problem. You can then use the `compareBoundaryPoints()` method to compare the relative positions of start and end points of both ranges. One range is the object you use to invoke the `compareBoundaryPoints()` method, and the other range is the second parameter of the method. The order in which you reference the two ranges influences the results, based on the value assigned to the first parameter.

Values for the first parameter can be one of four constant values that are properties of the static `Range` object: `Range.START_TO_START`, `Range.START_TO_END`, `Range.END_TO_START`, and `Range.END_TO_END`. What these values specify is which point of the current range is compared with which point of the range passed as the second parameter. For example, consider the following body text that has two text ranges defined within it:

It was the **best of *times***.

The first text range (assigned in our discussion here to variable `rng1`) is shown in boldface, while the second text range (`rng2`) is shown in bold-italic. In other words, `rng2` is nested inside `rng1`. We can compare the position of the start of `rng1` against the position of the start of `rng2` by using the `Range.START_TO_START` value as the first parameter of the `compareBoundaryPoints()` method:

```
var result = rng1.compareBoundaryPoints(Range.START_TO_START, rng2)
```

The value returned from the `compareBoundaryPoints()` method is an integer of one of three values. If the positions of both points under test are the same, then the value returned is `0`. If the start point of the (so-called source) range is before the range on which you invoke the method, the value returned is `-1`; in the opposite positions in the code, the return value is `1`. Therefore, from the example above, because the start of `rng1` is before the start of `rng2`, the method returns `-1`. If you change the statement to invoke the method on `rng2`, as in

```
var result = rng2.compareBoundaryPoints(Range.START_TO_START, rng1)
```

the result is `1`.

Note

In the first release of NN6, the returned values of `1` and `-1` are the opposite of what they should be. This is to be corrected in a subsequent release.

In practice, this method is helpful in knowing if two ranges are the same, if one of the boundary points of both ranges is the same, or if one range starts where the other ends.

On the CD-ROM

Example (with Listing 19-4) on the CD-ROM

Related Items: None.

createContextualFragment("*text*")

Returns: W3C DOM `DocumentFragment` Node.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `createContextualFragment()` method is a method of the NN6 `Range` object (a proprietary extension of the W3C DOM `Range` object). This method provides a way, within the context of the W3C DOM Level 2 node hierarchy to create a string of HTML text (with or without HTML tags, as needed) for insertion or appendage to existing node trees. During the development of the NN6 browser, this method filled a gap that was eventually filled by Netscape's adoption of the Microsoft proprietary `innerHTML` property. The method obviates the need for tediously assembling a complex HTML element via a long series of `document.createElement()` and `document.createTextNode()` methods for each segment, plus the assembly of the node tree prior to inserting it into the actual visible document. The existence of the `innerHTML` property of all `element` objects, however, reduces the need for the `createContextualFragment()` method, while allowing more code to be shared across browser brands.

The parameter to the `createContextualFragment()` method is any text, including HTML tags. To invoke the method, however, you need to have an existing range object available. Therefore, the sequence used to generate a document fragment node is

```
var rng = document.createRange()
rng.selectNode(document.body) // any node will do
var fragment = rng.createContextualFragment("<H1>Howdy</H1>")
```

As a document fragment, the node is not part of the document node tree until you use the fragment as a parameter to one of the tree modification methods, such as `Node.insertBefore()` or `Node.appendChild()`.

On the CD-ROM

Example on the CD-ROM

Related Items: Node object (Chapter 15).

deleteContents()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `deleteContents()` method removes all contents of the current range from the document tree. After deletion, the range collapses to an insertion point where any surrounding content (if any) cinches up to its neighbors.

Some alignment of a range's boundaries forces the browser to make decisions about how element boundaries inside the range are treated after the deletion. An easy deletion is one for which the range boundaries are symmetrical. For example, consider the following HTML with a range highlighted in bold:

```
<P>One paragraph with an <EM>emphasis</EM> inside.</P>
```

After you delete the contents of this range, the text node inside the EM element disappears, but the EM element remains in the document tree (with no child nodes). Similarly, if the range is defined as being the entire second child node of the P element, as follows

```
<P>One paragraph with an <EM>emphasis</EM> inside.</P>
```

then deleting the range contents removes both the text node and the EM element node, leaving the P element with a single, unbroken text node as a child (although in the previous case, an extra space would be between the words "an" and "inside" because the EM element does not encompass a space on either side).

When range boundaries are not symmetrical, the browser does its best to maintain document tree integrity after the deletion. Consider the following HTML and range:

```
<P>One paragraph with an <EM>emphasis</EM> inside.</P>
```

After deleting this range's contents, the document tree for this segment looks like the following:

```
<P>One paragraph <EM>phasis</EM> inside.</P>
```

The range collapses to an insertion point just before the <EM> tag. But notice that the EM element persisted to take care of the text still under its control. Many other combinations of range boundaries and nodes are possible, so be sure that you check out the results of a contents deletion for asymmetrical boundaries before applying the deletion.

Example on the CD-ROM

Related Items: Range.

detach()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The detach() method instructs the browser to release the current range object from the object model. In the process, the range object is nulled out to the extent that an attempt to access the object results in a script error. You can still assign a new range to the same variable if you like. You are not required to detach a range when you're finished with it, and the browser resources employed by a range are not that large. But it is good practice to "clean up after yourself," especially when a script repetitively creates and manages a series of new ranges.

Related Items: document.createRange() method.

extractContents()

Returns: DocumentFragment node reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The extractContents() method (not implemented in the first release of NN6) deletes the contents of the range and returns a reference to the document fragment node that is held in the browser memory, but which is no longer part of the document tree. A range's contents can consist of portions of multiple nodes and may not be surrounded by an element node; that's why its data is of the type

`DocumentFragment` (one of the W3C DOM's node types). Because a `DocumentFragment` node is a valid node, it can be used with other document tree methods where nodes are required as parameters. Therefore, you can extract a text range from one part of a document to insert elsewhere in the document.

On the CD-ROM

Example on the CD-ROM

Related Items: `cloneContents()`, `deleteContents()` methods.

insertNode(*nodeReference*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `insertNode()` method (not implemented in the first release of NN6) inserts a node at the start point of the current range. The node being inserted may be an element or text fragment node, and its source can be any valid node creation mechanism, such the `document.createTextNode()` method or any node extraction method.

On the CD-ROM

Example (with Listing 19-5) on the CD-ROM

Related Items: None.

isValidFragment("*HTMLText*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `isValidFragment()` method belongs to the Netscape-specific version of the W3C DOM `Range` object. The method validates text as to whether it can be successfully converted to a document fragment node via Netscape's other proprietary `Range` method, `createContextualFragment()`. Knowing that this is *not* an HTML or XML validator is important. Ideally, you pass the text through the `isValidFragment()` method prior to creating the fragment, as in the following:

```
var rng = document.createRange()
rng.selectNode(document.body)
```

```
var newHTML = "<H1>Howdy</H1>"
if (rng.isValidFragment(newHTML)) {
    var newFragment = rng.createContextualFragment(newHTML)
}
```

See the description of the `Range.createContextualFragment()` method earlier in this chapter for the application of a document fragment node in NN6.

On the CD-ROM

Example on the CD-ROM

Related Items: `Range.createContextualFragment()` method.

selectNode(*nodeReference*)
selectNodeContents(*nodeReference*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `selectNode()` and `selectNodeContents()` methods are convenience methods for setting both end points of a range to surround a node or a node's contents. The kind of node you supply as the parameter to either method (text node or element node) has a bearing on the range's container node types and units of measure for each (see the container- and offset-related properties of the Range object earlier in this chapter).

Starting with the `selectNode()` method, if you specify an element node as the one to select, the start and end container node of the new range is the next outermost element node; offset values count nodes within that parent element. If you specify a text node to be selected, the container node for both ends is the parent element of that text node; offset values count the nodes within that parent.

With the `selectNodeContents()` method, the start and end container nodes are the very same element specified as the parameter; offset values count the nodes within that element. If you specify a text node's contents to be selected, the text node is the start and end parent, but the range is collapsed at the beginning of the text.

By and large, you specify element nodes as the parameter to either method, allowing you to set the range to either encompass the element (via `selectNode()`) or just the contents of the element (via `selectNodeContents()`).

On the CD-ROM

Example on the CD-ROM

Related Items: `setEnd()`, `setEndAfter()`, `setEndBefore()`, `setStart()`, `setStartAfter()`, `setStartBefore()` methods.

setEnd(*nodeReference*, *offset*)
setStart(*nodeReference*, *offset*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

You can adjust the start and end points of a text range independently via the `setStart()` and `setEnd()` methods. While not as convenient as the `selectNode()` or `selectNodeContents()` methods, these two methods give you the ultimate in granularity over precise positioning of a range boundary.

The first parameter to both methods is a reference to a node. This reference can be an element or text node, but your choice here also influences the kind of measure applied to the integer offset value supplied as the second parameter. When the first parameter is an element node, the offset counts are in increments of child nodes inside the specified element node. But if the first parameter is a text node, the offset counts are in increments of characters within the text node.

When you adjust the start and end points of a range with these methods, you have no restrictions to the symmetry of your boundaries. One boundary can be defined relative to a text node, while the other relative to an element node — or vice versa.

To set the end point of a range to the last node or character within a text node (depending on the unit of measure for the *`offset`* parameter), you can use the `length` property of the units being measured. For example, to set the end point to the end of the last node within an element (perhaps there are multiple nested elements and text nodes within that outer element), you can use the first parameter reference to help you get there:

```
rng.setEnd(document.getElementById("myP"),
document.getElementById("myP").childNodes.length)
```

These kinds of expressions get lengthy, so you may want to make a shortcut to the reference to simplify the values of the parameters, as shown in this version that sets the end point to after the last character of the last text node of a P element:

```
var nodeRef = document.getElementById("myP").lastChild
rng.setEnd(nodeRef, nodeRef.nodeValue.length)
```

In both previous examples with the `length` properties, the values of those properties are always pointing to the node or character position after the final object because the index values for those objects' counts are zero-based. Also bear in mind that if you want to set a range end point at the edge of a node, you have four other methods to choose from (`setEndAfter()`, `setEndBefore()`, `setStartAfter()`, `setStartBefore()`). The `setEnd()` and `setStart()` methods are best used when an end point needs to be set at a location other than at a node boundary.

On the CD-ROM

Example on the CD-ROM

Related Items: `selectNode()`, `selectNodeContents()`, `setEndAfter()`, `setEndBefore()`, `setStartAfter()`, `setStartBefore()` methods.

setEndAfter(*nodeReference*)
setEndBefore(*nodeReference*)
setStartAfter(*nodeReference*)
setStartBefore(*nodeReference*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

You can adjust the start and end points of a text range relative to existing node boundaries via your choice of these four methods. The "before" and "after" designations are used to specify which side of the existing node boundary the range should have for its boundary. For example, using `setStartBefore()` and `setEndAfter()` with the same element node as a parameter is the equivalent of the `selectNode()` method on that element. You may also specify a text node as the parameter to any of these methods. But because these methods work with node boundaries, the offset values are always defined in terms of node counts, rather than character counts. At the same time, however, the boundaries do not need to be symmetrical, so that one boundary can be inside one node and the other boundary inside another node.

On the CD-ROM

Example on the CD-ROM

Related Items: `selectNode()`, `selectNodeContents()`, `setEnd()`, `setStart()` methods.

surroundContents(*nodeReference*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `surroundContents()` method (not implemented in the first release of NN6) surrounds the current range with a new parent element. Pass the new parent element as a parameter to the method. No document tree nodes or elements are removed or replaced in the process, but the current range becomes a child node of the new node; if the range coincides with an existing node, then the relationship between that node and its original parent becomes that of grandchild and grandparent. An application of this method may be to surround user-selected text with a SPAN element whose class renders the content with a special font style or other display characteristic based on a style sheet selector for that class name.

When the element node being applied as the new parent has child nodes itself, those nodes are discarded before the element is applied to its new location. Therefore, for the most predictable results, using content-free element nodes as the parameter to the `surroundContents()` method is best.

On the CD-ROM

Example (with Listing 19-6) on the CD-ROM

Related Items: `Range.insertNode()` method.

toString()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Use the `toString()` method to retrieve a copy of the body text that is contained by the current text range. The text returned from this method is ignorant of any HTML tags or node boundaries that exist in the document tree. You also use this method (eventually) to get the text of a user selection, after it has been converted to a text range (as soon as NN6 implements the planned feature).

On the CD-ROM

Example on the CD-ROM

Related Items: `selection.getRangeAt()`, `Range.extractContents()` methods.

selection Object

Properties	*Methods*	*Event Handlers*
`type`	`clear()`	
	`createRange()`	
	`empty()`	

Syntax

Accessing `selection` object properties or methods:

```
(IE4+)     [window.]document.selection.property | method()
```

About this object

In some ways, the short list of properties and methods for the selection object is misleading. The items shown in the list belong to the IE4+ `selection` object. NN6 implements a `selection` object (not a part of the W3C DOM), but the first release of the browser does not provide a way to create such an object. Opening remarks below provide a preview of how the NN6 `selection` object will work whenever it is implemented. Details about properties and methods are not provided at this time.

The IE version

The IE4+ `selection` object is a property of the `document` object, providing scripted access to any body text or text in a form text control that is selected either by the user or by script. A `selection` object of one character or more is always highlighted on the page, and only one `selection` object can be active at any given instant.

Take advantage of the `selection` object when your page invites a user to select text for some operation that utilizes the selected text. The best event to use for working with a selection is the `onMouseUp` event handler. This event fires on every release of the mouse, and your script can investigate the `document.selection` object to see if any text has been selected (using the selection's `type` property). Turn a selection into a `TextRange` object via the `createRange()` method. You can then use the `text` property of the text range to access the actual selected characters. This sequence may seem like a long way to go for the text, perhaps, but the IE `selection` object provides no direct property for reading or writing the selected text.

If you intend to perform some action on a selection, you may not be able to trigger that action by way of a button or link. In some browser versions and operating systems, clicking one of these elements automatically deselects the body selection.

The NN version

Navigator 4 provides the `document.getSelection()` method to let scripts look at the selected body text, but you have no `selection` object per se for that browser. The NN6 `selection` object intends to improve the situation.

The `document.getSelection()` is deprecated in NN6 in favor of the roundabout way of getting a copy of a selection similar to the IE route described previously: Make a range out of the selection and get the text of the range. To obtain the `selection` object representing the current selection, use the `window.getSelection()` method (as soon as the method is implemented in NN6). One important difference between the IE and NN selections is that the NN6 `selection` object works only on body text, and not on selections inside text-oriented form controls.

An NN6 `selection` object has relationships with the document's node tree in that the object defines itself by the nodes (and offsets within those nodes) that encase the start and end points of a selection. When a user drags a selection, the node in which the selection starts is called the *anchor* node; the node holding the text at the point of the selection release is called the *focus* node; for double- or triple-clicked selections, the direction between anchor and focus nodes is in the direction of the language script (for example, left-to-right in Latin-based script families). In many ways, an NN6+ `selection` object behaves just as the W3C DOM `Range` object, complete with methods to collapse and extend the selection. Unlike a range, however, the text encompassed by a `selection` object is highlighted on the page. If your scripts need to work with the nodes inside a selection, the `getRangeAt()` method of the `selection` object returns a range object whose boundary points coincide with the selection's boundary points.

Properties

type

Value: String Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `type` property returns `Text` whenever a selection exists on the page. Otherwise the property returns `None`. A script can use this information to determine if a selection is made on the page:

```
if (document.selection.type == "Text") {
    // process selection
    ...
}
```

Microsoft indicates that this property can sometimes return `Control`, but that terminology is associated with an edit mode outside the scope of this book.

On the CD-ROM

Example (with Listing 19-7) on the CD-ROM

Related Items: `TextRange.select()` method.

Methods

clear()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Use the `clear()` method to delete the current selection from the document. To the user, the `clear()` method has the same effect as setting the `TextRange.text` property to an empty string. The difference is that you can use the `clear()` method without having to generate a text range for the selection. After you delete a selection, the `selection.type` property returns `None`.

On the CD-ROM

Example on the CD-ROM

Related Items: `selection.empty()` method.

createRange()

Returns: `TextRange` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

To generate a text range for a user selection in IE, invoke the `createRange()` method of the `selection` object. I'm not sure why the method for the `selection` object is called `createRange()` while text ranges for other valid objects are created with a `createTextRange()` method. The result of both methods is a full-fledged `TextRange` object.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange` object.

empty()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `empty()` method deselects the current IE selection. After deselection, the `selection.type` property returns `None`. The action of the `empty()` method is the same as the `UnSelect` command invoked via the `execCommand()` method for a document. If the selection was made from a `TextRange` object (via the `TextRange.select()` method), the `empty()` method affects only the visible selection and not the text range.

Example on the CD-ROM

Related Items: `selection.clear()` method.

Text and TextNode Objects

Properties	*Methods*	*Event Handlers*
attributes†	appendChild()†	
childNodes†	appendData()	
data	cloneNode()†	
firstChild†	deleteData()	
lastChild†	hasChildNodes()†	
length†	insertBefore()†	
localName†	insertData()	
namespaceURI†	normalize()†	
nextSibling†	removeChild()†	
nodeName†	replaceChild()†	
nodeType†	replaceData()	
nodeValue†	splitText()	
ownerDocument†	substringData()	
parentNode†		
prefix†		
previousSibling†		

†See Chapter 15

Syntax

Accessing `Text` and `TextNode` object properties or methods:

```
(IE5+/NN6+)  [window.]document.getElementById("id").textNodeRef.property |
             method()
```

About this object

Discussing both the `Text` object of the W3C DOM and NN6 in the same breath as the IE5+ `TextNode` object is a little tricky. Conceptually, they are the same kind of object in that they are the document tree objects — text nodes — that contain an HTML element's text (see Chapter 14 for details on the role of the text node in the `document` object hierarchy). Generating a new text node by script is achieved the same way in both object models: `document.createTextNode()`. What makes the discussion of the two objects tricky is that while the W3C DOM version comes from a strictly object-oriented specification (in which a text node is an instance of a `CharacterData` object, which, in turn is an instance of the generic `Node` object), the IE object model is not quite as complete. For example, while the W3C DOM `Text` object inherits all of the properties and methods of the `CharacterData` and `Node` definitions, the IE `TextNode` object exposes only those properties and method that Microsoft deems appropriate.

No discrepancy in terminology gets in the way as to what to call these objects because their object names never become part of the script. Instead script statements always refer to text nodes by other means, such as through a child node-related property of an element object or as a variable that receives the result of the `document.createTextNode()` method.

While both objects share a number of properties and one method, the W3C DOM `Text` object contains a few methods that have "data" in their names. These properties and methods are inherited from the `CharacterData` object in the DOM specification. They are discussed as a group in the section about object methods in this chapter. In all cases, check the browser version support for each property and method described here.

Properties

data

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `data` property contains the string comprising the text node. Its value is identical to the `nodeValue` property of a text node. See the description of the `nodeValue` property in Chapter 15.

On the CD-ROM

Example on the CD-ROM

Related Items: `nodeValue` property of all element objects (Chapter 15).

Methods

appendData("*text*")
deleteData(*offset*, *count*)
insertData(*offset*, "*text*")
replaceData(*offset*, *count*, "*text*")
substringData(*offset*, *count*)

Returns: See text.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

These five methods of the W3C DOM `Text` object provide scripted manipulation of the text inside a text node. Methods that modify the node's data automatically change the values of both the `data` and `nodeValue` properties.

The purposes of these methods are obvious for the most part. Any method that requires an *offset* parameter uses this integer value to indicate where in the existing text node the deletion, insertion, or replacement starts. Offsets are zero-based, meaning that to indicate the action should take place starting with the first character, specify a zero for the parameter. A *count* parameter is another integer, but one that indicates how many characters are to be included. For example, consider a text node that contains the following data:

```
abcdefgh
```

This node could be a node of an element on the page or a node that has been created and assigned to a variable but not yet inserted into the page. To delete the first three characters of that text node, the statement is

```
textNodeReference.deleteData(0,3)
```

This leaves the text node content as

```
defgh
```

As for the `replaceData()` method, the length of the text being put in place of the original chunk of text need not match the *count* parameter. The *count* parameter, in concert with the *offset* parameter, defines what text is to be removed and replaced by the new text.

The `substringData()` method is similar to the JavaScript core language `String.substr()` method in that both require parameters indicating the offset within the string to start reading and for how many characters. You get the same result with the `substringData()` method of a text node as you do from a `nodeValue.substr()` method when both are invoked from a valid text node object.

Of all five methods discussed here, only `substringData()` returns a value: a string.

On the CD-ROM

Example (with Listing 19-8) on the CD-ROM

Related Items: `appendChild()`, `removeChild()`, `replaceChild()` methods of element objects (Chapter 15).

splitText(*offset*)

Returns: `Text` or `TextNode` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `splitText()` method performs multiple actions with one blow. The *`offset`* parameter is an integer indicating the zero-based index position within the text node at which the node is to divide into two nodes. After you invoke the method on the current text node, the current node consists of the text from the beginning of the node up to the offset position. The method returns a reference to the text node whose data starts with the character after the dividing point and extends to the end of the original node. Users won't notice any change in the rendered text: This method influences only the text node structure of the document. Using this method means, for example, that an HTML element that starts with only one text node will have two after the `splitText()` method is invoked. The opposite action (combining contiguous text node objects into a single node) is performed by the NN6 `normalize()` method (Chapter 15).

On the CD-ROM

Example on the CD-ROM

Related Items: `normalize()` method (Chapter 15).

TextRange Object

Properties	*Methods*	*Event Handlers*
`boundingHeight`	`collapse()`	
`boundingLeft`	`compareEndPoints()`	
`boundingTop`	`duplicate()`	
`boundingWidth`	`execCommand()`	
`htmlText`	`expand()`	

Properties	*Methods*	*Event Handlers*
`offsetLeft`†	`findText()`	
`offsetTop`†	`getBookmark()`	
`text`	`getBoundingClientRect()`†	
	`getClientRects()`†	
	`inRange()`	
	`isEqual()`	
	`move()`	
	`moveEnd()`	
	`moveStart()`	
	`moveToBookmark()`	
	`moveToElementText()`	
	`moveToPoint()`	
	`parentElement()`	
	`pasteHTML()`	
	`queryCommandEnabled()`	
	`queryCommandIndeterm()`	
	`queryCommandState()`	
	`queryCommandSupported()`	
	`queryCommandText()`	
	`queryCommandValue()`	
	`scrollIntoView()`†	
	`select()`	
	`setEndPoint()`	

†See Chapter 15

Syntax

Creating a `TextRange` object:

```
var rangeRef = document.body.createTextRange()
var rangeRef = buttonControlRef.createTextRange()
var rangeRef = textControlRef.createTextRange()
var rangeRef = document.selection.createRange()
```

Accessing `TextRange` object properties or methods:

```
(IE4+)        rangeRef.property | method([parameters])
```

About this object

Unlike most of the objects covered in Part III of the book, the IE4+ `TextRange` object is not tied to a specific HTML element. The `TextRange` object is, instead, an abstract object that represents text content anywhere on the page (including text content of a text-oriented form control) between a start point and an end point (collectively, the *boundaries* of the range). The user may not necessarily know that a `TextRange` object exists, because no requirement exists to force a `TextRange` object to physically select text on the page (although the `TextRange` object can be used to assist scripts in automating the selection of text; or a script may turn a user selection into a `TextRange` object for further processing).

The purpose of the `TextRange` object is to give scripts the power to examine, modify, remove, replace, and insert content on the page. Start and end points of an IE `TextRange` object are defined exclusively in terms of character positions within the element that is used to create the range (usually the BODY element, but also button- and text-related form control elements). Character positions of body text do not take into account source code characters that may define HTML elements. This factor is what distinguishes a `TextRange`'s behavior from, for instance, the various properties and methods of HTML elements that let you modify or copy elements and their text (for example, `innerText` and `outerText` properties). A `TextRange` object's start point can be in one element, and its end point in another. For example, consider the following HTML:

```
<P>And now to introduce our <EM>very special</EM> guest:</P>
```

If the text shown in boldface indicates the content of a `TextRange` object, you can see that the range crosses element boundaries in a way that makes HTML element object properties difficult to use for replacing that range with some other text. Challenges still remain in this example, however. Simply replacing the text of the range with some other text forces your script (or the browser) to reconcile the issue of what to do about the nested EM element, because the `TextRange` object handles only its text. (Your word processing program must address the same kind of issue when you select a phrase that starts in italic but ends in normal font, and then you paste text into that selection.)

An important aspect of the `TextRange` object is that the size of the range can be zero or more characters. Start and end points always position themselves between characters. When the start point and end point of a range are at the same location, the range acts as a text insertion pointer. In fact, when the `TextRange` object represents text inside a text-related form control, the `select()` method of the `TextRange` object can be used to display the text insertion pointer where your script desires. Therefore, through the `TextRange` object you can script your forms to always display the text insertion pointer at the end of existing text in a text box or textarea when the control receives focus.

Working with text ranges

To create a `TextRange` object, use the `createTextRange()` method with the `document.body` object or any button- or text-related form control object. If you want to convert a block of selected text to a text range, use the special createRange() method of the document.selection object. Regardless of how you create it, the range encompasses the entire text of the object used to generate the range. In other words, the start point is at the very beginning of the text and the end point is at the very end. Note that when you create a TextRange object from the BODY element, text that is inside text-related form controls is not part of the text of the TextRange (just as text field content isn't selected if you select manually the entire text of the page).

After you create a TextRange object (assigned to a variable), the typical next steps involve some of the many methods associated with the object that help narrow the size of the range. Some methods (move(), moveEnd(), moveStart(), and sentEndPoint()) offer manual control over the intra-character position for the start and end points. Parameters of some of these methods understand concepts, such as words and sentences, so not every action entails tedious character counts. Another method, moveToElementText(), automatically adjusts the range to encompass a named element. The oft-used collapse() method brings the start and end points together at the beginning or end of the current range—helpful when a script must iterate through a range for tasks, such as word counting or search and replace. The expand() method can extend a collapsed range to encompass the whole word, whole sentence, or entire range surrounding the insertion point. Perhaps the most powerful method is findText(), which allows scripts to perform single or global search and replace operations on body text.

After the range encompasses the desired text, several other methods let scripts act on the selection. The types of operations include scrolling the page to make the text represented by the range visible to the user (scrollIntoView()) and selecting the text (select()) to provide visual feedback to the user that something is happening (or to set the insertion pointer at a location in a text form control). An entire library of additional commands are accessed through the execCommand() method for operations, such as copying text to the clipboard and a host of formatting commands that can be used in place of style sheet property changes. To swap text from the range with new text accumulated by your script, you can modify the text property of the range.

Using the TextRange object can be a bit tedious, because it often requires a number of script statements to execute an action. Three basic steps are generally required to work with a TextRange object:

1. Create the text range.
2. Set the start and end points.
3. Act on the range.

As soon as you are comfortable with this object, you will find it provides a lot of flexibility in scripting interaction with body content. For ideas about applying the TextRange object in your scripts, see the examples that accompany the following descriptions of individual properties and methods.

About browser compatibility

The TextRange object is available only for the Windows 9*x*/NT version of IE4 and IE5. MacOS versions through IE5 do not support the TextRange object.

The W3C DOM and NN6 implement a slightly different concept of text ranges in what they call the Range object. In many respects, the fundamental way of working with a Range object is the same as for a TextRange object: create, adjust start and end points, and act on the range. But the W3C version (like the W3C DOM itself) is more conscious of the node hierarchy of a document. Properties and methods of the W3C Range object reflect this node-centric point of view, so that most of the terminology for the Range object differs from that of the IE TextRange object. As of this writing, it is unknown if or when IE will implement the W3C Range object.

At the same time, the W3C Range object lacks a couple of methods that are quite useful with the IE TextRange object — notably findText() and select(). On the other hand, the Range object, as implemented in NN6, works on all OS platforms.

The bottom line question, then, is whether you can make range-related scripts work in both browsers. While the basic sequence of operations is the same for both objects, the scripting vocabulary is quite different. Table 19-1 presents a summary of the property and method behaviors that the two objects have in common and their respective vocabulary terms (sometimes the value of a property in one object is accessed via a method in the other object). Notice that the ways of moving individual end points are not listed in the table because the corresponding methods for each object (for example, moveStart() in TextRange versus setStart() in Range) use very different spatial paradigms.

Table 19-1 TextRange versus Range Common Denominators

TextRange Object	*Range Object*
text	toString()
collapse()	collapse()
compareEndPoints()	compareEndPoints()
duplicate()	clone()
moveToElementText()	selectContents()
parentElement()	commonParent

To blend text range actions for both object models into a single scripted page, you have to include script execution branches for each category of object model or create your own API to invoke library functions that perform the branching. On the IE side of things, too, you have to script around actions that can cause script errors when run on MacOS and other non-Windows versions of the browser.

Properties

boundingHeight
boundingLeft
boundingTop
boundingWidth

Value: Integer Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Every text range has physical dimension and location on the page, even if you cannot see the range reflected graphically with highlighting. Even a text insertion pointer (meaning a collapsed text range) has a rectangle whose height equals the line height of the body text in which the insertion point resides; its width, however, is zero.

The pixel dimensions of the rectangle of a text range can be retrieved via the `boundingHeight` and `boundingWidth` properties of the `TextRange` object. When a text range extends across multiple lines, the dimensions of the rectangle are equal to the smallest single rectangle that can contain the text (a concept identical to the bounding rectangle of inline body text, as described in the `TextRectangle` object later in this chapter). Therefore, even a range consisting of one character at the end of one line and another character at the beginning of the next, force the bounding rectangle to be as wide as the paragraph element.

A text range rectangle has a physical location on the page. The top-left position of the rectangle (with respect to the browser window edge) is reported by the `boundingTop` and `boundingLeft` properties. In practice, text ranges that are generated from selections can report very odd `boundingTop` values in IE4 when the page scrolls. Use the `offsetTop` and `offsetLeft` properties for more reliable results.

On the CD-ROM

Example (with Listing 19-9) on the CD-ROM

Related Items: `offsetLeft`, `offsetTop` properties of element objects (Chapter 15).

htmlText

Value: String Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `htmlText` property returns the HTML of the text contained by a text range. If a range's start and end points are at the very edges of an element's text, then the

HTML tag for that element becomes part of the htmlText property value. Also, if the range starts in one element and ends partway in another, the tags that influence the text of the end portion become part of the htmlText. This property is read-only, so you cannot use it to insert or replace HTML in the text range (see the pasteHTML() method and various insert commands associated with the execCommand() method in the following section).

On the CD-ROM Example on the CD-ROM

Related Items: text property.

text

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Use the text property to view or change the string of visible characters that comprise a text range. The browser makes some decisions for you if the range you are about to change has nested elements inside. By and large, the nested element (and any formatting that may be associated with it) is deleted, and the new text becomes part of the text of the container that houses the start point of the text range. By the same token, if the range starts in the middle of one element and ends in the parent element's text, the tag that governs the start point now wraps all of the new text.

On the CD-ROM Example on the CD-ROM

Related Items: htmlText property.

Methods

collapse([*startBoolean*])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Use the collapse() method to shrink a text range from its current size down to a single insertion point between characters. This method becomes more important than you may think at first, especially in a function that is traversing the body or large chunk of text. For example, in a typical looping word-counting script, you create a text range that encompasses the full body (or text in a TEXTAREA). When the range is created, its start point is at the very beginning of the text, and its end point is at the very end. To begin counting words, you can first collapse the range to the insertion point at the very beginning of the range. Next, use the `expand()` method to set the range to the first word of text (and increment the counter if the `expand()` method returns `true`). At that point, the text range extends around the first word. What you want is for the range to collapse at the end of the current range so that the search for the next word starts after the current one. Use `collapse()` once more, but this time with a twist of parameters.

The optional parameter of the `collapse()` method is a Boolean value that directs the range to collapse itself either at the start or end of the current range. The default behavior is the equivalent of a value of `true`, which means that unless otherwise directed, a `collapse()` method shifts the text range to the point in front of the current range. That works great as an early step in the word-counting example, because you want the text range to collapse to the start of the text before doing any counting. But for subsequent movements through the range, you want to collapse the range so that it is after the current range. Thus, you include a `false` parameter to the `collapse()` method.

On the CD-ROM

Example on the CD-ROM

Related Items: `Range.collapse()`, `TextRange.expand()` methods.

compareEndPoints("*type*", *rangeRef*)

Returns: Integer (`-1`, `0`, or `1`).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Generating multiple `TextRange` objects and assigning them to different variables is no problem. You can then use the `compareEndPoints()` method to compare the relative positions of start and end points of two ranges. One range is the object that you use to invoke the `compareEndPoints()` method, and the other range is the second parameter of the method. The order doesn't matter, because the first parameter of the method determines which points in each range you will be comparing.

Values for the first parameter can be one of four explicit strings: `StartToEnd`, `StartToStart`, `EndToStart`, and `EndToEnd`. What these values specify is which point of the current range is compared with which point of the range passed as the second parameter. For example, consider the following body text that has two text ranges defined within it:

```
It was the best of times.
```

The first text range (assigned in our discussion here to variable `rng1`) is shown in boldface, while the second text range (`rng2`) is shown in bold-italic. In other words, `rng2` is nested inside `rng1`. We can compare the position of the start of `rng1` against the position of the start of `rng2` by using the `StartToStart` parameter of the `compareEndPoints()` method:

```
var result = rng1.compareEndPoints("StartToStart", rng2)
```

The value returned from the `compareEndPoints()` method is an integer of one of three values. If the positions of both points under test are the same, then the value returned is `0`. If the first point is before the second, the value returned is `-1`; if the first point is after the second, the value is `1`. Therefore, from the example above, because the start of `rng1` is before the start of `rng2`, the method returns `-1`. If you changed the statement to invoke the method on `rng2`, as in

```
var result = rng2.compareEndPoints("StartToStart", rng1)
```

the result would be `1`.

In practice, this method is helpful in knowing if two ranges are the same, if one of the boundary points of both ranges is the same, or if one range starts where the other ends.

On the CD-ROM

Example (with Listing 19-10) on the CD-ROM

Related Items: `Range.compareEndPoints()` method.

duplicate()

Returns: `TextRange` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `duplicate()` method returns a `TextRange` object that is a snapshot copy of the current `TextRange` object. In a way, a non-intuitive relationship exists between the two objects. If you alter the `text` property of the copy without moving the start or end points of the original, then the original takes on the new text. But if you move the start or end points of the original, the `text` and `htmlText` of the original obviously change, while the copy retains its properties from the time of the duplication. Therefore, this method can be used to clone text from one part of the document to other parts.

On the CD-ROM

Example on the CD-ROM

Related Items: Range.clone(), TextRange.isEqual() methods.

execCommand("*commandName*"[, *UIFlag*[, *value*]])

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+ for Win32 operating systems lets scripts access a very large number of commands that act on insertion points, abstract text ranges, and selections that are made with the help of the TextRange object. Access to these commands is through the execCommand() method, which works with TextRange objects and the document object (see the document.execCommand() method discussion in Chapter 18 and list of document- and selection-related commands in Table 18-3).

The first, required parameter is the name of the command that you want to execute. Only a handful of these commands offer unique capabilities that aren't better accomplished within the IE object model and style sheet mechanism. Of particular importance is the command that lets you copy a text range into the Clipboard. Most of the rest of the commands modify styles or insert HTML tags at the position of a collapsed text range. These actions are better handled by other means, but they are included in Table 19-2 for the sake of completeness only (see Table 18-3 for additional commands).

Table 19-2 TextRange.execCommand() Commands

Command	*Parameter*	*Description*
Bold	None	Encloses the text range in a <B> tag pair
Copy	None	Copies the text range into the Clipboard
Cut	None	Copies the text range into the Clipboard and deletes it from the document or text control
Delete	None	Deletes the text range
InsertButton	ID String	Inserts a <BUTTON> tag at the insertion point, assigning the parameter value to the ID attribute
InsertFieldset	ID String	Inserts a <FIELDSET> tag at the insertion point, assigning the parameter value to the ID attribute
InsertHoritontalRule	ID String	Inserts an <HR> tag at the insertion point, assigning the parameter value to the ID attribute

Continued

Table 19-2 *(continued)*

Command	*Parameter*	*Description*
`InsertIFrame`	ID String	Inserts an `<IFRAME>` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputButton`	ID String	Inserts an `<INPUT TYPE="button">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertIntpuCheckbox`	ID String	Inserts an `<INPUT TYPE="checkbox">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputFileUpload`	ID String	Inserts an `<INPUT TYPE="FileUpload">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputHidden`	ID String	Inserts an `<INPUT TYPE="hidden">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputImage`	ID String	Inserts an `<INPUT TYPE="image">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputPassword`	ID String	Inserts an `<INPUT TYPE="password">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputRadio`	ID String	Inserts an `<INPUT TYPE="radio">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputReset`	ID String	Inserts an `<INPUT TYPE="reset">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertInputSubmit`	ID String	Inserts an `<INPUT TYPE="submit">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertIntputText`	ID String	Inserts an `<INPUT TYPE="text">` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertMarquee`	ID String	Inserts a `<MARQUEE>` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertOrderedList`	ID String	Inserts an `<OL>` tag at the insertion point, assigning the parameter value to the `ID` attribute
`InsertParagraph`	ID String	Inserts a `<P>` tag at the insertion point, assigning the parameter value to the `ID` attribute

Command	Parameter	Description
InsertSelectDropdown	ID String	Inserts a <SELECT TYPE="select-one"> tag at the insertion point, assigning the parameter value to the ID attribute
InsertSelectListbox	ID String	Inserts a <SELECT TYPE="select-multiple"> tag at the insertion point, assigning the parameter value to the ID attribute
InsertTextArea	ID String	Inserts an empty <TEXTAREA> tag at the insertion point, assigning the parameter value to the ID attribute
InsertUnroderedList	ID String	Inserts a <UL> tag at the insertion point, assigning the parameter value to the ID attribute
Italic	None	Encloses the text range in an <I> tag pair
OverWrite	Boolean	Sets the text input control mode to overwrite (true) or insert (false)
Paste	None	Pastes the current Clipboard contents into the insertion point or selection
PlayImage	None	Begins playing dynamic images if they are assigned to the DYNSRC attribute of the IMG element
Refresh	None	Reloads the current page
StopImage	None	Stops playing dynamic images if they are assigned to the DYNSRC attribute of the IMG element
Underline	None	Encloses the text range in a <U> tag pair

An optional second parameter is a Boolean flag to instruct the command to display any user interface artifacts that may be associated with the command. The default is false. For the third parameter, some commands require an attribute value for the command to work. For example, insert a new paragraph at an insertion point, you pass the identifier to be assigned to the ID attribute of the P element. The syntax is

```
myRange.execCommand("InsertParagraph", true, "myNewP")
```

The execCommand() method returns Boolean true if the command is successful; false if not successful. Some commands can return values (for example, finding out the font name of a selection), but these values are accessed through the queryCommandValue() method.

While the commands in Table 19-2 work on text ranges, even the commands that work on selections (Table 18-3) can frequently benefit from some preprocessing with a text range. Consider, for example, a function whose job it is to find every instance of a particular word in a document and set its background color to a yellow highlight. Such a function utilizes the powers of the findText() method of a text range to locate each instance. Then the `select()` method selects the text in preparation for applying the `BackColor` command. Here is a sample:

```
function hiliteIt(txt) {

    var rng = document.body.createTextRange()
    for (var i = 0; rng.findText(txt); i++) {
        rng.select()
        rng.execCommand("BackColor", "false", "yellow")
        rng.execCommand("Unselect")
        // prepare for next search
        rng.collapse(false)
    }
}
```

This example is a rare case that makes the `execCommand()` method way of modifying HTML content more efficient than trying to wrap some existing text inside a new tag. The downside is that you don't have control over the methodology used to assign a background color to a span of text (in this case, IE wraps the text in a `<FONT>` tag with a `STYLE` attribute set to `BACKGROUND-COLOR:yellow` — probably not the way you'd do it on your own).

On the CD-ROM

Example on the CD-ROM

Related Items: Several query command methods of the `TextRange` object.

expand("*unit*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The single `expand()` method can open any range — collapsed or not — to the next largest character, word, or sentence or to the entire original range (for example, encompassing the text of the BODY element if the range was generated by `document.body.createTextRange()`). The parameter is a string designating which unit to expand outward to: `character`, `word`, `sentence`, or `textedit`. If the operation is successful, the method returns `true`; otherwise it returns `false`.

When operating from an insertion point, the `expand()` method looks for the word or sentence that encloses the point. The routine is not very smart about sentences, however. If you have some text prior to a sentence that you want to expand to, but that text does not end in a period, the `expand()` routine expands outward until it can find either a period or the beginning of the range. Listing 15-14 demonstrates a workaround for this phenomenon. When expanding from an insertion point to a character, the method expands forward to the next character in language order. If the insertion point is at the end of the range, it cannot expand to the next characters, and the `expand()` method returns `false`.

It is not uncommon in an extensive script that needs to move the start and end points all over the initial range to perform several `collapse()` and `expand()` method operations from time to time. Expanding to the full range is a way to start some range manipulation with a clean slate, as if you just created the range.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.collapse()` method.

findText("*searchString*"[, *searchScope*, *flags*])

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

One of the most useful methods of the `TextRange` object is `findText()`, whose default behavior is to look through a text range starting at the range's start point up to the end of the range in search of a case-insensitive match for a search string. If an instance is found in the range, the start and end points of the range are cinched up to the found text and the method returns `true`; otherwise it returns `false`, and the start and end points do not move. Only the rendered text is searched and not any of the tags or attributes.

Optional parameters let you exert some additional control over the search process. You can restrict the distance from a collapsed range to be used for searching. The *`searchScope`* parameter is an integer value indicating the number of characters from the start point. The larger the number, the more text of the range is included in the search. Negative values force the search to operate backward from the current start point. If you want to search backward to the beginning of the range, but you don't know how far away the start of the range is, you can specify an arbitrarily huge number that would encompass the text.

The optional *`flags`* parameter lets you set whether the search is to be case-sensitive and/or to match whole words only. The parameter is a single integer value that uses bit-wise math to calculate the single value that accommodates one or both settings. The value for matching whole words is `2`; the value for matching case is `4`. If you want only one of those behaviors, then supply just the desired number. But for both behaviors, use the bit-wise XOR operator (the ^ operator) on the values to reach a value of `6`.

The most common applications of the `findText()` method include a search-and-replace action and format changes to every instance of a string within the range. This iterative process requires some extra management of the process. Because searching always starts with the range's current start point, advancing the start point to the end of the text found in the range is necessary. This advancing allows a successive application of `findText()` to look through the rest of the range for another match. And because `findText()` ignores the arbitrary end point of the current range and continues to the end of the initial range, you can use the `collapse(false)` method to force the starting point to the end of the range that contains the first match.

A repetitive search can be accomplished by a `while` or `for` repeat loop. The Boolean returned value of the `findText()` method can act as the condition for continuing the loop. If the number of times the search succeeds is not essential to your script, a `while` loop works nicely:

```
while (rng.findText(searchString)) {
    ...
    rng.collapse(false)
}
```

Or you can use a `for` loop counter to maintain a count of successes, such as a counter of how many times a string appears in the body:

```
for (var i = 0; rng.findText(searchString); i++) {
    ...
    rng.collapse(false)
}
```

Some of the operations you want to perform on a range (such as many of the commands invoked by the `execCommand()` method) require that a selection exists for the command to work. Be prepared to use the `select()` method on the range after the `findText()` method locates a matching range of text.

On the CD-ROM

Example (with Listing 19-11) on the CD-ROM

Related Items: `TextRange.select()` method.

getBookmark()

Returns: Bookmark String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In the context of a `TextRange` object, a bookmark is not to be confused with the kinds of bookmarks you add to a browser list of favorite Web sites. Instead, a bookmark is a string that represents a definition of a text range, including its location in a document, its text, and so on. Viewing the string is futile, because it contains string versions of binary data, so the string means nothing in plain language. But a bookmark allows your scripts to save the current state of a text range so that it may be restored at a later time. The `getBookmark()` method returns the string representation of a snapshot of the current text range. Some other script statement can adjust the TextRange object to the exact specifications of the snapshot with the moveToBookmark() method (described later in this chapter).

On the CD-ROM

Example on the CD-ROM

Related Items: TextRange.moveToBookmark() method.

inRange(*otherRangeRef*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

You can compare the physical stretches of text contained by two different text ranges via the inRange() method. Typically, you invoke the method on the larger of two ranges and pass a reference to the smaller range as the sole parameter to the method. If the range passed as a parameter is either contained by or equal to the text range that invokes the method, then the method returns true; otherwise the method returns false.

On the CD-ROM

Example on the CD-ROM

Related Items: TextRange.isEqual() method.

isEqual(*otherRangeRef*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

If your script has references to two independently adjusted TextRange objects, you can use the isEqual() method to test whether the two objects are identical. This method tests for a very literal equality, requiring that the text of the two ranges be character-for-character and position-for-position equal in the context of the original ranges (for example, body or text control content). To see if one range is contained by another, use the inRange() method instead.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.inRange()` method.

move("*unit*"[, *count*])

Returns: Integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `move()` method performs two operations. First, the method collapses the current text range to become an insertion point at the location of the previous end point. Next, it moves that insertion point to a position forward or backward any number of character, word, or sentence units. The first parameter is a string specifying the desired unit (`character`, `word`, `sentence`, or `textedit`). A value of `textedit` moves the pointer to the beginning or end of the entire initial text range. If you omit the second parameter, the default value is `1`. Otherwise you can specify an integer indicating the number of units the collapsed range should be moved ahead (positive integer) or backward (negative). The method returns an integer revealing the exact number of units the pointer is able to move —if you specify more units than are available, the returned value lets you know how far it can go.

Bear in mind that the range is still collapsed after the `move()` method executes. Expanding the range around desired text is the job of other methods.

You can also use the `move()` method in concert with the `select()` method to position the flashing text insertion pointer within a text box or textarea. Thus, you can script a text field, upon receiving focus or the page loading, to have the text pointer waiting for the user at the end of existing text. A generic function for such an action is shown in the following:

```
function setCursorToEnd(elem) {
    if (elem) {
        if (elem.type && (elem.type == "text" || elem.type == "textarea")) {
            var rng = elem.createTextRange()
            rng.move("textedit")
            rng.select()
        }
    }
}
```

You can then invoke this method from a text field's `onFocus` event handler:

```
<INPUT TYPE="text" ... onFocus="setCursorToEnd(this)">
```

The function previously shown includes a couple of layers of error checking, such as making sure that the function is invoked with a valid object as a parameter and that the object has a `type` property whose value is one capable of having a text range made for its content.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.moveEnd()`, `TextRange.moveStart()` methods.

moveEnd("*unit*"[, *count*])
moveStart("*unit*"[, *count*])

Returns: Integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `moveEnd()` and `moveStart()` methods are similar to the `move()` method, but they each act only on the end and starting points of the current range, respectively. In other words, the range does not collapse before the point is moved. These methods allow you to expand or shrink a range by a specific number of units by moving only one of the range's boundaries.

The first parameter is a string specifying the desired unit (`character`, `word`, `sentence`, or `textedit`). A value of `textedit` moves the pointer to the beginning or end of the entire initial text range. Therefore, if you want the end point of the current range to zip to the end of the body (or text form control), use `moveEnd("textedit")`. If you omit the second parameter, the default value is `1`. Otherwise you can specify an integer indicating the number of units the collapsed range is to move ahead (positive integer) or backward (negative). Moving either point beyond the location of the other forces the range to collapse and move to the location specified by the method. The method returns an integer revealing the exact number of units the pointer is able to move — if you specify more units than are available, the returned value lets you know how far it can go.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.move()` method.

moveToBookmark("*bookmarkString*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

If a snapshot of a text range specification has been preserved in a variable (with the help of the `getBookmark()` method), the `moveToBookmark()` method uses that bookmark string as its parameter to set the text range to exactly the way it appeared when the bookmark was originally obtained. If the method is successful, it returns a value of `true`, and the text range is set to the same string of text as originally preserved via `getBookmark()`. It is possible that the state of the content of the text range has been altered to such an extent that resurrecting the original text range is not feasible. In that case, the method returns `false`.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.getBookmark()` method.

moveToElementText(*elemObjRef*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The fastest way to cinch up a text range to the boundaries of an HTML element on the page is to use the `moveToElementText()` method. Any valid reference to the HTML element object is accepted as the sole parameter — just don't try to use a string version of the object ID unless it is wrapped in the `document.getElementById()` method (IE5+). When the boundaries are moved to the element, the range's `htmlText` property contains the tags for the element.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.parentElement()` method.

moveToPoint(*x*, *y*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `moveToPoint()` method shrinks the current text range object to an insertion point and then moves it to a position in the current browser window or frame. You control the precise position via the *x* (horizontal) and *y* (vertical) pixel coordinates specified as parameters. The position is relative to the visible window, and not the document, which may have been scrolled to a different position. Invoking the `moveToPoint()` method is the scripted equivalent of the user clicking that spot in the window. Use the `expand()` method to flesh out the collapsed text range to encompass the surrounding character, word, or sentence.

Note

Using the `moveToPoint()` method on a text range defined for a text form control may cause a browser crash. The method appears safe with the `document.body` text ranges, even if the x,y position falls within the rectangle of a text control. Such a position, however, does not drop the text range into the form control or its content.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.move()`, `TextRange.moveStart()`, `TextRange.moveEnd()` methods.

parentElement()

Returns: Element object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `parentElement()` method returns a reference to the next outermost HTML element container that holds the text range boundaries. If the text range boundaries are at the boundaries of a single element, the `parentElement()` method returns that element's reference. But if the boundaries straddle elements, then the object returned by the method is the element that contains the text of the least-nested text portion. In contrast to the `expand()` and various move-related methods, which understand text constructs, such as words and sentences, the `parentElement()` method is concerned solely with element objects. Therefore, if a text range is collapsed to an insertion point in body text, you can expand it to encompass the HTML element by using the `parentElement()` method as a parameter to `moveToElementText()`:

```
rng.moveToElementText(rng.parentElement())
```

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.expand()`, `TextRange.move()`, `TextRange.moveEnd()`, `TextRange.moveStart()` methods.

pasteHTML("*HTMLText*")

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

While the `execCommand()` method offers several commands that insert HTML elements into a text range, it is probably more convenient to simply paste fully formed HTML into the current text range (assuming you need to be working with a text range instead of even more simply setting new values to an element object's `outerHTML` property). Provide the HTML to be inserted as a string parameter to the `pasteHTML()` method.

Use the `pasteHTML()` method with some forethought. Some HTML that you may attempt to paste into a text range may force the method to wrap additional tags around the content you provide to ensure the validity of the resulting HTML. For example, if you were to replace a text range consisting of a portion of text of a P element with, for instance an LI element, the `pasteHTML()` method has no choice but to divide the P element into two pieces, because a P element is not a valid container for a solo LI element. This division can greatly disrupt your document object hierarchy, because the divided P element assumes the same ID for both pieces. Existing references to that P element will break, because the reference now returns an array of two like-named objects.

On the CD-ROM

Example on the CD-ROM

Related Items: `outerHTML`-`property`; `insertAdjacenHTML()` method.

queryCommandEnabled("*commandName*")
queryCommandIndeterm("*commandName*")
queryCommandState("*commandName*")
queryCommandSupported("*commandName*")
queryCommandText("*commandName*")
queryCommandValue("*commandName*")

Returns: See `document.queryCommandEnabled()` in Chapter 18.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

See descriptions under `document.queryCommandEnabled()` in Chapter 18.

select()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `select()` method selects the text inside the boundaries of the current text range. For some operations, such as prompted search and replace, it is helpful to show the user the text of the current range to highlight what text is about to be replaced. In some other operations, especially several commands invoked by `execCommand()`, the operation works only on a text selection in the document. Thus, you can use the `TextRange` object facilities to set the boundaries, followed by the `select()` method to prepare the text for whatever command you like. Text selected by the `select()` method becomes a `selection` object (covered earlier in this chapter).

On the CD-ROM

Example on the CD-ROM

Related Items: `selection` object.

setEndPoint("*type*", *otherRangeRef*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In contrast to the `moveEnd()` method, which adjusts the end point of the current range with respect to characters, words, sentences, and the complete range, the `setEndPoint()` method sets a boundary of the current range (not necessarily the ending boundary) relative to a boundary of another text range whose reference is passed as the second parameter. The first parameter is one of four types that control which boundary of the current range is to be adjusted and which boundary of the other range is the reference point. Table 19-3 shows the four possible values and their meanings.

Table 19-3 setEndPoint() Method Types

Type	*Description*
`StartToEnd`	Moves the start point of the current range to the end of the other range
`StartToStart`	Moves the start point of the current range to the start of the other range
`EndToStart`	Moves the end point of the current range to the start of the other range
`EndToEnd`	Moves the end point of the current range to the end of the other range

Note that the method moves only one boundary of the current range at a time. If you want to make two ranges equal to each other, you have to invoke the method twice, once with `StartToStart` and once with `EndToEnd`. At that instant, the `isEqual()` method applied to those two ranges returns `true`.

Setting a boundary point with the `setEndPoint()` method can have unexpected results when the revised text range straddles multiple elements. Don't be surprised to find that the new HTML text for the revised range does not include tags from the outer element container.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange.moveEnd()`, `TextRange.moveStart()`, `TextRange.moveToElementText()` methods.

TextRectangle Object

Properties	*Methods*	*Event Handlers*
`bottom`		
`left`		
`right`		
`top`		

Syntax

Accessing `TextRectangle` object properties:

```
[window.]document.all.elemID.getBoundingClientRect().property
[window.]document.all.elemID.getClientRects()[i].property
```

About this object

The IE5+ `TextRectangle` object (not implemented in IE5/Mac) exposes to scripts a concept that is described in the HTML 4.0 specification, whereby an element's rendered text occupies a rectangular space on the page just large enough to contain the text. For a single word, the rectangle is as tall as the line height for the font used to render the word and no wider than the space occupied by the text. But for a sequence of words that wraps to multiple lines, the rectangle is as tall as the line height times the number of lines and as wide as the distance between the leftmost and rightmost character edges, even if it means that the rectangle encloses some other text that is not part of the element.

If you extract the `TextRectangle` object for an element by way of, for example, the `getBoundingClientRect()` method, be aware that the object is but a snapshot of the rectangle when the method was invoked. Resizing the page may very well alter dimensions of the actual rectangle enclosing the element's text, but the `TextRectangle` object copy that you made previously does not change its values to reflect the element's physical changes. After a window resize or modification of body text, any dependent `TextRectangle` objects should be recopied from the element.

Properties

bottom
left
right
top

Values: Integers Read-only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The screen pixel coordinates of its four edges define every `TextRectangle` object. These coordinates are relative to the window or frame displaying the page. Therefore, if you intend to align a positioned element with an inline element's `TextRectangle`, your position assignments must take into account the scrolling of the body.

To my eye, the left edge of a `TextRectangle` does not always fully encompass the left-most pixels of the rendered text. You may have to fudge a few pixels in the measure when trying to align a real element with the `TextRectangle` of another element.

On the CD-ROM

Example (with Listing 19-12) on the CD-ROM

Related Items: `getBoundingClientRect()`, `getClientRects()` methods of element objects (Chapter 15).

✦ ✦ ✦

CHAPTER 20

HTML Directive Objects

✦ ✦ ✦ ✦

In This Chapter

Accessing non-displayed element objects

Linking operating-system specific style sheet definitions

HTML, HEAD, LINK, TITLE, META, BASE, and SCRIPT elements

✦ ✦ ✦ ✦

Thanks to the modern browser's desire to expose all HTML elements to the document object model, we can now (in IE4+ and NN6) access a variety of objects that represent many HTML elements that are normally invisible to the human viewer of a page. These elements are called *directive elements* because they predominantly contain instructions for the browser — instructions that direct the browser to locate associated content on the page, link in external specifications, treat content as executable script statements, and more.

As you browse through the objects of this chapter, you may wonder why they have so many properties that normally indicate that the elements occupy space on the rendered page. After all, how can a META element have dimension or position on the page when it has no renderable content? The reason is that modern browsers internally employ some form of object-oriented behavior that lets all HTML elements — rendered or not — inherit the same set of properties, methods, and event handlers that any generic element has (see Chapter 15). The logical flaw is that unrendered elements can have properties and methods that don't genuinely apply to them. In such cases, their property values may be zero, an empty string, or an empty array. Yet the properties and methods exist in the objects just the same. Therefore, despite the large number of objects covered in this chapter, there are relatively few properties and methods that are not shared already with all HTML elements (as covered in Chapter 15).

HTML Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`version`		

Syntax

Accessing HTML element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
(IE4+/NN6) [window.]document.body.parentElement.property | method([parameters])
```

About this object

The HTML element is the big wrapper around all other elements of the page. In the object tree, the HTML element sits between the all-encompassing `document` object and the element's most common children, the HEAD and BODY elements. Other than one deprecated property (`version`), the HTML element object offers nothing of importance to the scripter — with one possible exception. When your script needs to use methods on the child nodes of the HTML element, you must invoke most of those methods from the point of view of the HTML element. Therefore, you should know how to create a reference to the HTML element object (shown in the preceding "Syntax" section) just in case you need it.

Property

version

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `version` property is an artifact of an "ancient" way an HTML document used to specify the HTML version of its content. These days, the preferred way to declare the HTML version for a document is through a Document Type Declaration (DTD) statement that precedes the `<HTML>` tag. An example of a modern DTD statement that accommodates HTML 4 plus deprecated elements and attributes as well as frameset support is

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN"
                    "http://www.w3.org/TR/REC-html40/frameset.dtd">
```

See `http://www.w3.org/TR/REC-html40/struct/global.html#h-7.2` for several other possibilities. A DTD statement does not affect the `version` property of an HTML element object.

Related Items: None.

HEAD Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
profile		

Syntax

Accessing HEAD element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

The purpose of the HEAD element is primarily to act as a container for most of the other HTML directive elements. Other than as a reference point to the child elements nested within, the HEAD element object rarely comes into play when scripting a document.

Properties

profile

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `profile` property is the script version of the optional `PROFILE` attribute of a HEAD element. While the attribute and property are supported in NN6 (that is, they exist), they are not used in practice yet. You can find details about the attribute at `http://www.w3.org/TR/REC-html40/struct/global.html#profiles`.

Related Items: META element object.

BASE Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
href		
target		

Syntax

Accessing BASE element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

The BASE element enables the page author to specify a default server directory and/or link target for the entire page. If you omit the BASE element from the HTML, browsers use the current page's path as the base URL and the current window or frame as the default target. Occasionally, a page generated entirely by way of `document.write()` has difficulty establishing the same BASE URL as the document that generates the content, particularly if the primary page is written out by a server script (in Perl or in another language). Including a `<BASE>` tag in the dynamically written new page solves the problem; the new page can fetch images or other external elements via relative URLs within the page.

The two distinctive properties of the BASE element object are rarely scripted, if ever.

Properties

href

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `href` property is generally an absolute URL to the directory you wish to declare as the default directory for the page. Even though browsers automatically set the BASE HREF to the document's own directory, this object and property do not have any values unless you explicitly set them in a `<BASE>` tag. In IE, changing this property after a page loads causes the page to re-resolve all relative URLs on the page to the new BASE HREF. Therefore, if images have relative URLs assigned to their `src` properties (either by way of the tag attribute or script), a change to the BASE element's `href` property forces the browser to look for those same relative URLs in the new directory. If the files aren't there, then the images show up broken on the page.

On the CD-ROM

Example on the CD-ROM

target

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `target` property governs the default window or frame that is to receive any content coming from a server in response to a click on a link or any other element that has its own `TARGET` attribute. Valid values include the name of any frame (as assigned to the `NAME` attribute of the `<FRAME>` tag) or window (as defined by the second attribute of the `window.open()` method). You can also assign standard HTML targets (`_blank`, `_parent`, `_self`, and `_top`) to this property as strings.

On the CD-ROM

Example on the CD-ROM

BASEFONT Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`color`		
`face`		
`size`		

Syntax

Accessing BASEFONT element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

The BASEFONT element enables authors to define a font face, size, and color for an entire section of an HTML document — or the entire document. Although page authors still frequently use the BASEFONT element, font control in modern browsers should fall in the hands of style sheets. (The element is deprecated in HTML 4.0.) The paradox of this is that the BASEFONT element is accessible as a scriptable object only in browsers that support style sheets. Even so, I recommend avoiding dynamic font changes by way of the BASEFONT element and use scripts to control style sheets instead.

Note

The BASEFONT element has no end tag, so IE's `outerHTML` property consists of all HTML in the document starting with the element itself.

The three distinctive properties of the BASEFONT element object are rarely, if ever, scripted.

Properties

color
face
size

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

These three properties define the characteristics of font rendering for all content following the element's tag in the document. Color specifications can be hexa-decimal triplets or Netscape color names (a list is available at `http://developer.netscape.com/docs/manuals/htmlguid/colortab.htm`). Font faces can include a list of comma-separated font face names. And because this is HTML as opposed to style sheet fonts, the size property is in terms of the 1 through 7 scale of font sizes. You can also use relative sizes (for example, +1).

On the CD-ROM

Example on the CD-ROM

ISINDEX Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`alt`		
`border`		
`checked`		
`complete`		

Properties	Methods	Event Handlers
dynsrc		
form		
height		
hspace		
indeterminate		
loop		
lowsrc		
maxLength		
name		
prompt		
readOnly		
size		
start		
status		
value		
vrml		
vspace		
width		

Syntax

Accessing ISINDEX element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

The ISINDEX element is a holdover from the early beginnings of HTML. It offered the first text input field prior to the addition of FORM and INPUT elements to the HTML specification. IE treats this element as if it were an INPUT element, so ISINDEX takes on all possible INPUT element properties (including those of buttons). This element is deprecated in HTML 4.0 and should not be part of your development vocabulary. Use forms and genuine INPUT elements instead (see Chapters 23–26).

LINK Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
charset		onLoad
disabled		
href		
hreflang		
media		
rel		
rev		
styleSheet		
target		
type		

Syntax

Accessing LINK element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

The LINK element (not to be confused with the A element that is often referred to as a "link" element when it contains an `HREF` attribute pointing to another document) has many potential uses in pointing to external documents that relate to the current document. Its most common usage today is for linking an external style sheet specification to the document. In fact, it's not uncommon for sophisticated site designs to use `document.write()` to generate the `<LINK>` tag so that operating-system specific style sheets are applied to the page. In the following code fragment (which goes inside a document's HEAD element), the page loads a Macintosh-specific style sheet when the page is running on a Macintosh; otherwise, it loads a Windows-specific style sheet:

```
<SCRIPT LANGUAGE="JavaScript">
var isMac = navigator.userAgent.indexOf("Mac") != -1
var linkTagStart = "<LINK REL='stylesheet' TYPE='text/css' HREF='"
var linkTagEnd = ".css'>"
if (isMac) {
    document.write(linkTagStart + "mac" + linkTagEnd
} else {
    document.write(linkTagStart + "windows" + linkTagEnd
}
</SCRIPT>
```

While it may appear that the LINK element can load a variety of content into a page, do not use it for multimedia (in which case you should use the EMBED or OBJECT elements) or external HTML (where you should use an IFRAME element).

Many of the properties of the LINK element object are script representations of HTML 4.0 attributes for the element. However, browsers don't take full advantage of the possibilities available from the LINK element yet. (For example, a browser can provide arrows to the previous and next documents in a series, as specified by the `REV` and `REL` attributes. But so far, no browser implements this.) Properties unique to this object offer scripted access (in various browser versions) to attribute values of the LINK element. Therefore, this chapter does not spend a lot of time on properties that are not in current use.

Properties

charset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `charset` property advises the browser about the character encoding of the content that will arrive from the external document (assuming you also have the HREF attribute set). Values for this property must match the encoding naming conventions defined in an industry standard registry (`ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`).

disabled

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

By changing the `disabled` property (default is `false`), you can turn externally linked content on and off. For example, you can define two different style sheet links in a document that has two `<LINK>` tags with one's `DISABLED` attribute set. You can switch between the two style sheets by setting the `disabled` property of one to `true` and the other to `false`.

href

Value: String See Text

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Another way to swap style sheets is to modify the value of a single LINK element object's `href` property (although the property is read-only in IE4+/Mac and NN6). The property's value is a URL string.

hrefLang

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `hrefLang` property is an advisory for the browser (if the browser takes advantage of it) about the written language used for the content to which the LINK element's `HREF` attribute points. Values for this property must be in the form of the standard language codes (for example, `en-us` for U.S. English).

media

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `media` property (not available in IE4/Mac) is an advisory for the browser about the target output device intended for the content to which the LINK element's `HREF` attribute points. This is an outgrowth of HTML 4.0 efforts to make way for future browsers and content that can be optimized for devices such as printers, handheld computers, and audio digitizers. The W3C specifies a preliminary set of constant string values for this property's equivalent attribute. So far, browsers (at most) recognize `all` (default), `print`, and `screen`.

rel
rev

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `rel` and `rev` properties are intended to define relationships in the forward and back directions with respect to the current document. Browsers have yet to exploit most of the potential of these attributes and properties. For the most part, the attributes solely direct the browser to treat the external content as a style sheet definition file.

A long list of values are predefined for these properties, based on the corresponding attribute values specified in HTML 4.0. If the browser does not respond to a particular value, the value is simply ignored. You can string together multiple values in a space-delimited list inside a single string. Accepted values are as follows:

alternate	contents	index	start
appendix	copyright	next	stylesheet
bookmark	glossary	prev	subsection
chapter	help	section	

styleSheet

Value: Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

When a LINK element loads an external style sheet, the IE-specific `styleSheet` property of the LINK element object provides scripted access to the style sheet rules that belong to that external file. Use properties of the `styleSheet` object (see Chapter 30) to access specifics about the imported rules.

target

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

In the context of using LINK elements to point to other content associated with the current document (for example, the next and previous documents within a series), the `target` property can advise the browser which frame or window to use to display that content. For example, a suitably equipped browser can display a glossary in a separate window. No browsers currently implement these extended features of the LINK element, so the property is provided in browsers only for compatibility with the W3C standards. If the property were truly functional, it would accept values in the form of a string name for a frame or one of the window constants (`_blank`, `_parent`, `_self`, or `_top`).

type

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `type` property specifies the MIME type for the content that will arrive from the external document to which the element's `HREF` attribute points. LINK elements are used primarily for Cascading Style Sheets, so the property value is `text/css`.

Event handlers

onLoad

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onLoad` event handler fires when the external content pointed to by the LINK element's `HREF` attribute completes loading. IE5 for Windows fires this event handler even if the loading does not succeed, so use this event handler with care.

META Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`charset`		
`content`		
`httpEquiv`		
`name`		
`url`		

Syntax

Accessing META element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

In computer terminology, *metadata* usually consists of extra information about the primary data of a document or information collection. In HTML documents, metadata can be additional hidden information about the document, such as the name of the author and keywords. If the browser is suitably equipped, metadata can also include some instructions, such as when to reload the page by itself. META elements add all of this metadata to HTML documents. Both fact and folklore urround the application of META elements within pages. One fact is that Internet search engine robots scour pages for certain kinds of keyword meta tags to help place your page within relevant categories when Web surfers are looking for specific content. More on the folklore side is that browsers always respond to META element wording that prevents browsers from copying pages into the cache—when in fact, this behavior is not universal among browsers.

Complete details about META element usage is beyond the scope of this JavaScript book, but you should be aware of one composition that enables you to set a page to reload itself (or another page) at a fixed time interval. This is especially useful if your page retrieves very timely information from a database. The format is

```
<META HTTP-EQUIV="refresh" CONTENT="n,url=url">
```

`n` is the number of seconds to delay before reloading the page, and `url` is the complete URL of the page to be reloaded. Note that you can specify any page you like. This allows for a kind of slide show to be sequenced in a freestanding kiosk, as each page's META element points to the next page in the series after a fixed amount of time.

Unique properties for the META element object mimic the HTML attributes for the `<META>` tag. These properties are rarely, if ever, accessed from a script, so I mention them here only briefly.

Properties

charset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `charset` property advises the browser about the character encoding of the content for the page. Values for this property must match the encoding naming conventions defined in an industry standard registry (`ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`).

content

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

For many applications of the META element, the `content` property contains the primary value associated with the element. For example, search engines look for a META element whose `NAME` attribute is `"keywords"`. The value of the `CONTENT` attribute is a comma-delimited string of keywords that the search engine reads and indexes in its own database. The `content` property simply represents the `CONTENT` attribute string. Changing the values by script obviously does nothing to alter the tag values of the page on the server.

httpEquiv

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A META element can simulate and extend the transmission of server instructions to the browser — instructions that normally arrive in the form of http headers. These header supplements are supplied in META elements via the `HTTP-EQUIV` attribute, which is represented in the object model by the `httpEquiv` property. Common values include `refresh` and `expires`. Each of these also requires a `CONTENT` attribute that provides necessary details for carrying out the instructions. If you assign a string value to the `httpEquiv` property, be sure the `content` property has a suitable string assigned to it.

name

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A META element that includes genuine metadata about the page (for example, author or keywords) usually has a `NAME` attribute that identifies what the metadata is (analogous to the name of a name/value pair). The `name` and `content` properties go hand in hand because the content string usually must be in a particular form for an external process (for example, a search engine) to read the data successfully. Values for the `name` attribute are rarely case-sensitive.

url

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

If a META element needs to point to a document on the Internet for any reason, the URL of that document is assigned to the `URL` attribute of the element. You can modify the value via the `url` property of a META element object. I recommend a complete URL string for the `url` property value.

SCRIPT Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`defer`		
`event`		
`htmlFor`		
`language`		
`src`		
`text`		
`type`		

Syntax

Accessing SCRIPT element object properties or methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

The `<SCRIPT>` tag is well known to scripters, and modern browsers (IE4+ and NN6) treat the SCRIPT element as an object that, itself, can be scripted. The circularity of this description isn't as far fetched as it sounds. While scripting an existing script is a rarity in practice, it is not out of the question to generate a new SCRIPT element after the page loads. If you use W3C DOM syntax to create a new SCRIPT element, you then need to assign values to the properties that are normally set via the tag's attributes. Thus, scripting a script does make sense.

Unless you have experience with IE's option of binding event handlers to `<SCRIPT>` tags (see Chapter 14), some of the properties described next will be foreign to you.

Even so, these properties are now a part of the W3C DOM specification, so they are implemented in NN6 as well.

One property to take special note of is `language`. This property name conflicts slightly with the `language` property that is part of all HTML element objects. The preferred way to specify the language of the script statements inside the element is to set the `TYPE` attribute to a MIME type. Unfortunately, this technique does not distinguish among versions of JavaScript. Also, for backward compatibility, I advise you to continue using the `LANGUAGE` attribute as well because only IE4+ and NN6+ recognize the `TYPE` attribute.

Note Microsoft developer documentation states that the SCRIPT element object has an `onLoad` event handler. If that assertion is true, then it is broken in IE4 and IE5.

Properties

defer

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The default process of loading a page that contains scripts is to wait for any immediate script execution to complete before the rest of the page loads. But if you include a `DEFER` attribute in the tag, modern browsers continue to load the rest of the page without waiting for immediate scripts to run. The `defer` property enables you to inspect or set that property; its default value is `false`. Once a page loads, any changes you make to an existing SCRIPT element's `defer` property has no effect.

event
htmlFor

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Modern browsers enable you to bind events to script statements when you specify both a `FOR` and `EVENT` attribute in the `<SCRIPT>` tag. Statements inside the tag execute only when the object named by the `FOR` attribute receives the event named by the `EVENT` attribute. You can examine the `EVENT` attribute by way of the SCRIPT element object's `event` property, and you can view the `FOR` attribute through the htmlFor property. Both properties simply mimic whatever values are assigned to their respective attributes, such as onClick() and myDIV.

language

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Use the language property to get or set the name of the scripting language specified for a SCRIPT element object. Even though NN and IE browsers default to JavaScript (or some equivalent), the property has no value unless you set the LANGUAGE attribute in the <SCRIPT> tag. If you must specify a particular version of JavaScript, you can do so by appending the version number immediately after the language name:

```
document.getElementById("myScript").language = "JavaScript1.5"
```

IE accepts several language names as values for this property: JavaScript, JScript, VBScript, and VBS. For IE5, XML is also accepted.

Also see the type property.

src

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The src property is a string of the URL of an external .js script file to be linked into a page. You cannot change this property after you load the external script.

text

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The full text of a SCRIPT element is available for reading through the text property. While IE5 may give the impression that you can modify this property, the script that loads with the page is what is stored in the browser's memory. Thus, the original script statements continue to work even though the object's property is different.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `TYPE` attribute was added to the `<SCRIPT>` tag in HTML 4.0 to help resolve the conflict that the `LANGUAGE` attribute created for all HTML elements. The value of the attribute (and thus the `type` property) is a MIME type string. For JavaScript, that value is `text/javascript`.

TITLE Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`text`		

Syntax

Accessing TITLE element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

Before the TITLE element was accessible to scripting as an object, the prescribed way to get to the content of the page's `<TITLE>` tag was through the `document.title` property. While that property is still available for backward compatibility, scripts written exclusively for newer browsers should access the `text` property of the TITLE element object. As a useful exercise, you can modify Listing 18-17 (loaded via Listing 18-16) to use the IE4+ or W3C DOM syntax to retrieve and display the document's title.

Property

text

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `text` property represents the text between the start and end tags of the TITLE element object. This is simply a convenience property because the text can be referenced by other ways in IE4+ (`innerText` property), NN6 (`innerHTML`), and W3C DOM (`firstChild.nodeValue`) syntaxes. For backward compatibility with earlier browsers, you can alternatively use the `document.title` property.

Related Items: `document.title` property.

✦ ✦ ✦

CHAPTER 21

Link and Anchor Objects

In This Chapter

Differences between link, anchor, and A element objects

Scripting a link to invoke a script function

Scripting a link to swap an image on mouse rollovers

The Web is based on the notion that the world's information can be strung together by way of the *hyperlink* — the clickable hunk of text or image that enables an inquisitive reader to navigate to a further explanation or related material. Of all the document objects you work with in JavaScript, the link is the one that makes that connection. Anchors also provide guideposts to specific locations within documents.

As scriptable objects going back to the first scriptable browsers, links and anchors are comparatively simple devices. But this simplicity belies their significance in the entire scheme of the Web. Under script control, links can be far more powerful than mere tethers to locations on the Web.

In modern browsers (IE4+ and NN6), the notion of separating links and anchors as similar yet distinctly different object begins to fade. The association of the word "link" with objects is potentially confused by the newer browsers' recognition of the LINK element (see Chapter 20), which has an entirely different purpose, as a scriptable object. Taking the place of the anchor and link objects is an HTML element object representing the element created by the `<A>` tag. As an element object, the A element assumes all of the properties, methods, and event handlers that accrue to all HTML element objects in modern object models. To begin making that transition, this chapter treats all three types of objects at once. If you develop pages that must be compatible with early scriptable browsers, pay special attention to the comments about properties and event handler compatibility.

Anchor, Link, and A Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
charset		
coords		
hash		
host		
hostname		
href		
hreflang		
Methods		
mimeType		
name		
nameProp		
pathname		
port		
protocol		
protocolLong		
rel		
rev		
search		
shape		
target		
text		
type		
urn		
x		
y		

Syntax

Accessing link object properties:

```
(all)      [window.]document.links[index].property
```

Accessing A element object properties:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

About this object

A little scripting history can help you to understand where the link and anchor objects came from and how the A element object evolved from them.

Using the terminology of the original object model, the anchor and link objects are both created in the object model from the `<A>` tag. What distinguishes a link from an anchor is the presence of the `HREF` attribute in the tag. Without an `HREF` attribute, the element is an anchor object, which (prior to version 4 browsers) has no properties, events, or event handlers associated with it. And even in NN4, the anchor object gains only four properties, all but one of which (`name`) disappear in NN6. Table 21-1 shows the implementation schedule for backward-compatible (and NN4-specific) properties associated with an anchor object.

Table 21-1 anchor Object Backward-Compatible Properties

Property	NN	IE
`name`	4	4
`text`	4	n/a
`x`	4	n/a
`y`	4	n/a

A link, on the other hand, is much more alive as an object — all just because of the inclusion of an `HREF` attribute, which usually points to a URL to load into a window or frame. In fact, the majority of early object model properties for the link object are the same as those of the early `location` object — properties that reveal information about the URL assigned to the `HREF` attribute. The other vital part of the original link object — especially as distinct from an anchor object — is that a link can respond to events. Initially, event handlers were limited to just `onClick` and `onMouseOver`. By NN4, additional mouse events and an `onDblClick` event joined the repertoire. Table 21-2 shows the properties and event handlers (there were no methods) for backward compatibility prior to the existence of the A element object.

Table 21-2 link Object Backward-Compatible Properties and Event Handlers

Property	NN	IE
`hash`	2	3
`host`	2	3
`hostname`	2	3
`href`	2	3

Continued

Table 21-2 *(continued)*

Property	*NN*	*IE*
pathname	2	3
prot	2	3
protocol	2	3
search	2	3
target	2	3
text	4	n/a
x	4	n/a
y	4	n/a
Event Handler	***NN***	***IE***
onClick	2	3
onDblClick	4[1]	4
onMouseDown	4	4
onMouseOut	3	4
onMouseOver	2	3
onMouseUp	4	4

[1]Not in NN4/Mac

When object models treat HTML elements as objects (IE4+ and NN6), both the anchor and link objects are subsumed by the A element object. Even so, one important characteristic from the original object still holds true: all A element objects that behave as link objects (by virtue of the presence of an `HREF` attribute) are members of the `document.links` property array. Therefore, if your scripts need to inspect or modify properties of all link objects on a page, they can do so by way of a `for` loop through the array of link objects. This is true even if you script solely for modern browsers and want to, say, change a style attribute of all links (for example, changing their `style.textDecoration` property from `none` to `underline`). The fact that the same element can have different behaviors depending on the existence of one attribute makes me think of the A element object as potentially two different animals. Thus, you see references to link and anchor objects throughout this book when the distinction between the two is important.

Scripting newcomers are often confused about the purpose of the `TARGET` attribute of an A element when they want a scripted link to act on a different frame or window. Under plain HTML, the `TARGET` attribute points to the frame or window into which the new document (the one assigned to the `HREF` attribute) is to load, leaving the current window or frame intact. But if you intend to use event handlers to navigate (by setting the `location.href` property), the `TARGET` attribute does not apply to the scripted action. Instead, assign the new URL to the `location.href` property of the desired frame or window. For example, if one frame contains a table of contents consisting entirely of links, the `onClick` event handlers of those links can load other pages into the `main` frame by assigning the URL to the `parent.main.location.href` property. You must also cancel the default behavior of any link, as described in the discussion of the generic `onClick` event handler in Chapter 15.

When you want a click of the link (whether the link consists of text or an image) to initiate an action without actually navigating to another URL, you can use a special technique — the `javascript:` pseudo-URL — to direct the URL to a JavaScript function. The URL `javascript:`*`functionName`*`()` is a valid parameter for the `HREF` attribute (and not just in the link object). Browsers that don't have JavaScript enabled do not respond to clicks on such a link.

If you don't want the link to do anything other than change the statusbar in the `onMouseOver` event handler, define an empty function and set the URL to that empty JavaScript function (such as `HREF="javascript:doNothing()"`). Starting with NN3 and IE4, you can also add a special void operator that guarantees that the called function does not trigger any true linking action (`HREF="javascript: void someFunction()"`). Specifying an empty string for the `HREF` attribute yields an FTP-like file listing for the client computer — an undesirable artifact. Don't forget, too, that if the URL leads to a type of file that initiates a browser helper application (for example, to play a RealAudio sound file), then the helper app or plug-in loads and plays without changing the page in the browser window.

A single link can change the content of more than one frame at once with the help of JavaScript. If you want only JavaScript-enabled browsers to act on such links, use a `javascript:` pseudo-URL to invoke a function that changes the `location.href` properties of multiple frames. For example, consider the following function, which changes the content of two frames:

```
function navFrames(url1, url2) {
    parent.product.location.href = url1
    parent.accessories.location.href = url2
}
```

You can then have a `javascript:` pseudo-URL invoke this multipurpose function and pass the specifics for the link as parameters:

```
<A HREF="javascript: void navFrames('products/gizmo344.html',
'access/access344.html')">Deluxe Super Gizmo</A>
```

Or if you want one link to do something for everyone, but something extra for JavaScript-enabled browsers, you can combine the standard link behavior with an `onClick` event handler to take care of both situations:

```
function setAccessFrame(url) {
    parent.accessories.location.href = url
}
...
<A HREF="products/gizmo344.html" TARGET="product"
onClick="setAccessFrame('access/access344.html')">Deluxe Super Gizmo</A>
```

Notice here that the `TARGET` attribute is necessary for the standard link behavior, while the script assigns a URL to a frame's `location.href` property.

One additional technique allows a single link tag to operate for both scriptable and nonscriptable browsers (NN3+ and IE4+). For nonscriptable browsers, establish a genuine URL to navigate from the link. Then make sure that the link's `onClick` event handler evaluates to `return false`. At click time, a scriptable browser executes the event handler and ignores the `HREF` attribute; a nonscriptable browser ignores the event handler and follows the link. See the discussion of the generic `onClick` event handler in Chapter 15 for more details.

As you design your links, consider building `onMouseOver` and `onMouseOut` event handlers into your link definitions. The most common applications for these event handlers are as a means of adjusting the `window.status` property or swapping images. (Early IMG element objects do not have event handlers of their own, so you must wrap them inside A elements to gain the event handler effect.) Thus, as a user rolls the mouse pointer atop a link, a descriptive label (perhaps more detailed or friendly than what the link text or image may indicate) appears in the status line at the bottom of the window. Whether a user notices the change down there is another issue, so don't rely on the status line as a medium for mission-critical communication. Image swaps, however, are more dramatic and enable a user to receive visual feedback that the mouse pointer is atop a particular button image. Thanks to the `onMouseDown` event handler in NN4 and IE4, you can even swap the image when the user presses down with the mouse button atop the link.

Properties

charset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `charset` property represents the HTML 4.0 `CHARSET` attribute of an A element. It advises the browser of the character set used by the document to which the `HREF` attribute points. The value is a string of one of the character set codes from the registry found at `ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets`.

coords
shape

Value: Strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

HTML 4.0 provides specifications for A elements that accommodate different shapes (rect, circle, and poly) and coordinates when the link surrounds an image.

Although the `coords` and `shape` properties are present for A element objects in NN6 (as directed by the W3C DOM), active support for the feature is not present in NN6.

hash
host
hostname
pathname
port
protocol
search

Value: Strings Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

This large set of properties is identical to the same-named properties of the `location` object (see Chapter 17). All properties are components of the URL that is assigned to the link object's `HREF` attribute. Although none of these properties appear in the W3C DOM specification for the A element object, they survive in modern browsers for backward compatibility. If you want to script the change of the destination for a link, try modifying the value of the object's `href` property rather than individual components of the URL.

Related Item: `location` object.

href

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `href` property (included in the W3C DOM) is the URL of the destination of an A element equipped to act as a link. URLs can be relative or absolute.

In IE4+ and NN6, you can turn an anchor object into a link object by assigning a value to the `href` property even if the A element has no `HREF` attribute in the HTML that loads from the server. Naturally, this conversion is temporary, and it lasts only as long as the page is loaded in the browser. When you assign a value to the `href` property of an A element that surrounds text, the text assumes the appearance of a link (either the default appearance or whatever style you assign to links).

Related Item: `location` object.

hrefLang

Value: String Read/Write

NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				

The `hrefLang` property advises the browser (if the browser takes advantage of it) about the written language used for the content to which the A element's `HREF` attribute points. Values for this property must be in the form of the standard language codes (for example, `en-us` for U.S. English).

Methods

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `Methods` property (note the uppercase "M") represents the HTML 4.0 `METHODS` attribute for an A element. Values for this attribute and property serve as advisory instructions to the browser about which HTTP method(s) to use for accessing the destination document. This is a rare case in which an HTML 4.0 attribute is not echoed in the W3C DOM. In any case, while IE4+ supports the property, the IE browsers do nothing special with the information.

mimeType

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Introduced in IE4 (but not IE4/Mac), the `mimeType` property is still present in IE5 but apparently is no longer supported. The HTML 4.0 and W3C DOM specifications define a `TYPE` attribute and `type` property instead. Perhaps this property was intended as an advisory to allow the browser to "know" ahead of time the MIME type of the destination document. In such a scenario, different MIME types can trigger scripts to use different cursors while hovering atop the link. The property has no actual control over the MIME type of the destination document.

Related Item: `A.type` property.

name

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

While a `NAME` attribute is optional for an A element serving solely as a link object, it is required for an anchor object. This value is exposed to scripting via the `name` property. While it is unlikely you will need to change the value by scripting, you can use this property as a way to identify a link object from among the `document.links` arrays in a repeat loop. For example:

```
for (var i = 0; i < document.links.length; i++) {
    if (document.links[i].name == "bottom" {
        // statements dealing with the link named "bottom"
    }
}
```

nameProp

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `nameProp` property is a convenience property that retrieves the segment of the HREF to the right of the rightmost forward slash character of the URL. Most typically, this value is the name of the file from a URL. But if the URL also includes a port number, that number is returned as part of the `nameProp` value.

protocolLong

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE-specific `protocolLong` property returns a verbose rendition of the `protocol` property as indicated in the A element's `HREF` attribute. For example, if the `HREF` attribute points to an `http:` protocol, the `protocolLong` property returns `HyperText Transfer Protocol`. Introduced in IE4 (but not IE4/Mac), the `protocolLong` property is still present in IE5 but apparently is no longer supported.

rel
rev

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `rel` and `rev` properties define relationships in the forward and back directions with respect to the destination document of the A element. Browsers have yet to exploit most of the potential of these attributes and properties.

A long list of values are predefined for these properties, based on the corresponding attribute values specified in HTML 4.0. If the browser does nothing with a particular value, the value is ignored. You can string together multiple values in a space-delimited list inside a single string. Accepted values are as follows:

`alternate`	`contents`	`index`	`start`
`appendix`	`copyright`	`next`	`stylesheet`
`bookmark`	`glossary`	`prev`	`subsection`
`chapter`	`help`	`section`	

target

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

An important property of the link object is the `target`. This value reflects the window name supplied to the `TARGET` attribute in the A element.

You can temporarily change the target for a link. But, as with most transient object properties, the setting does not survive soft reloads. Rather than altering the target this way, you can safely force the target change by letting the `HREF` attribute call a `javascript:`*`functionName`*`()` psuedo-URL in which the function assigns a document to the desired `window.location`. If you have done extensive HTML authoring before, you will find it hard to break the habit of relying on the `TARGET` attribute.

Related Item: `document.links` property.

text

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Between the start and end tags of a link goes the text (or image) that is highlighted in the distinguishing link color of the document. Navigator 4 enables you to read that text with the `link.text` property. This property is read-only. For later browsers, use the IE4+ and/or W3C DOM syntax for reading the text node (`innerText`, `innerHTML`, or `nodeValue`) property of the A element.

Note This property was not implemented in releases of Navigator 4 prior to version 4.02.

type

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `type` property represents the HTML 4.0 `TYPE` attribute, which specifies the MIME type for the content of the destination document to which the element's `HREF` attribute points. This is primarily an advisory property for browsers that wish to, say, display different cursor styles based on the anticipated type of content at the other end of the link. Thus far, browsers do not take advantage of this feature. However, you can assign MIME type values to the attribute (for example, `video/mpeg`) and let scripts read those values for making style changes to the link text after the page loads. IE4+ implements this property as the `mimeType` property.

Related Item: `A.mimeType` property.

urn

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `urn` property represents the IE-specific `URN` attribute, which enables authors to use a URN (Uniform Resource Name) for the destination of the A element. (See http://www.ietf.org/rfc/rfc2141.txt for information about URNs.) This property is not in common use.

x
y

Value: Integer Read-Only

	Nav2	Nav3	Nav4	Nav6	IE3/J1	IE3/J2	IE4/J3	IE5
Compatibility			✓					

Your Navigator 4 script can retrieve the x and y coordinates of a link object (the top-left corner of the rectangular space occupied by the linked text or image) via the `link.x` and `link.y` properties. With IE4+ and NN6, you can get the coordinates of a typical link via the A element's `offsetLeft` and `offsetTop` properties.

✦ ✦ ✦

CHAPTER 22

Image, Area, and Map Objects

In This Chapter

How to precache images

Swapping images after a document loads

Creating interactive, client-side image maps

For NN3+ and IE4+ browsers, images and areas — those items created by the `<IMG>` and `<AREA>` tags — are first-class objects that you can script for enhanced interactivity. You can swap the image displayed in an `<IMG>` tag with other images (restricted to images of the same size in NN3 and NN4), perhaps to show the highlighting of an icon button when the cursor rolls atop it. And with scriptable client-side area maps, pages can be smarter about how they respond to users' clicks on image regions.

One further benefit afforded scripters is that they can preload images into the browser's image cache as the page loads. With cached images, the user experiences no delay when the first swap occurs.

Image and IMG Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align`		`onAbort`
`alt`		`onError`
`border`		`onLoad`
`complete`		
`dynsrc`		
`fileCreatedDate`		
`fileModifiedDate`		
`fileSize`		
`fileUpdatedDate`		
`height`		
`href`		
`hspace`		

Continued

Properties	Methods	Event Handlers
isMap		
longDesc		
loop		
lowsrc		
name		
nameProp		
protocol		
src		
start		
useMap		
vspace		
width		
x		
y		

Syntax

Creating an `image` object:

```
imageName = new Image([pixelWidth, pixelHeight])
```

Accessing IMG element and `image` object properties or methods:

```
(NN3+/IE4+)   [window.]document.imageName. property | method([parameters])
(NN3+/IE4+)   [window.]document.images[index]. property | method([parameters])
(NN3+/IE4+)   [window.]document.images["imageName"]. property |
              method([parameters])
(IE4+)        [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6+)   [window.]document.getElementById("elemID").property |
              method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	(✓)		✓	✓	✓

About this object

Before getting into detail about images as objects, it's important to understand the distinction between instances of the static `Image` object and IMG element objects. The former exist only in the browser's memory without showing anything to the user; the latter are the elements on the page generated via the `<IMG>` (or nonsanctioned, but accepted, `<IMAGE>`) tag. Scripts use `Image` objects to precache images for a page, but Image objects obviously have fewer applicable properties, methods, and event handlers because they are neither visible on the page nor influenced by tag attributes.

IMG elements have been in the HTML vocabulary since the earliest days, but Netscape Navigator 3 was the first to treat them like first-class objects along with the companion Image object for precaching images. Internet Explorer 3.01 for the Macintosh includes a partial implementation of both objects (to allow image precaching and swapping), and all flavors of IE4+ treat IMG elements as true document objects. The primary advantage of treating IMG elements as objects is that scripts can change the image that occupies the IMG object's space on the page, even after the document has loaded and displayed an initial image. The key to this scriptability is the src property of an image.

In a typical scenario, a page loads with an initial image. That image's tags specify any of the extra attributes, such as HEIGHT and WIDTH (which help speed the rendering of the page), and specify whether the image uses a client-side image map to make it interactive. (See the AREA object later in this chapter.) As the user spends time on the page, the image can then change (perhaps in response to user action or some timed event in the script), replacing the original image with a new one in the same space. In browsers prior to IE4 and NN6 that support the IMG element object, the height and width of the initial image that loads into the element establishes a fixed-sized rectangular space for the image. Attempts to fit an image of another size into that space forces the image to scale (up or down, as the case may be) to fit the rectangle. But in IE4+ and NN6+, a change in the image's size is reflected by an automatic reflow of the page content around the different size.

The benefit of the separate Image object is that a script can create a virtual image to hold a preloaded image. (The image is loaded into the image cache but the browser does not display the image.) The hope is that one or more unseen images will load into memory while the user is busy reading the page or waiting for the page to download. Then, in response to user action on the page, an image can change instantaneously rather than forcing the user to wait for the image to load on demand.

To preload an image, begin by assigning a new, empty image object to a global variable. The new image is created via the constructor function available to the Image object:

```
var imageVariable = new Image(width, height)
```

You help the browser allocate memory for the image if you provide the pixel height and width of the precached image as parameters to the constructor function. All that this statement does is create an object in memory whose properties are all empty. To force the browser to load the image into the cache, assign an image file URL to the object's src property:

```
var oneImage = new Image(55,68)
oneImage.src = "neatImage.gif"
```

As this image loads, you see the progress in the statusbar just like any image. Later, assign the src property of this stored image to the src property of the IMG element object that appears on the page:

```
document.images["someImage"].src = oneImage.src
```

Depending on the type and size of image, you will be amazed at the speedy response of this kind of loading. With small-palette graphics, the image displays instantaneously.

A popular user-interface technique is to change the appearance of an image that represents a clickable button when the user rolls the mouse pointer atop that art. This action assumes that a mouse event fires on an element associated with the object. Prior to IE4 and NN6, IMG element objects did not respond to mouse events on their own. The required technique was to encase the IMG element inside an A element. This allowed the events associated with rollovers (`onMouseOver` and `onMouseOut`) and a user click on the image to effect some change (usually to navigate to another page). While IE4+ and NN6+ provide these events directly for IMG element objects, you can guarantee your pages to be backward-compatible if you continue to surround your images with A elements. You can see examples of these kinds of actions in Chapters 12 and 22.

Image rollovers are most commonly accomplished in two different image states: normal and highlighted. But you may want to increase the number of states to more closely simulate the way clickable buttons work in application programs. In some instances, a third state signifies that the button is switched on. For example, if you use rollovers in a frame for navigational purposes and the user clicks a button to navigate to the Products area, that button stays selected but in a different style than the rollover highlights. Some designers go one step further by providing a fourth state that appears briefly when the user mouses down an image. Each one of these states requires the download of yet another image, so you have to gauge the effect of the results against the delay in loading the page.

The speed with which image swapping takes place may lead you to consider using this method for animation. Though this method may be practical for brief bursts of animation, the many other ways of introducing animation to your Web page (such as via GIF89a-standard images, Java applets, and a variety of plug-ins) produce animation that offers better speed control. In fact, swapping preloaded JavaScript image objects for some cartoon-like animations may be too fast. You can build a delay mechanism around the `setInterval()` method, but the precise timing between frames varies with client processor performance.

All browsers that implement the IMG element object also implement the `document.images` array. You can (and should) use the availability of this array as a conditional switch before any script statements that work with the IMG element or `Image` object. The construction to use is as follows:

```
if (document.images) {
    // statements working with images as objects
}
```

Earlier browsers treat the absence of this array as the equivalent of `false` in the `if` clause's conditional statement.

Tip

If you place an image inside a table cell, Navigator 3 sometimes generates two copies of the image object in its object model. This can disturb the content of the `document.images` array for your scripts. Specifying `HEIGHT` and `WIDTH` attributes for the image sometimes cures the problem. Otherwise, you have to craft scripts so they don't rely on the `document.images` array.

Most of the properties discussed here mirror attributes of the IMG HTML element. For more details on the meanings and implications of attribute values on the rendered content, consult the HTML 4.0 specification (`http://www.w3.org/TR/REC-html40`) and Microsoft's extensions for IE (`http://msdn.microsoft.com/workshop/author/dhtml/reference/objects/img.asp`).

Properties

`align`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property defines how the image is oriented in relation to surrounding text content. It is a double-duty property because you can use it to control the vertical or horizontal alignment depending on the value (and whether the image is influenced by a `float` style attribute). Values are string constants, as follows:

```
absbottom    middle
absmiddle    right
baseline     texttop
bottom       top
left
```

The default alignment for an image is `bottom`. Increasingly, element alignment is handed over to style sheet control.

On the CD-ROM

Example (with Listing 22-1) on the CD-ROM

Related Items: text-align, float style sheet attributes.

`alt`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `alt` property enables you to set or modify the text that the browser displays in the image's rectangular space (if height and width are specified in the tag) before the image downloads to the client. Also, if a browser has images turned off (or is incapable of displaying images), the `alt` text helps users identify what is normally displayed in that space. You can modify this `alt` text even after the page loads.

On the CD-ROM Example on the CD-ROM

Related Item: `title` property.

border

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `border` property defines the thickness in pixels of a border around an image. Remember that if you wrap an image inside an A element to make use of the mouse events (for rollovers and such), be sure to set the `BORDER=0` attribute of the `<IMG>` tag to prevent the browser from generating the usual link kind of border around the image. Even though the default value of the attribute is zero, surrounding the image with an A element or attaching the image to a client-side image map puts a border around the image.

On the CD-ROM Example on the CD-ROM

Related Items: `isMap`, `useMap` properties.

complete

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Sometimes you may want to make sure that an image is not still in the process of loading before allowing another process to take place. This situation is different from waiting for an image to load before triggering some other process (which you can do via the image object's `onLoad` event handler). To verify that the IMG object displays a completed image, check for the Boolean value of the `complete` property. To verify that a particular image file has loaded, first find out whether the `complete` property is `true`; then compare the `src` property against the desired filename.

An image's `complete` property switches to `true` even if only the specified `LOWSRC` image has finished loading. Do not rely on this property alone for determining whether the `SRC` image has loaded if both `SRC` and `LOWSRC` attributes are specified in the `<IMG>` tag.

One of the best ways to use this property is in an `if` construction's conditional statement:

```
if (document.myImage.complete) {
    // statements that work with document.myImage
}
```

Note

The `complete` property is not reliable in Navigator 4 and some versions of Internet Explorer 4. For those browsers, the value returns `true` in all instances.

On the CD-ROM

Example (with Listing 22-2) on the CD-ROM

Related Items: `IMG.src`, `IMG.lowsrc`, `IMG.readyState` properties; onLoad event handler.

dynsrc

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `dynsrc` property is a URL to a video source file, which (in IE) you can play through an IMG element. You can turn a space devoted to a static image into a video viewer by assigning a URL of a valid video source (for example, an `.avi` or `.mpg` file) to the `dynsrc` property of the image element object. Unlike the `src` property of image objects, assigning a URL to the `dynsrc` property does not precache the video.

You may experience buggy behavior in various IE versions when you assign a value to an image's `dynsrc` property after the IMG element renders a `.gif` or `.jpg` image. In IE5/Windows, the status bar indicates that the video file is still downloading, even though the download is complete. Clicking the Stop button has no effect. IE5.5/Windows may not even load the video file, leaving a blank space on the page. IE5/Macintosh changes between static and motion images with no problems, but playing the video file multiple times causes the IMG element to display black space beyond the element's rectangle. You can experience all this behavior in the example provided in Listing 22-3. None of these bugs is fatal, but they should discourage you from using the IMG element as a vehicle for video content.

On the CD-ROM

Example (with Listing 22-3) on the CD-ROM

Related Items: `IMG.loop`, `IMG.start` properties.

fileCreatedDate
fileModifiedDate
fileSize

Value: String, Integer (`fileSize`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These three IE-specific properties return information about the file displayed in the IMG element (whether still or motion image). Two of the properties reveal the dates on which the current image's file was created and modified. For an unmodified file, its creation and modified dates are the same. The `fileSize` property reveals the number of bytes of the file.

Date values returned for the first two properties are formatted differently between IE4 and IE5. The former provides a full readout of the day and date; the latter returns a format similar to mm/dd/yyyy. Note, however, that the values contain only the date and not the time. In any case, you can use the values as the parameter to a `new Date()` constructor function. This enables you to then use date calculations for such information as the number of days between the current day and the most recent modification.

Not all servers provide the proper date or size information about a file or in a format that IE can interpret. Test your implementation on the deployment server to ensure compatibility.

Also, be aware that these properties can be read-only for a file that is loaded in the browser. JavaScript by itself cannot get this information about files on the server that are not loaded in the browser.

Note: All of these file-related properties are present in the Mac version of IE, but the values are empty.

On the CD-ROM: Example on the CD-ROM

Related Items: None.

height
width

Value: Integer Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `height` and `width` properties return and (in later browsers) control the pixel height and width of an image object. The property is read-only in NN3 and NN4, but it is read/write in all others that support the IMG element object.

If you adjust the `height` property of an image, the browser automatically scales the image within the same proportions as the original. But adjusting the `width` property has no effect on the `height` property in most browser versions. Scaling of an image may cause unwanted pixelation in the image, so modify an image's size with extreme care.

On the CD-ROM

Example on the CD-ROM

Related Items: `hspace`, `vspace` properties.

href

See `src` property.

hspace
vspace

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `hspace` and `vspace` properties control the pixel width of a transparent margin surrounding an image. Specifically, `hspace` controls the margins at the top and bottom of the image; `vspace` controls the left and right side margins. Images, by default, have margins of zero pixels.

On the CD-ROM

Example on the CD-ROM

Related Items: `height`, `width` properties.

isMap

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `isMap` property enables you to set whether the image should act as a server-side image map. When set as a server-side image map, pixel coordinates of the click are passed as parameters to whatever link `HREF` surrounds the image. For client-side image maps, see the `useMap` property later in this chapter.

longDesc

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `longDesc` property is a URL of a file that is intended to provide a detailed description of the image associated with the IMG element. While NN6 recognizes this property, the browser does not appear to do anything special with this information — whether specified by script or the `LONGDESC` attribute.

Related Item: `alt` property.

On the CD-ROM

Example on the CD-ROM

Related Item: `IMG.useMap` property.

loop

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `loop` property represents the number of times a video clip playing through the IMG element object should run. After the video plays that number of times, only the first frame of the video appears in the image area. The default value is `1`; but if you set the value to `-1`, the video plays continuously. Unfortunately, setting the property to `0` prior to assigning a URL to the `dynsrc` property does not prevent the movie from playing at least once (except on the Mac, as noted in the `dynsrc` property discussion earlier in this chapter).

On the CD-ROM

Example on the CD-ROM

Related Item: `dynsrc` property.

lowsrc
lowSrc

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

For image files that take several seconds to load, recent browsers enable you to specify a lower-resolution image or some other quick-loading placeholder to stand in while the big image crawls to the browser. You assign this alternate image via the `LOWSRC` attribute in the `<IMG>` tag. The attribute is reflected in the `lowsrc` property of an image object.

All compatible browsers recognize the all-lowercase version of this property. But the W3C DOM specification calls for the interCap "S". NN6 recognizes this version as well.

Be aware that if you assign a URL to the `LOWSRC` attribute, the `complete` property switches to `true` and the `onLoad` event handler fires when the alternate file finishes loading: The browser does not wait for the main `SRC` file to load.

On the CD-ROM

Example on the CD-ROM

Related Items: `IMG.src`, `IMG.complete` properties.

name

Value: Identifier String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	(✓)		✓	✓	✓

The `name` property returns the value assigned to the `NAME` attribute of an IMG element. Starting with IE4 and NN6, you can use the ID of the element to reference the IMG element object via `document.all` and `document.getElementById()`. But references in the form of `document.`*`imageName`* and `document.images[`*`imageName`*`]` must use only the value assigned to the `NAME` attribute.

In some designs, it may be convenient to assign numerically sequenced names to IMG elements, such as `img1`, `img2`, and so on. As with any scriptable identifier, the name cannot begin with a numeric character. Rarely, if ever, will you need to change the name of an IMG element object.

On the CD-ROM

Example on the CD-ROM

Related Item: `id` property.

nameProp

Value: Filename String   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Unlike the `src` property, which returns a complete URL in IE, the IE `nameProp` property (not implemented in IE5/Mac) returns only the filename exclusive of protocol and path. If your image swapping script needs to read the name of the file currently assigned to the image (to determine which image to show next), the `nameProp` property makes it easier to get the actual filename without having to perform extensive parsing of the URL.

On the CD-ROM

Example on the CD-ROM

Related Item: `IMG.src` property.

protocol

Value: String   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The IE `protocol` property returns only the protocol portion of the complete URL returned by the `src` property. This allows your script, for example, to see if the image is sourced from a local hard drive or a Web server. Values returned are not the actual protocol strings; rather, they are descriptions thereof: `HyperText Transfer Protocol` or `File Protocol`.

On the CD-ROM

Example on the CD-ROM

Related Items: `IMG.src`, `IMG.nameProp` properties.

src

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	(✓)		✓	✓	✓

The `src` property is the gateway to precaching images (in instances of the `Image` object that are stored in memory) and performing image swapping (in IMG element objects). Assigning a URL to the `src` property of an image object in memory causes the browser to load the image into the browser's cache (provided the user has the cache turned on). Assigning a URL to the `src` property of an IMG element object causes the element to display the new image. To take advantage of this powerful combination, you preload alternate versions of swappable images into image objects in memory and then assign the `src` property of the image object to the `src` property of the desired IMG element object. These powers are available in IE3 only in the Macintosh version (specifically, version 3.01, which was the first scriptable version of IE3 for the Mac).

In NN3 and NN4 (all OS platforms) and IE3 for the Mac, the size of the image defined by the IMG element's attributes (or, if not specified, then calculated by the browser from the size of the incoming image) governs the rectangular space devoted to that image. An attempt to assign an image of a different size to that IMG element object causes the image to rescale to fit the rectangle (usually resulting in a distorted image). In all later browsers, however, the IMG element object resizes itself to accommodate the image, and the page content reflows around the new size.

Note that when you read the `src` property, it returns a fully formed URL of the image file including protocol and path. This often makes it inconvenient to let the name of the file guide your script to swap images with another image in a sequence of your choice. Some other mechanism (such as storing the current filename in a global variable) may be easier to work with (and see the IE5+/Windows `nameProp` property).

IE4+ replicates the `src` property as the `href` property for an image object. This may be deprecated in IE, so stick with the `src` property when dealing with the URL of a still image.

On the CD-ROM

Example (with Figure 22-1 and Listing 22-4) on the CD-ROM

Related Items: `IMG.lowsrc`, `IMG.nameProp` properties.

start

Value: String   Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `start` property works in conjunction with video clips viewed through the IMG element in IE4+. By default, a clip starts playing (except on the Macintosh) when the image file opens. This follows the default setting of the `start` property: `"fileopen"`. Another recognized value is `"mouseover"`, which prevents the clip from running until the user rolls the mouse pointer atop the image.

Example on the CD-ROM

Related Items: `IMG.dynsrc`, `IMG.loop` properties.

useMap

Value: Identifier String   Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `useMap` property represents the `USEMAP` attribute of an IMG element, pointing to the name assigned to the AREA element in the page (see Listing 22-7 on CD-ROM). This AREA element contains the details about the client-side image map (described later in this chapter). The value for the `useMap` property must include the hash mark that defines an internal HTML reference on the page. If you need to switch among two or more image maps for the same IMG element (for example, you swap images or the user is in a different mode), you can define multiple MAP elements each with a different name. Then change the value of the `useMap` property for the IMG element object to associate a different map with the image.

Related Item: `isMap` property.

vspace

See `hspace`.

width

See `height`.

x
y

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

An NN4 script can retrieve the x and y coordinates of an IMG element (the top-left corner of the rectangular space occupied by the image) via the `x` and `y` properties. These properties are read-only. They were supplanted in NN6 via the `offsetLeft` and `offsetTop` properties of any element.

Even without Dynamic HTML, you can use the information from these properties to help scroll a NN4 document to a precise position (with the `window.scrollTo()` method) as a navigational aid in your page. Due to the different ways each operating system platform renders pages and the different sizes of browser windows, you can dynamically locate the position of an image (in other words, scroll the document) given the current client conditions.

On the CD-ROM

Example on the CD-ROM

Related Items: `IMG.offsetLeft`, `IMG.offsetTop` properties; `IMG.scrollIntoView()`, `window.scrollTo()` methods.

Event handlers

onAbort
onError

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Your scripts may need to be proactive when a user clicks the Stop button while an image loads or when a network or server problem causes the image transfer to fail. Use the `onAbort` event handler to activate a function in the event of a user clicking the Stop button; use the `onError` event handler for the unexpected transfer snafu.

In practice, these event handlers don't supply all the information you may like to have in a script, such as the filename of the image loading at the time. If such information is critical to your scripts, then the scripts need to store the name of a currently loading image to a variable before they set the image's `src` property. You also don't know the nature of the error that triggers an error event. You can treat such problems by forcing a scripted page to reload or by navigating to an entirely different spot in your Web site.

On the CD-ROM

Example on the CD-ROM

onLoad

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

An IMG object's `onLoad` event handler fires when one of three actions occurs: an image's LOWSRC image finishes loading; in the absence of a LOWSRC image specification, the SRC image finishes loading; or when each frame of an animated GIF (GIF89a format) appears.

It's important to understand that if you define a LOWSRC file inside an `<IMG>` tag, the IMG object receives no further word about the SRC image having completed its loading. If this information is critical to your script, verify the current image file by checking the `src` property of the image object.

Be aware, too, that an IMG element's `onLoad` event handler may fire before the other elements on the page have completed loading. If the event handler function refers to other elements on the page, the function should verify the existence of other elements prior to addressing them.

Note

The `onLoad` event handler for images appears to be broken in Navigator 4.

On the CD-ROM

Example (with Listing 22-5) on the CD-ROM

Related Items: `IMG.src`, `IMG.lowsrc` properties.

AREA Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`alt`		
`coords`		
`hash`		
`host`		

Properties	Methods	Event Handlers
hostname		
href		
noHref		
pathname		
port		
protocol		
search		
shape		
target		

Syntax

Accessing AREA element object properties:

```
(NN3+/IE4+)     [window.]document.links[index].property
(IE4+)          [window.]document.all.elemID.property | method([parameters])
(IE4+)          [window.]document.all.MAPElemID.areas[index].property |
                method([parameters])
(IE5+/NN6+)     [window.]document.getElementById("MAPElemID").areas[index].
                property | method([parameters])
(IE5+/NN6+)     [window.]document.getElementById("elemID").property |
                method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

About this object

Document object models treat an image map area object as one of the link (A element) objects in a document (see the anchor object in Chapter 21). When you think about it, such treatment is not illogical at all because clicking a map area generally leads the user to another document or anchor location in the same document — a hyperlinked reference.

Although the HTML definitions of links and map areas differ greatly, the earliest scriptable implementations of both kinds of objects had nearly the same properties and event handlers. Therefore, to read about the details for these items, refer to the discussion about the link object in Chapter 21. The one difference is that in NN3 and NN4, a map area object does not have the same full array of mouse event handlers — you can count upon having only the `onClick` (NN4+), `onMouseOver`, and `onMouseOut` event handlers for those browsers.

Starting with IE4 and NN6, all AREA element attributes are accessible as scriptable properties. Moreover, you can change the makeup of client-side image map areas by way of the MAP element object. The MAP element object contains an array of AREA element objects nested inside. You can remove, modify, or add to the AREA elements inside the MAP element.

Client-side image maps are fun to work with, and they have been well documented in HTML references since Netscape Navigator 2 introduced the feature. Essentially, you define any number of areas within the image based on shape and coordinates. Many graphics tools can help you capture the coordinates of images that you need to enter into the `COORDS` attribute of the `<AREA>` tag.

Tip

If one gotcha exists that trips up most HTML authors, it's the tricky link between the `<IMG>` and `<MAP>` tags. You must assign a name to the `<MAP>`; in the `<IMG>` tag, the `USEMAP` attribute requires a hash symbol (#) and the map name. If you forget the hash symbol, you can't create a connection between the image and its map.

Tip

The `onClick` event handler appears in Netscape's area object beginning with Navigator 4. To be backward compatible with Navigator 3, use a `javascript:` URL for the `HREF` attribute if you want to navigate to another page with a click of the region.

On the CD-ROM

Example (with Listing 22-6) on the CD-ROM

Properties

`alt`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `alt` property represents the `ALT` attribute of an AREA. Future browsers may implement this attribute to provide additional information about the link associated with the AREA element.

Related Item: `title` property.

coords
shape

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `coords` and `shape` properties control the location, size, and shape of the image hot spot governed by the AREA element. Shape values that you can use for this property control the format of the `coords` property values, as follows:

Shape	***Coordinates***	***Example***
`circ`	center-x, center-y, radius	`"30, 30, 20"`
`circle`	center-x, center-y, radius	`"30, 30, 20"`
`poly`	x1, y1, x2, y2,...	`"0, 0, 0, 30, 15,30, 0, 0"`
`polygon`	x1, y1, x2, y2,...	`"0, 0, 0, 30, 15,30, 0, 0"`
`rect`	left, top, right, bottom	`"10, 20, 60, 40"`
`rectangle`	left, top, right, bottom	`"10, 20, 60, 40"`

The default shape for an AREA is a `rectangle`.

On the CD-ROM

Example on the CD-ROM

Related Items: None.

hash
host
hostname
href
pathname
port
protocol

search
target

See corresponding properties of the link object (Chapter 21).

shape

See `coords`.

MAP Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`areas`		`onScroll`
`name`		

Syntax

Accessing MAP element object properties:

```
(IE4+)        [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)    [window.]document.getElementById("elemID").property |
              method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

The MAP element object is an invisible HTML container for all AREA elements, each of which defines a "hot" region for an image. Client-side image maps associate links (and targets) to rectangular, circular, or polygonal regions of the image.

By far, the most important properties of a MAP element object are the `areas` array and, to a lesser extent, its `name`. It is unlikely that you will change the name of a MAP. (It is better to define multiple MAP elements with different names, and then assign the desired name to an IMG element object's `useMap` property.) But you can use the `areas` array to change the makeup of the AREA objects inside a given client-side map.

Properties

areas

Value: Array of AREA element objects Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Use the `areas` array to iterate through all AREA element objects within a MAP element. While NN6 adheres closely to the document node structure of the W3C DOM, IE4+ provides more direct access to the AREA element objects nested inside a MAP. If you want to rewrite the AREA elements inside a MAP, you can clear out the old ones by setting the `length` property of the `areas` array to zero. Then assign AREA element objects to slots in the array to build that array.

On the CD-ROM

Example (with Listing 22-7) on the CD-ROM

Related Items: AREA element object.

✦ ✦ ✦

CHAPTER 23

The Form and Related Objects

✦ ✦ ✦ ✦

In This Chapter

The FORM object as a container of form controls

How to submit forms via e-mail

Processing form validations

LABEL, FIELDSET, and LEGEND element objects

✦ ✦ ✦ ✦

Prior to the advent of dynamic object models and automatic page reflow, the majority of scripting in an HTML document took place in and around forms. Even with all the new DHTML powers, forms remain the primary user interface elements of HTML documents because they enable users to input information and make choices in very familiar user interface elements, such as buttons, option lists, and so on. The challenge of scripting forms and form elements often involves getting object references just right. The references can get pretty long by the time you start pointing to the property of a form element (which is part of a form, which is part of a document, which is part of a window or frame).

Expanded object models of IE4+ and NN6+ include scriptable access to form-related elements that are part of the HTML 4.0 specification. One pair of elements, FIELDSET and LEGEND, provides both contextual and visual containment of form controls in a document. Another element, LABEL, provides context for text labels that usually appear adjacent to form controls. While there is generally little need to script these objects, the browsers give you access to them just as they do for virtually every HTML element supported by the browser.

The Form in the Object Hierarchy

Take another look at the JavaScript object hierarchy in the lowest common denominator object model (refer back to Figure 14-1). The FORM element object can contain a wide variety of form element objects (sometimes called *form controls*), which I cover in Chapters 24 through 26. In this chapter, however, I focus primarily on the container.

The good news on the compatibility front is that much of the client-side scripting works on all scriptable browsers. While you are free to use newer ways of addressing forms and their nested elements when your audience exclusively uses the newer browsers, it can serve you well to be comfortable with the "old-fashioned" reference syntax. Therefore, almost all example code in this and the next three chapters uses syntax that is compatible with the earliest scriptable browsers. Besides, the only significant additions to the defining points of the form object in newer browsers are those characteristics that all other HTML elements share. The true scriptable heart of the form object has been within the scripter's reach since NN2.

FORM Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`acceptCharset`	`handleEvent()`	`onReset`
`action`	`reset()`	`onSubmit`
`autocomplete`	`submit()`	
`elements`		
`encoding`		
`enctype`		
`length`		
`method`		
`name`		
`target`		

Syntax

Accessing FORM object properties or methods:

```
(All)       [window.]document.formName. property | method([parameters])
(All)       [window.]document.forms[index]. property | method([parameters])
(All)       [window.]document.forms["formName"]. property | method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

Forms and their elements are the most common two-way gateways between users and JavaScript scripts. A form control element provides the only way that users can enter textual information. Form controls also provide somewhat standardized and recognizable user interface elements for the user to make a selection from a predetermined set of choices. Sometimes those choices appear in the form of an on/off checkbox, in a set of mutually exclusive radio buttons, or as a selection from a list.

As you have seen in many Web sites, the form is the avenue for the user to enter information that is sent to the server housing the Web files. Just what the server does with this information depends on the CGI (Common Gateway Interface) programs running on the server. If your Web site runs on a server directly under your control (that is, it is *in-house* or *hosted* by a service), you have the freedom to set up all kinds of data-gathering or database search programs to interact with the user. But with some of the more consumer-oriented Internet Service Providers (ISPs), you may have no CGI support available — or, at best, a limited set of popular but inflexible CGI programs available to all customers of the service. Custom databases or transactional services are rarely provided for this kind of Internet service.

Regardless of your Internet server status, you can find plenty of uses for JavaScript scripts in forms. For instance, rather than using data exchanges (and Internet bandwidth) to gather raw user input and report any errors, a JavaScript-enhanced document can preprocess the information to make sure that it employs the format that your back-end database or other programs most easily process. All corrective interaction takes place in the browser, without one extra bit flowing across the Net. I devote all of Chapter 43 to these kinds of form data-validation techniques.

How you define a FORM element (independent of the user interface elements described in subsequent chapters) depends a great deal on how you plan to use the information from the form's controls. If you intend to use the form completely for JavaScript purposes (that is, no queries or postings going to the server), you do not need to use the `ACTION`, `TARGET`, and `METHOD` attributes. But if your Web page will be feeding information or queries back to a server, you need to specify at least the `ACTION` and `METHOD` attributes. You need to also specify the `TARGET` attribute if the resulting data from the server is to be displayed in a window other than the calling window and the `ENCTYPE` attribute if your form's scripts fashion the server-bound data in a MIME type other than in a plain ASCII stream.

References to form control elements

For most client-side scripting, user interaction comes from the elements within a form; the FORM element object is merely a container for the various control elements. If your scripts perform any data validation checks on user entries prior to submission or other calculations, many statements have the form object as part of the reference to the element.

A complex HTML document can have multiple FORM objects. Each `<FORM>. . . </FORM>` tag pair defines one form. You don't receive any penalties (except for potential confusion on the part of someone reading your script) if you reuse a name for an element in each of a document's forms. For example, if each of three forms has a grouping of radio buttons with the name "choice," the object reference to each button ensures that JavaScript doesn't confuse them. The reference to the first button of each of those button groups is as follows:

```
document.forms[0].choice[0]
document.forms[1].choice[0]
document.forms[2].choice[0]
```

Remember, too, that you can create forms (or any HTML object for that matter) on the fly when you assemble HTML strings for writing into other windows or frames. Therefore, you can determine various attributes of a form from settings in an existing document.

Passing forms and elements to functions

When a form or form element contains an event handler that calls a function defined elsewhere in the document, you can use a couple of shortcuts to simplify the task of addressing the objects while the function does its work. Failure to grasp this concept not only causes you to write more code than you have to, but it also hopelessly loses you when you try to trace somebody else's code in his or her JavaScripted document. The watchword in event handler parameters is

```
this
```

which represents a reference to the current object that contains the event handler attribute. For example, consider the function and form definition in Listing 23-1. The entire user interface for this listing consists of form elements, as shown in Figure 23-1.

Listing 23-1: Passing the Form Object as a Parameter

```
<HTML>
<HEAD>
<TITLE>Beatle Picker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function processData(form) {
    for (var i = 0; i < form.Beatles.length; i++) {
        if (form.Beatles[i].checked) {
            break
        }
    }
    var chosenBeatle = form.Beatles[i].value
    var chosenSong = form.song.value
    alert("Looking to see if " + chosenSong + " was written by " +
chosenBeatle + "...")
}

function checkSong(songTitle) {
    var enteredSong = songTitle.value
    alert("Making sure that " + enteredSong + " was recorded by the Beatles.")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM NAME="Abbey Road">
Choose your favorite Beatle:
<INPUT TYPE="radio" NAME="Beatles" VALUE="John Lennon" CHECKED="true">John
<INPUT TYPE="radio" NAME="Beatles" VALUE="Paul McCartney">Paul
<INPUT TYPE="radio" NAME="Beatles" VALUE="George Harrison">George
<INPUT TYPE="radio" NAME="Beatles" VALUE="Ringo Starr">Ringo<P>

Enter the name of your favorite Beatles song:<BR>
<INPUT TYPE="text" NAME="song" VALUE="Eleanor Rigby"
onChange="checkSong(this)"><P>
<INPUT TYPE="button" NAME="process" VALUE="Process Request..."
onClick="processData(this.form)">
```

```
</FORM>
</BODY>
</HTML>
```

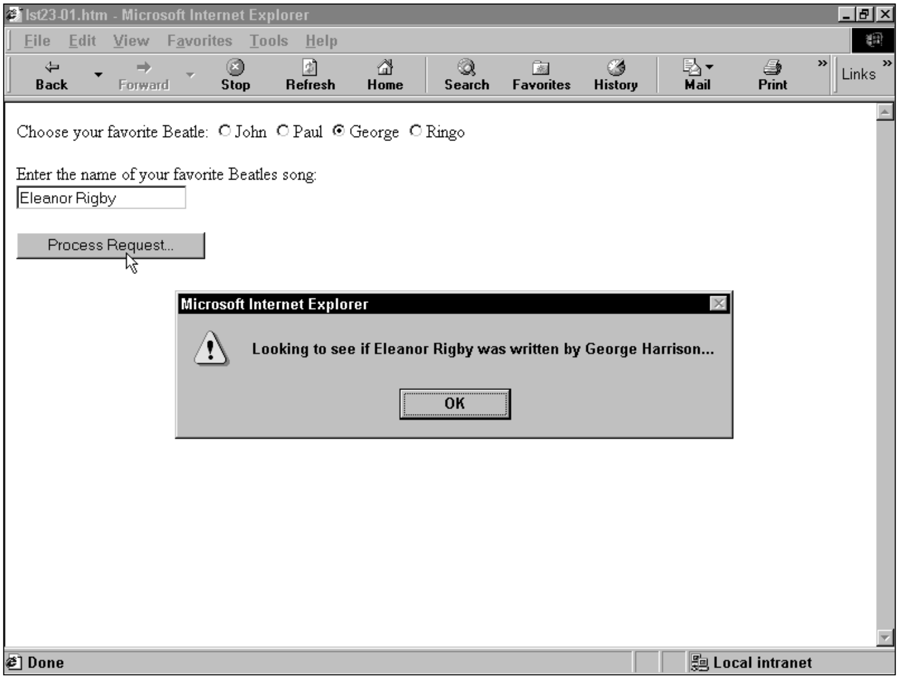

Figure 23-1: Controls pass different object references to functions in Listing 23-1.

The `processData()` function, which needs to read and write properties of multiple form control elements, can reference the controls in two ways. One way is to have the `onClick` event handler (in the button element at the bottom of the document) call the `processData()` function and not pass any parameters. Inside the function, all references to objects (such as the radio buttons or the song field) must be complete references, such as

```
document.forms[0].song.value
```

to retrieve the value entered into the `song` field.

A more efficient way is to send a reference to the FORM object as a parameter with the call to the function (as shown in Listing 23-1). By specifying `this.form` as the parameter, you tell JavaScript to send along everything it knows about the form from which the function is called. This works because `form` is a property of every form control element; the property is a reference to the form that contains the control. Therefore, `this.form` passes the value of the `form` property of the control.

At the function, the reference to the FORM object is assigned to a variable name (arbitrarily set to `form` here) that appears in parentheses after the function name. I use the parameter variable name `form` here because it represents an entire form. But you can use any valid variable name you like.

The reference to the form contains everything the browser needs to know to find that form within the document. Any statements in the function can therefore use the parameter value in place of the longer, more cumbersome reference to the form. Thus, here I can use `form` to take the place of `document.forms[0]` in any address. To get the value of the `song` field, the reference is:

```
form.song.value
```

Had I assigned the form object to a parameter variable called `sylvester`, the reference would have been:

```
sylvester.song.value
```

When a function parameter is a reference to an object, statements in the function can retrieve or set properties of that object as well as invoke the object's methods.

Another version of the `this` parameter passing style simply uses the word `this` as the parameter. Unlike `this.form`, which passes a reference to the entire form connected to a particular element, `this` passes a reference only to that one element. In Listing 23-1, you can add an event handler to the `song` field to do some validation of the entry (to make sure that the entry appears in a database array of Beatles' songs created elsewhere in the document). Therefore, you want to send only the `field` object to the function for analysis:

```
<INPUT TYPE="text" NAME="song" onChange="checkSong(this)"><P>
```

You then have to create a function to catch this call:

```
function checkSong(songTitle) {
    var enteredSong = songTitle.value
    alert("Making sure that " + enteredSong + " was recorded by the Beatles.")
}
```

Within this function, you can go straight to the heart — the `value` property of the field element without a long reference.

One further extension of this methodology passes only a single property of a form control element as a parameter. In the last example, the `checkSong()` function needs only the `value` property of the field, so the event handler can pass `this.value` as a parameter. Because `this` refers to the very object in which the event handler appears, the `this.`*`propertyName`* syntax enables you to extract and pass along a single property:

```
<INPUT TYPE="text" NAME="song" onChange="checkSong(this.value)"><P>
```

A benefit of this way of passing form element data is that the function doesn't have to do as much work:

```
function checkSong(songTitle) {
    alert("Making sure that " + songTitle + " was recorded by the Beatles.")
}
```

Unlike passing object references (like the form and text field objects above), when you pass a property value (for example, `this.value`), the property's value is passed with no reference to the object from which it came. This suffices when the function just needs the value to do its job. However, if part of that job is to modify the object's property (for example, converting all text from a field to uppercase and redisplaying the converted text), the value passed to the function does not maintain a "live" connection with its object. To modify a property of the object that invokes an event handler function, you need to pass some object reference so that the function knows where to go to work on the object.

Tip

Many programmers with experience in other languages expect parameters to be passed either by reference or by value, but not both ways. The rule of thumb in JavaScript, however, is fairly simple: object references are passed by reference; property values are passed by value.

Here are some guidelines to follow when deciding what kind of value to pass to an event handler function:

✦ Pass the entire form control object (`this`) when the function needs to make subsequent access to that same element (perhaps reading an object's `value` property, converting the value to all uppercase letters, and then writing the result back to the same object's `value` property).

✦ Pass only one property (`this.`*`propertyName`*) when the function needs read-only access to that property.

✦ Pass the entire FORM element object (`this.form`) for the function to access multiple elements inside a form (for example, a button click means that the function must retrieve a field's content).

Also be aware that you can submit multiple parameters (for example, `onClick="someFunction (this.form, this.name)"`) or even an entirely different object from the same form (for example, `onClick="someFunction (this.form.emailAddr.value)"`). Simply adjust your function's incoming parameters accordingly. (See Chapter 41 for more details about custom functions.)

E-mailing forms

A common request among scripters is how to send a form via e-mail to the page's author. This includes the occasional desire to send "secret" e-mail to the author whenever someone visits the Web site. Let me address the privacy issue first.

A site visitor's e-mail address is valuable personal information that you should not retrieve without the visitor's permission or knowledge. That's one reason why Netscape plugged a privacy hole in Navigator 2 that allowed submitting a form to a `mailto:` URL without requesting permission from the user. You can use some workarounds for this in Navigator 3, but I do not condone surreptitiously lifting e-mail addresses and therefore choose not to publicize those workarounds here. Besides, as more users gravitate to newer browser versions, the workarounds fail anyway.

Microsoft, on the other hand, went too far in preventing forms e-mailing in the earliest browser versions. While Netscape's browsers reveal to the user in an alert that an e-mail message bearing the user's e-mail address (as stored in the browser's preferences) will be sent upon approval, Internet Explorer 3 does not send form content via e-mail at all. Internet Explorer 4 sends form content as an attachment through Microsoft Outlook, but only after displaying a mail composition window to the user. Starting with IE5, the process is much more fluid, but the action works best when Outlook is the default e-mail client on the computer.

Many ISPs that host Web sites provide standard CGIs for forwarding forms to an e-mail address of your choice. This manner of capturing form data, however, does not also capture the visitor's e-mail address unless your form has a field where the visitor voluntarily enters that information.

Note

Under no circumstances is a form submitted via the `mailto`: URL a secure document. The form data is embedded within a plain e-mail message that goes through the same Internet routes and servers as any e-mail message.

The remaining discussion about mailing forms focuses primarily on NN2+ and IE5+ browsers. You should be aware that mailing forms in the following ways is controversial in some Web standards circles. As of this writing, the W3C HTML specification does not endorse these techniques specifically. However, the latest browsers do support them nonetheless. Use these facilities judiciously and only after extensive testing on the client browsers you intend to support.

If you want to have forms submitted as e-mail messages, you must attend to three `<FORM>` tag attributes. The first is the `METHOD` attribute. You must set it to `POST`. Next comes `ENCTYPE`. If you omit this attribute, the e-mail client sends the form data as an attachment consisting of escaped name-value pairs, as in this example:

```
name=Danny+Goodman&rank=Scripter+First+Class&serialNumber=042
```

But if you set the `ENCTYPE` attribute to text/plain, the form name-value pairs are placed in the body of the mail message in a more human-readable format:

```
name=Danny Goodman
rank=Scripter First Class
serialNumber=042
```

The last attribute of note is the `ACTION` attribute, which is normally the spot to place a URL to another file or server CGI. Substitute the URL with the special `mailto:` URL followed by an optional parameter for the subject. Here is an example:

```
ACTION="mailto:prez@whitehouse.gov?subject=Opinion%20Poll"
```

To sum up, the following example shows the complete `<FORM>` tag for e-mailing the form in Navigator.

```
<FORM NAME="entry"
    METHOD=POST
    ENCTYPE="text/plain"
    ACTION="mailto:prez@whitehouse.gov?subject=Opinion Poll">
```

None of this requires any JavaScript at all. But seeing how you can use the attributes — and the fact that these attributes are exposed as properties of the FORM element object — you might see some extended possibilities for script control over forms.

Changing form attributes

With the exception of IE3 (whose FORM object properties are read-only), all scriptable browsers expose FORM element attributes as modifiable properties. Therefore, you can change, say, the action of a form via a script in response to user interaction on your page. For example, you can have two different CGI programs invoked on your server depending on whether a form's checkbox is checked.

Tip

The best opportunity to change the properties of a FORM element object is in a function invoked by the form's `onSubmit` event handler. The modifications are performed at the last instant prior to actual submission, leaving no room for user-induced glitches to get in the way.

Buttons in forms

A common mistake that newcomers to scripting make is defining all clickable buttons as the submit type of `input` object (`<INPUT TYPE="submit">`). The Submit button does exactly what it says — it submits the form. If you don't set any `METHOD` or `ACTION` attributes of the `<FORM>` tag, the browser inserts its default values for you: `METHOD=GET` and `ACTION=`*pageURL*. When you submit a form with these attributes, the page reloads itself and resets all field values to their initial values.

Use a Submit button only when you want the button to actually submit the form. If you want a button for other types of action, use the button style (`<INPUT TYPE="button">`). A regular button can invoke a function that performs some internal actions and then invokes the FORM element object's `submit()` method to submit the form under script control.

Redirection after submission

Undoubtedly, you have submitted a form to a site and seen a "Thank You" page come back from the server to verify that your submission was accepted. This is warm and fuzzy, if not logical, feedback for the submission action. It is not surprising that you would want to recreate that effect even if the submission is to a `mailto:` URL. Unfortunately, a problem gets in the way.

A common sense approach to the situation calls for a script to perform the submission (via the `form.submit()` method) and then navigate to another page that does the "Thank You." Here is such a scenario from inside a function triggered by a click of a link surrounding a nice, graphical Submit button:

```
function doSubmit() {
    document.forms[0].submit()
    location.href = "thanks.html"
}
```

The problem is that when another statement executes immediately after the `form.submit()` method, the submission is canceled. In other words, the script does not wait for the submission to complete itself and verify to the browser that all is well (even though the browser appears to know how to track that information given the statusbar feedback during submission). The point is, because JavaScript does not provide an event that is triggered by a successful submission, there is no sure-fire way to display your own "Thank You" page.

Don't be tempted by the `window.setTimeout()` method to change the location after some number of milliseconds following the `form.submit()` method. You cannot predict how fast the network and/or server is for every visitor. If the submission does not complete before the timeout ends, then the submission is still canceled — even if it is partially complete.

It's too bad we don't have this power at our disposal yet. Perhaps a future version of the document object model will provide an event that enables us to do something only after a successful submission.

Form element arrays

Starting with NN2 and IE4, document object models provide a feature that is beneficial to a lot of scripters. If you create a series of like-named objects, they automatically become an array of objects accessible via array syntax (see Chapter 7). This is particularly helpful when you create forms with columns and rows of fields, such as in an order form. By assigning the same name to all fields in a column, you can employ `for` loops to cycle through each row using the loop index as an array index.

As an example, the following code shows a typical function that calculates the total for an order form row (and calls another custom function to format the value):

```
function extendRows(form) {
    for (var i = 0; i < Qty.length; i++) {
        var rowSum = form.Qty[i].value * form.Price[i].value
        form.Total[i].value = formatNum(rowSum,2)
    }
}
```

All fields in the Qty column are named `Qty`. The item in the first row has an array index value of zero and is addressed as `form.Qty[i]`.

Unfortunately, Internet Explorer 3 does not turn like-named fields into an array of references. But you can still script repetitive moves through an organized set of fields. The key is to assign names to the fields that include their index numbers: `Qty0`, `Qty1`, `Qty2`, and so on. You can even assign these names in a `for` loop that generates the table:

```
for (var i = 0; i <= rowcount; i++) {
    ...
    document.write("<INPUT TYPE='text' NAME='Qty" + i + "'>")
    ...
}
```

Later, when it comes time to work with the fields, you can use the indexing scheme to address the fields:

```
for (var i = 0; i < Qty.length; i++) {
    var rowSum = form.elements["Qty" + i].value * form.elements["Price" +
i].value
    form["Total" + i].value = formatNum(rowSum,2)
}
```

In other words, construct names for each item, and use those names as array index names. This solution is backward- and forward-compatible.

About <INPUT> element objects

While this chapter focuses strictly on the FORM element as a container of controls, the next three chapters discuss different types of controls that nest inside a form. Many of these controls share the same HTML tag: `<INPUT>`. Only the `TYPE` attribute of the `<INPUT>` tag determines whether the browser shows you a clickable button, a checkbox, a text field, or so on. The fact that one element has so many guises makes the system seem illogical at times to scripters.

An INPUT element has some attributes (and corresponding scriptable object properties) that simply don't apply to every type of form control. For example, while the maxLength property of a text box makes perfect sense in limiting the number of characters that a user can type into it, the property has no bearing whatsoever on form controls that act as clickable buttons. Similarly, you can switch a radio button or checkbox on or off by adjusting the checked property; however, that property simply doesn't apply to a text box.

As the document object models have evolved, they have done so in an increasingly object-oriented way. The result in this form-oriented corner of the model is that all elements created via the <INPUT> tag have a long list of characteristics that they all share by virtue of being types of INPUT elements — they inherit the properties and methods that are defined for any INPUT element. To try to limit the confusion, I divide the chapters in this book that deal with INPUT elements along functional lines (clickable buttons in one chapter, text fields in the other), and only list and discuss those INPUT element properties and methods that apply to the specific control type. In the meantime, this chapter continues with details of the FORM element object.

Properties

acceptCharset

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The acceptCharset property represents the ACCEPTCHARSET attribute of the FORM element in HTML 4.0. The value is a list of one or more recognized character sets that the server receiving the form must support. For a list of registered character set names, see ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets.

Related Items: None.

action

Value: URL String Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The action property (along with the method and target properties) primarily functions for HTML authors whose pages communicate with server-based CGI scripts. This property is the same as the value you assign to the ACTION attribute of a <FORM> tag. The value is typically a URL on the server where queries or postings are sent for submission.

User input may affect how you want your page to access a server. For example, a checked box in your document may set a form's action property so that a CGI script on one server handles all the input, whereas an unchecked box means the form data goes to a different CGI script or a CGI script on an entirely different server.

Or, one setting may direct the action to one `mailto:` address, whereas another setting sets the `action` property to a different `mailto:` address.

Although the specifications for all three related properties indicate that they you can set them on the fly, such changes are ephemeral. A soft reload eradicates any settings you make to these properties, so you should make changes to these properties only in the same script function that submits the form (see `form.submit()` later in this chapter).

Note The value of the `action` property is read-only in IE3.

On the CD-ROM Example on the CD-ROM

Related Items: `form.method`, `form.target`, `form.encoding` properties.

autocomplete

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Microsoft added a feature to forms with IE5 (but not IE5/Mac) that allows the browser to supply hints for filling out form controls if the controls' names map to a set of single-line text controls defined via some additional attributes linked to the vCard XML schema. For details on implementing this browser feature, see `http://msdn.microsoft.com/workshop/author/forms/autocomplete_ovr.asp`. Values for the `autoComplete` property are your choice of two strings: `on` or `off`. In either case, the FORM element object does not report knowing about this property unless you set the `AUTOCOMPLETE` attribute in the form's tag.

Related Items: None.

elements

Value: Array of form control elements Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Elements include all the user interface elements defined for a form: text fields, buttons, radio buttons, checkboxes, selection lists, and more. The `elements` property is an array of all form control items defined within the current form. For example, if a form defines three `<INPUT>` items, the `elements` property for that form is an array consisting of three entries (one for each item in source code order). Each entry is a valid reference to that element; so, to extract properties or call methods for those elements, your script must dig deeper in the reference. Therefore, if the first element of a form is a text field and you want to extract the string currently showing in the field (a text element's `value` property), the reference looks like this:

```
document.forms[0].elements[0].value
```

Notice that this reference summons two array-oriented properties along the way: one for the document's `forms` property and one for the form's `elements` property.

In practice, I suggest you refer to form controls (and forms) by their names. This allows you the flexibility to move controls around the page as you fine-tune the design, and you don't have to worry about the source code order of the controls. The `elements` array comes in handy when you need to iterate through all of the controls within a form. If your script needs to loop through all elements of a form in search of particular kinds of elements, use the `type` property of every form object (NN3+ and IE4+) to identify which kind of object it is. The `type` property consists of the same string used in the `TYPE` attribute of an `<INPUT>` tag.

Overall, I prefer to generate meaningful names for each form control element and use those names in references throughout my scripts. The `elements` array helps with form control names, as well. Instead of a numeric index to the `elements` array, you can use the string name of the control element as the index. Thus, you can create a generic function that processes any number of form control elements, and simply pass the string name of the control as a parameter to the function. Then use that parameter as the `elements` array index value. For example:

```
function putVal(controlName, val) {
    document.forms[0].elements[controlName].value = val
}
```

If you want to modify the number of controls within a form, you should use the element and/or node management facilities of the browser(s) of your choice. For example, in IE4+ and NN6+, you can assemble the HTML string for an entirely new set of form controls and then assign that string to the `innerHTML` property of the FORM element object.

On the CD-ROM

Example (with Listing 23-2 and Figure 23-2) on the CD-ROM

Related Items: `text`, `textarea`, `button`, `radio`, `checkbox`, and `select` objects.

encoding
enctype

Value: MIME Type String Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

You can define a form to alert a server when the data you submit is in a MIME type. The `encoding` property reflects the setting of the `ENCTYPE` attribute in the form definition. The `enctype` property name is defined for FORM element objects in the W3C DOM (with `encoding` removed), but NN6 provides both properties for backward and forward compatibility.

For `mailto:` URLs, I recommend setting this value (in the tag or via script) to `"text/plain"` to have the form contents placed in the mail message body. If the definition does not have an `ENCTYPE` attribute, this property is an empty string.

Note

The value of the `encoding` property is read-only in IE3.

On the CD-ROM

Example on the CD-ROM

Related Items: `form.action`, `form.method` properties.

length

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `length` property of a FORM element object provides the same information as the `length` property of the form's `elements` array. The property provides a convenient, if not entirely logical, shortcut to retrieving the number of controls in a form.

On the CD-ROM

Example on the CD-ROM

Related Items: `form.elements` property.

method

Value: String (`GET` or `POST`) Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A form's `method` property is either the `GET` or `POST` value (not case-sensitive) assigned to the `METHOD` attribute in a `<FORM>` definition. Terminology overlaps here a bit, so be careful to distinguish a form's method of transferring its data to a server from the object-oriented method (action or function) that all JavaScript forms have.

The `method` property is of primary importance to HTML documents that submit a form's data to a server-based CGI script because it determines the format used to convey this information. For example, to submit a form to a `mailto:` URL, the `method` property must be `POST`. Details of forms posting and CGI processing are beyond the scope of this book. Consult HTML or CGI documentation to determine which is the appropriate setting for this attribute in your Web server environment. If a form does not have a `METHOD` attribute explicitly defined for it, the default value is `GET`.

Note

The `method` property is read-only in IE3.

On the CD-ROM

Example on the CD-ROM

Related Items: `form.action`, `form.target`, `form.encoding` properties.

name

Value: Identifier String — Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Assigning a name to a form via the `NAME` attribute is optional but highly recommended when your scripts need to reference a form or its elements. This attribute's value is retrievable as the `name` property of a form. You don't have much need to read this property unless you inspect another source's document for its form construction, as in:

```
var formName = parent.frameName.document.forms[0].name
```

Moreover, because CGI programs frequently rely on the name of the form for validation purposes, it is unlikely you will need to change this property.

target

Value: Identifier String — Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Whenever an HTML document submits a query to a server for processing, the server typically sends back an HTML page—whether it is a canned response or, more likely, a customized page based on the input provided by the user. You see this situation all the time when you perform a search at Web sites. In a multiframe or multiwindow environment, you may want to keep the form part of this transaction in view for the user but leave the responding page in a separate frame or window for viewing. The purpose of the `TARGET` attribute of a `<FORM>` definition is to enable you to specify where the output from the server's query should be displayed.

The value of the `target` property is the name of the window or frame. For instance, if you define a frameset with three frames and assign the names `Frame1`, `Frame2`, and `Frame3` to them, you need to supply one of these names (as a quoted string) as the parameter of the `TARGET` attribute of the `<FORM>` definition. Browsers also observe four special window names that you can use in the `<FORM>` definition: `_top`, `_parent`, `_self`, and `_blank`. To set the target as a separate subwindow opened via a script, use the window name from the `window.open()` method's second parameter and not the window object reference that the method returns.

Note

The value of the `target` property is read-only in IE3.

On the CD-ROM

Example on the CD-ROM

Related Items: `form.action`, `form.method`, `form.encoding` properties.

Methods

handleEvent(*event*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

See the discussion of the `window.handleEvent()` method in Chapter 16 for a description of this NN4-specific method.

reset()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

A common practice, especially with a long form, is to provide a button that enables the user to return all the form elements to their default settings. The standard Reset button (a separate object type described in Chapter 24) does that task just fine. But if you want to clear the form using script control, you must do so by invoking the `reset()` method for the form. More than likely, such a call is initiated from outside the form, perhaps from a function or graphical button. In such cases, make sure that the reference to the `reset()` method includes the complete reference to the form you want to reset — even if the page only has one form defined for it.

On the CD-ROM

Example (with Listing 23-3) on the CD-ROM

Related Items: `onReset` event handler; `reset` object.

submit()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The most common way to send a form's data to a server's CGI program for processing is to have a user click a Submit button. The standard HTML Submit button is designed to send data from all named elements of a form according to the specifications listed in the `<FORM>` definition's attributes. But if you want to submit a form's data to a server automatically for a user, or want to use a graphical button for submission, you can accomplish the submission with the `form.submit()` method.

Invoking this method is almost the same as a user clicking a form's Submit button (except that the `onSubmit` event handler is not triggered). Therefore, you may have an image on your page that is a graphical submission button. If that image is surrounded by a link object, you can capture a mouse click on that image and trigger a function whose content includes a call to a form's `submit()` method (see Listing 23-3).

In a multiple-form HTML document, however, you must reference the proper form either by name or according to its position in a `document.forms` array. Always make sure that the reference you specify in your script points to the desired form before you submit any data to a server.

As a security and privacy precaution for people visiting your site, JavaScript ignores all `submit()` methods whose associated form actions are set to a `mailto:` URL. Many Web page designers would love to have secret e-mail addresses captured from visitors. Because such a capture can be considered an invasion of privacy, the power has been disabled since Navigator 2.02. You can, however, still use an explicit Submit button object to mail a form to you from browsers. (See the section, "E-mailing forms" earlier in this chapter.)

Because the `form.submit()` method does not trigger the form's `onSubmit` event handler, you must perform any presubmission processing and forms validation in the same script that ends with the `form.submit()` statement. You also do not want to interrupt the submission process after the script invokes the `form.submit()` method. Script statements inserted after one that invokes `form.submit()`—especially those that navigate to other pages or attempt a second submission—cause the first submission to cancel itself.

On the CD-ROM

Example on the CD-ROM

Related Item: `onSubmit` event handler.

Event handlers

onReset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Immediately before a Reset button returns a form to its default settings, JavaScript sends a `reset` event to the form. By including an `onReset` event handler in the form definition, you can trap that event before the reset takes place.

A friendly way of using this feature is to provide a safety net for a user who accidentally clicks the Reset button after filling out a form. The event handler can run a function that asks the user to confirm the action.

The `onReset` event handler employs a technique that surfaced with Navigator 3: The event handler must evaluate to `return true` for the event to continue to the browser. This may remind you of the way `onMouseOver` and `onMouseOut` event handlers work for links and image areas. This requirement is far more useful here because your function can control whether the reset operation ultimately proceeds to conclusion.

On the CD-ROM

Example (with Listing 23-4) on the CD-ROM

onSubmit

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

No matter how a form's data is actually submitted (by a user clicking a Submit button or by a script invoking the `form.submit()` method), you may want your

JavaScript-enabled HTML document to perform some data validation on the user input, especially with text fields, before the submission heads for the server. You have the option of doing such validation while the user enters data (see Chapter 43) or in batch mode before sending the data to the server (or both). The place to trigger this last-ditch data validation is the form's `onSubmit` event handler. Note, however, that this event fires only from a genuine Submit type `<INPUT>` element and not from the form's `submit()` method.

When you define an `onSubmit` handler as an attribute of a `<FORM>` definition, JavaScript sends the `submit` event to the form just before it dashes off the data to the server. Therefore, any script or function that is the parameter of the `onSubmit` attribute executes before the data is actually submitted. Note that this event handler fires only in response to a genuine Submit-style button and not from a `form.submit()` method.

Any code executed for the `onSubmit` event handler must evaluate to an expression consisting of the word `return` plus a Boolean value. If the Boolean value is `true`, the submission executes as usual; if the value is `false`, no submission is made. Therefore, if your script performs some validation prior to submitting data, make sure that the event handler calls that validation function as part of a return statement (as shown in Listing 23-4).

Even after your `onSubmit` event handler traps a submission, JavaScript's security mechanism can present additional alerts to the user depending on the server location of the HTML document and the destination of the submission.

On the CD-ROM

Example on the CD-ROM

FIELDSET and LEGEND Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`align`		
`form`		

Syntax

Accessing FIELDSET or LEGEND element object properties or methods:

```
(IE4+)        [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)    [window.]document.getElementById("elemID").property |
              method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

About these objects

The FIELDSET and LEGEND elements go hand in hand to provide some visual context to a series of form controls within a form. Browsers that implement the FIELDSET element draw a rectangle around the document space occupied by the form controls nested inside the FIELDSET element (although IE5/Mac drops the space into a debossed area on the page — a nice effect). The rectangle renders the full width of the body, unless its width is controlled by appropriate style sheet properties (for example, `width`). To that rectangle is added a text label that is assigned via the LEGEND element nested inside the FIELDSET element. (For IE5/Mac, the legend text is rendered just inside the debossed space.) None of this HTML-controlled grouping is necessary if you design a page layout that already provides graphical elements to group the form controls together.

Nesting the elements properly is essential to obtaining the desired browser rendering. A typical HTML sequence looks like the following:

```
<FORM>
<FIELDSET>
<LEGEND>Legend Text</LEGEND>
All your form controls and their labels go here.
</FIELDSET>
</FORM>
```

You can have more than one FIELDSET element inside a form. Each set has a rectangle drawn around it. This can help organize a long form into more easily digestible blocks of controls for users — yet the single form retains its integrity for submission to the server.

A FIELDSET element acts like any HTML container with respect to style sheets and the inheritance thereof. For example, if you set the `color` style property of a FIELDSET element, the color affects the text of elements nested within; however, the color of the border drawn by the browser is unaffected. Assigning a color to the FIELDSET style's `border-color` property colors just the border and not the textual content of nested elements.

Note that the content of the LEGEND element can be any HTML. Alternatively, you can assign a distinctive style sheet rule to the LEGEND element. If your scripts need to modify the text of the legend, you can accomplish this with the `innerText` (IE4+), `innerHTML` (IE4+, NN6+), or `nodeValue` (IE5+, NN6+) properties of HTML element objects.

Only two element-specific properties are assigned to this object pair. The first is the `align` property of the LEGEND object. This property matches the capabilities of the `ALIGN` attribute for the element as specified in the HTML 4.0 recommendation (albeit the property is deprecated in favor of style sheet rules). IE5+ for the Mac and IE5.5+ for Windows enable you to adjust this property on the fly (generally between your choices of "right" and "left") to alter the location of the legend at the top of the fieldset rectangle.

Because these elements are children of a FORM element, it makes sense that the DOM Level 2 specification supplies the read-only `form` property to both of these objects. That property returns a reference to the FORM element object that encloses either element. The `form` property for the FIELDSET and LEGEND objects is implemented only in IE5/Mac and NN6.

LABEL Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
form		
htmlFor		

Syntax

Accessing LABEL element object properties or methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

About this object

With the push in the HTML 4.0 specification to provide context-oriented tags for just about every bit of content on the page, the W3C HTML working group filled a gap with respect to text that usually hangs in front of or immediately after INPUT, SELECT, and TEXTAREA form control elements. You use these text chunks as labels for the items to describe the purpose of the control. The only INPUT element that had an attribute for its label was the button input type. But even the newer BUTTON element did away with that.

A LABEL element enables you to surround a control's label text with a contextual tag. In addition, one of the element's attributes — `FOR` — enables you to associate the label with a particular form control element. In the HTML, the `FOR` attribute is assigned the ID of the control with which the label is associated. A LABEL element can be associated with a form control if the form control's tag is contained between the LABEL element's start and end tags.

At first glance, browsers do nothing special (from a rendering point of view) for a LABEL element. But for some kinds of elements, especially checkbox and radio input type elements, browsers help restore to users a vital user-interface convention: clicking the label is the same as clicking the control. For text elements, focus events are passed to the text input element associated with the label. In fact, all events that are directed at a label bubble upward to the form control associated with it. The following page fragment demonstrates how FIELDSET, LEGEND, and LABEL elements look in a form consisting of two radio buttons:

```
<FORM ...>
<FIELDSET ID="form1set1">
<LEGEND ID="form1set1legend">Choose the Desired Performance</LEGEND>
<INPUT TYPE="radio" NAME="speed" ID="speed1">
    <LABEL FOR="speed1">Fastest (lower quality)</LABEL><BR>
<INPUT TYPE="radio" NAME="speed" ID="speed2">
    <LABEL FOR="speed2">Slower (best quality)</LABEL>
</FIELDSET>
</FORM>
```

Even so, a LABEL and its associated form control element do not have to be adjacent to each other in the source code. For example, you can have a label in one cell of a table row with the form control in another cell (in the same or different row).

Properties

htmlFor

Value: Element Object Reference Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `htmlFor` property is the scripted equivalent of the `FOR` attribute of the LABEL element. An acceptable value is a full reference to a form control element (INPUT, TEXTAREA, or SELECT element objects). It is highly unlikely that you would modify this property for an existing LABEL element. However, if your script is creating a new LABEL element (perhaps a replacement form), use this property to associate the label with a form control.

On the CD-ROM

Example on the CD-ROM

✦ ✦ ✦

24 CHAPTER

Button Objects

This chapter is devoted to those lovable buttons that invite users to initiate action and make choices with a single click of the mouse button. In this category fall the standard system-looking buttons with labels on them, as well as radio buttons and checkboxes. For such workhorses of the HTML form, these objects have a limited vocabulary of object-specific properties, methods, and event handlers.

I group together the button, submit, and reset objects for an important reason: They look alike yet they are intended for very different purposes. Knowing when to use which button is important — especially when to differentiate between the button and submit objects. Many a newcomer get the two confused and wind up with scripting error headaches. That confusion won't happen to you by the time you finish this chapter.

In This Chapter

Triggering action from a user's click of a button

Assigning hidden values to radio and checkbox buttons

Distinguishing between radio button families and their individual buttons

The BUTTON Element Object, and the Button, Submit, and Reset Input Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`form`	`click()`	`onClick`
`name`		`onMouseDown`
`type`		`onMouseUp`
`value`		

Syntax

Accessing button object properties or methods:

```
(All)       [window.]document.formName.buttonName.property |
            method([parameters])
```

```
(All)       [window.]document.formName.elements[index].property |
            method([parameters])
(All)       [window.]document.forms[index].buttonName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].buttonName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].elements[index].property |
            method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About these objects

Button objects generate standard, pushbutton-style user interface elements on the page, depending on the operating system on which the particular browser runs. In the early days, the browsers called upon the operating systems to generate these standard interface elements. In more recent versions, the browsers define their own look, albeit frequently still different for each operating system. More recently, the appearance of a button may also be influenced by browser-specific customizations that browser makers put into their products. Even so, any computer user will recognize a button when the browser produces it on the page.

Starting with IE4 and NN6, you have two ways to put standard buttons into a page. The first, and completely backward-compatible way, is to use INPUT elements nested inside a FORM container. But a new HTML element, the BUTTON element, provides a slightly different way of specifying a button in a page, including the option of putting a button outside of a FORM (presumably for some client-side script execution, independent of form submission). From an HTML point of view, the difference between the two concerns itself with the way the label of the button is specified. With an INPUT element, the string assigned to the `VALUE` attribute becomes the label of the button; but a BUTTON element is a container (meaning with an end tag), whose content becomes the button's label. You can still assign a value to the `VALUE` attribute, which, if a form contains the button, gets submitted to the server, independent of the label text.

Always give careful thought to the label that you assign to a button. Because a button initiates some action, make sure that the verb in the label clearly defines what happens after you click it. Also, take cues from experienced user interface designers who craft operating system and commercial software buttons: Be concise. If you find your button labels going longer than two or three words, reconsider the design of your page so that the user can clearly understand the purpose of any button from a shorter label.

Browsers automatically display a button sized to accommodate the label text. But only browsers that support style sheets (IE4+ and NN6+) allow you to control more visual aspects of the button, such as size, label font, and coloration. And, as for the position of the button on the page, buttons, as in all in-line elements, appear where they occur in the source code. You can, of course, use element positioning of recent browsers (Chapter 31) to make a button appear wherever you want it. But if your pages run on multiple operating systems and generations of browsers, be aware that the appearance (and size) of a button will not be identical on all screens. Check out the results on as many platforms as possible.

Buttons in the Windows environment follow their normal behavior in that they indicate the focus with highlighted button-label text (usually with a dotted rectangle). Some newer browsers running on other operating systems offer this kind of highlighting and selection as a user option. IE5 provides additional INPUT element features that prevent buttons from receiving this kind of visible focus.

The lone button object event handler that works on all browser versions is one that responds to a user clicking the pointer atop the mouse: the `onClick` event handler. Virtually all action surrounding a button object comes from this event handler. You rarely need to extract property values or invoke the `click()` method (the method does not work correctly in Navigator 3). NN4 and IE4 add events for the components of a click: `mouseDown` and `mouseUp`; and IE4+ and NN6+ provide a plethora of user-initiated events for buttons.

Two special variants of the `button` object are the *submit* and *reset* button objects. With their heritages going back to early incarnations of HTML, these two button types perform special operations on their own. The submit-style button automatically sends the data within the same form object to the URL listed in the `ACTION` attribute of the `<FORM>` definition. The `METHOD` attribute dictates the format in which the button sends the data. Therefore, you don't have to script this action if your HTML page is communicating with a CGI program on the server.

If the form's `ACTION` attribute is set to a `mailto:` URL, you must provide the page visitor with a Submit button to carry out the action. Setting the form's `ENCTYPE` attribute to text/plain is also helpful so that the form data arrives in a more readable form than the normal encoded name-value pairs. See "E-Mailing forms" in Chapter 23 for details about submitting form content via e-mail.

The partner of the Submit button is the Reset button. This button, too, has special powers. A click of this button type restores all elements within the form to their default values. That goes for text objects, radio button groups, checkboxes, and selection lists. The most common application of the button is to clear entry fields of the last data entered by the user.

All that distinguishes these three types of buttons from each other in the `<INPUT>` tag or `<BUTTON>` tag is the parameter of the `TYPE` attribute. For buttons not intended to send data to a server, use the "button" style (this is the default value for the BUTTON element). Reserve "submit" and "reset" for their special powers.

If you want an image to behave like a button in all scriptable browsers, consider either associating a link with an image (see the discussion on the link object in Chapter 21) or creating a client-side image map (see the area object discussion in Chapter 22). But for IE4+ and NN6+, you can use the INPUT element with a `TYPE` attribute set to `image` (discussed later in this chapter).

Probably the biggest mistake scripters make with these buttons is using a Submit button to do the work of a plain button. Because these two buttons look alike, and the submit type of input element has a longer tradition than the button, confusing the two is easy. But if all you want is to display a button that initiates client-side script execution, use a plain button. The Submit button attempts to submit the form. If no `ACTION` attribute is set, then the page reloads, and all previous processing and field entries are erased. The plain button does its job quietly without reloading the page (unless the script intentionally does so).

Properties

form

Value: FORM object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A property of every INPUT element object is a reference to the FORM element that contains the control. This property can be very convenient in a script when you are dealing with one form control that is passed as a parameter to the function and you want to either access another control in the same form or invoke a method of the form. An event handler of any INPUT element can pass `this` as the parameter, and the function can still get access to the form without having to hard-wire the script to a particular form name or document layout.

On the CD-ROM

Example on the CD-ROM

Related Items: FORM object.

name

Value: Identifier String Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A button's name is fixed in the INPUT or BUTTON element's `NAME` attribute and cannot be adjusted via scripting except in newer browsers. You may need to retrieve this property in a general-purpose function handler called by multiple buttons in a document. The function can test for a button name and perform the necessary statements for that button. If you change the name of the object, even a soft reload or window resize restores its original name.

On the CD-ROM

Example on the CD-ROM

Related Items: `name` property of all form elements.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The precise value of the `type` property echoes the setting of the `TYPE` attribute of the `<INPUT>` or `<BUTTON>` tag that defines the object: `button`; `submit`; or `reset`.

value

Value: String Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Both INPUT and BUTTON elements have the `VALUE` attribute, which is represented by the `value` property in the object model. But the purpose of the attribute/property in the two elements differs. For the INPUT element, the `value` property represents the label displayed on the button. For a BUTTON element, however, the label text is created by the HTML text between the start and end tags for the BUTTON element. In both cases, when the element has a `NAME` value associated with it, the name/value pair is submitted along with the form (assuming the BUTTON element is inside a form).

If you do not assign a `VALUE` attribute to a reset or submit style button, the browsers automatically assign the labels `Reset` and `Submit` without assigning a value. A value property can be any string, including multiple words.

You can modify this text on the fly in a script, but some cautions apply. Browsers prior to IE4 and NN6 do not resize the width of the button to accommodate a new name that is longer or shorter than the original. Moreover, any soft reload or resize of the window restores the original label. IE4+ and NN6, however, resize the button and reflow the page to meet the new space needs; the new label survives a window resizing, but not a soft reload of the page. Finally, IE4 for the Mac allows you to set this property, but it doesn't really stick.

On the CD-ROM

Example on the CD-ROM

Related Items: `value` property of text object.

Methods

click()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A button's `click()` method should simulate, via scripting, the human action of clicking that button. Unfortunately, the method is highly unreliable in browsers prior to IE4 and NN4.

On the CD-ROM

Example on the CD-ROM

Related Items: `onClick` event handler.

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Virtually all button action takes place in response to the `onClick` event handler. A *click* is defined as a press and release of the mouse button while the screen pointer rests atop the button. The event goes to the button only after the user releases the mouse button.

For a Submit button, you should probably omit the `onClick` event handler and allow the form's `onSubmit` event handler to take care of lastminute data entry validation before sending the form. By triggering validation with the `onSubmit` event handler, your scripts can cancel the submission if something is not right (see the FORM object discussion in Chapter 23).

On the CD-ROM

Example (with Listing 24-1) on the CD-ROM

Related Items: `button.onMouseDown`, `button.onMouseUp`, `form.onSubmit` event handlers.

onMouseDown
onMouseUp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

More recent browsers have event handlers for the components of a `click` event: the `onMouseDown` and `onMouseUp` event handlers. These events fire in addition to the `onClick` event handler.

The system-level buttons provided by the operating system perform their change of appearance while a button is being pressed. Therefore, trapping for the components of a click action won't help you in changing the button's appearance via scripting. Remember that a user can roll the cursor off the button while the button is still down. When the cursor leaves the region of the button, the button's appearance returns to its unpressed look, but any setting you make with the `onMouseDown` event handler won't undo itself with an `onMouseUp` counterpart, even after the user releases the mouse button elsewhere. On the other hand, if you can precache a click-on and click-off sound, you can use these events to fire the respective sounds in response to the mouse button action.

Related Items: `button.onClick` event handler.

Checkbox Input Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`checked`	`click()`†	`onClick`†
`form`†		
`name`†		
`type`		
`value`		

† See Button object.

Syntax

Accessing checkbox properties or methods:

```
(All)       [window.]document.formName.boxName.property | method([parameters])
(All)       [window.]document.formName.elements[index].property |
            method([parameters])
(All)       [window.]document.forms[index].boxName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].boxName.property |
            method([parameters])
```

```
(All)       [window.]document.forms["formName"].elements[index].property |
            method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

Checkboxes have a very specific purpose in modern graphical user interfaces: to toggle between "on" and "off" settings. As with a checkbox on a printed form, a mark in the box indicates that the label text is true or should be included for the individual who made that mark. When the box is unchecked or empty, the text is false or should not be included. If two or more checkboxes are physically grouped together, they should have no interaction: Each is an independent setting (see the discussion on the radio object for interrelated buttons).

I make these user interface points at the outset because, in order to present a user interface in your HTML pages consistent with the user's expectations based on exposure to other programs, you must use checkbox objects only for on/off choices that the user makes. Using a checkbox as an action button that, for example, navigates to another URL, is not good form. Just as they do in a Windows or Mac dialog box, users make settings with checkboxes and radio buttons and initiate action by clicking a standard button or image map.

That's not to say that a checkbox object cannot perform some limited action in response to a user's click, but such actions are typically related to the context of the checkbox button's label text. For example, in some Windows and Macintosh dialog boxes, turning on a checkbox may activate a bunch of otherwise inactive settings elsewhere in the same dialog box. IE4+ and NN6+ allow disabling (dimming) or hiding form elements, so a checkbox may control those visible attributes of related controls. Or, in a two-frame window, a checkbox in one frame may control whether the viewer is an advanced user. If so, the content in the other frame may be more detailed. Toggling the checkbox changes the complexity level of a document showing in the other frame (using different URLs for each level). The bottom line, then, is that you should use checkboxes for toggling between on/off settings. Provide regular buttons for users to initiate processing.

In the `<INPUT>` tag for a checkbox, you can preset the checkbox to be checked when the page appears. Add the constant `CHECKED` attribute to the definition. If you omit this attribute, the default, unchecked appearance rules. As for the checkbox label text, its definition lies outside the `<INPUT>` tag. If you look at the way checkboxes behave in HTML browsers, this location makes sense: The label is not an active part of the checkbox (as it typically is in Windows and Macintosh user interfaces, where clicking the label is the same as clicking the box).

Naming a checkbox can be an important part of the object definition, depending on how you plan to use the information in your script or document. For forms whose content goes to a CGI program on the server, you must word the box name as needed for use by the CGI program, so that the program can parse the form data and extract the setting of the checkbox. For JavaScript client-side use, you can assign not only a name that describes the button, but also a value useful to your script for making `if...else` decisions or for assembling strings that are eventually displayed in a window or frame.

Properties

checked

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The simplest property of a checkbox reveals (or lets you set) whether or not a checkbox is checked. The value is `true` for a checked box and `false` for an unchecked box. To check a box via a script, simply assign `true` to the checkbox's `checked` property:

```
document.forms[0].boxName.checked = true
```

Setting the `checked` property from a script does not trigger a `click` event for the checkbox object.

You may need an instance in which one checkbox automatically checks another checkbox elsewhere in the same or other form of the document. To accomplish this task, create an `onClick` event handler for the one checkbox and build a statement similar to the preceding one to set the other related checkbox to `true`. Don't get too carried away with this feature, however: For a group of interrelated, mutually exclusive choices, use a group of radio buttons instead.

If your page design requires that a checkbox be checked after the page loads, don't bother trying to script this checking action. Simply add the one-word `CHECKED` attribute to the `<INPUT>` tag. Because the `checked` property is a Boolean value, you can use its results as an argument for an `if` clause, as shown in the next example.

On the CD-ROM

Example (with Listing 24-2) on the CD-ROM

Related Items: `defaultChecked`, `value` properties.

defaultChecked

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

If you add the `CHECKED` attribute to the `<INPUT>` definition for a checkbox, the `defaultChecked` property for that object is `true`; otherwise, the property is `false`. Having access to this property enables your scripts to examine checkboxes to see if they have been adjusted (presumably by the user, if your script does not set properties).

On the CD-ROM

Example (with Listing 24-3) on the CD-ROM

Related Items: `checked`, `value` properties.

type

Value: String (`checkbox`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Use the `type` property to help you identify a checkbox object from an unknown group of form elements.

Related Items: `form.elements` property.

value

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A checkbox object's `value` property is a string of any text that you want to associate with the box. Note that the checkbox's `value` property is not the label, as it is for a regular button, but hidden text associated with the checkbox. For instance, the label that you attach to a checkbox may not be worded in a way that is useful to your script. But if you place that useful wording in the `VALUE` attribute of the checkbox tag, you can extract that string via the `value` property.

When a checkbox object's data is submitted to a CGI program, the `value` property is sent as part of the name/value pair if the box is checked (nothing about the checkbox is sent if the box is unchecked). If you omit the `VALUE` attribute in your definition, the property always yields the string "on," which is submitted to a CGI program when the box is checked. From the JavaScript side, don't confuse this string with the on and off settings of the checkbox: Use the `checked` property to determine a checkbox's status.

On the CD-ROM

Example (with Listing 24-4) on the CD-ROM

Related Items: `checked` property.

Methods

click()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The intention of the `click()` method is to enact, via script, the physical act of clicking a checkbox (but without triggering the `onClick` event handler). Unfortunately, this method does not work in Navigator 2 or 3 as expected. Even if this method worked flawlessly, your scripts are better served by setting the `checked` property so that you know exactly what the setting of the box is at any time.

Related Items: `checked` property; `onClick` event handler.

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Because users regularly click checkboxes, the objects have an event handler for the `click` event. Use this event handler only if you want your page (or variable values hidden from view) to respond in some way to the action of clicking a checkbox. Most user actions, as mentioned earlier, are initiated by clicking standard buttons rather than checkboxes, so be careful not to overuse event handlers in checkboxes.

On the CD-ROM

Example (with Listing 24-5) on the CD-ROM

Related Items: checkbox mouse-related event handler.

Radio Input Object

Properties	***Methods***	***Event Handlers***
See checkbox object.		

Syntax

Accessing radio object properties or methods:

```
(All)     [window.]document.formName.buttonGroupName[index].property |
          method([parameters])
(All)     [window.]document.formName.elements[index] [index].property |
          method([parameters])
(All)     [window.]document.forms[index]. buttonGroupName[index].property |
          method([parameters])
(All)     [window.]document.forms["formName"]. buttonGroupName[index].property |
          method([parameters])
(All)     [window.]document.forms["formName"].elements[index].property |
          method([parameters])
(IE4+)    [window.]document.all.elemID[index].property | method([parameters])
(IE5+/NN6)[window.]document.getElementById("elemID")[index].property |
          method([parameters])
```

About this object

A radio button object is an unusual one within the body of JavaScript applications. In every other case of form control elements, one object equals one visual element on the screen. But a radio object actually consists of a group of radio buttons. Because of the nature of radio buttons — a mutually exclusive choice among two or more selections — a group always has multiple visual elements. All buttons in the group share the same name — which is how the browser knows to group buttons together and to let the clicking of a button deselect any other selected button within the group. Beyond that, however, each button can have unique properties, such as its value or checked property.

Use JavaScript array syntax to access information about an individual button within the button group. Look at the following example of defining a button group and see how to reference each button. This button group lets the user select a favorite member of the Three Stooges:

```
<FORM>
<B>Select your favorite Stooge:</B><P>
<INPUT TYPE="radio" NAME="stooges" VALUE="Moe Howard" CHECKED>Moe
<INPUT TYPE="radio" NAME="stooges" VALUE="Larry Fine" >Larry
<INPUT TYPE="radio" NAME="stooges" VALUE="Curly Howard" >Curly
<INPUT TYPE="radio" NAME="stooges" VALUE="Shemp Howard" >Shemp
</FORM>
```

After this group displays on the page, the first radio button is preselected for the user. Only one property of a radio button object (`length`) applies to all members of the group. However, the other properties apply to individual buttons within the group. To access any button, use an array index value as part of the button group name. For example:

```
firstBtnValue = document.forms[0].stooges[0].value // "Moe Howard"
secondBtnValue = document.forms[0].stooges[1].value // "Larry Fine"
```

Any time you access the checked, `defaultChecked`, `type`, or `value` property, you must point to a specific button within the group according to its order in the array (or, in IE4+ and NN6, each button can also have a unique ID). The order of buttons in the group depends on the sequence in which the individual buttons are defined in the HTML document. In other words, to uncover the currently selected radio button, your script has to iterate through all radio buttons in the radio group. Examples of this come later in the discussion of this object.

Supplying a `VALUE` attribute to a radio button can be very important in your script. Although the text label for a button is defined outside the `<INPUT>` tag, the `VALUE` attribute lets you store any string in the button's hip pocket. In the earlier example, the radio button labels were just first names, whereas the `value` properties were set in the definition to the full names of the actors. The values could have been anything that the script needed, such as birth dates, shoe sizes, URLs, or the first names again (because a script has no way to retrieve the labels except through `innerHTML` or node property access in more modern browsers). The point is that the `VALUE` attribute should contain whatever string the script needs to derive from the selection made by the user. The `VALUE` attribute contents are also what is sent to a CGI program on a server in a submit action for the form.

How you decide to orient a group of buttons on the screen is entirely up to your design and the real estate available within your document. You can string them in a horizontal row (as shown earlier), place `<BR>` tags after each one to form a column, or do so after every other button to form a double column. Numeric order within the array is determined only by the order in which the buttons are defined in the source code, not by where they appear. To determine which radio button of a group is checked before doing processing based on that choice, you need to construct a repeat loop to cycle through the buttons in the group (shown in the next example). For each button, your script examines the checked property.

Tip To be Navigator 2–friendly, be sure to always specify an `onClick` event handler to every radio button (even if `onClick=""`). This action overrides a bug that causes index values to be reversed among buttons in a group.

Properties

checked

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Only one radio button in a group can be highlighted (checked) at a time (the browser takes care of highlighting and unhighlighting buttons in a group for you). That one button's `checked` property is set to `true`, whereas all others in the group are set to `false`.

Beginning with NN3 (and IE3), you can safely set the `checked` property of a radio button. By setting the `checked` property of one button in a group to `true`, all other buttons automatically uncheck themselves.

Example (with Listing 24-6) on the CD-ROM

Related Items: `defaultChecked` property.

defaultChecked

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

If you add the `CHECKED` attribute to the `<INPUT>` definition for a radio button, the `defaultChecked` property for that object is `true`; otherwise, the property is `false`. Having access to this property enables your scripts to examine individual radio buttons to see if they have been adjusted (presumably by the user, if your script does not perform automatic clicking).

Example (with Listing 24-7) on the CD-ROM

Related Items: `checked`, `value` properties.

length

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A radio button group has *length* — the number of individual radio buttons defined for that group. Attempting to retrieve the length of an individual button yields a `null` value. The `length` property is valuable for establishing the maximum range of values in a repeat loop that must cycle through every button within that group. If you specify the `length` property to fill that value (rather than hard-wiring the value), the loop construction will be easier to maintain — as you make changes to the number of buttons in the group during page construction, the loop adjusts to the changes automatically.

Example on the CD-ROM

Related Items: None.

name

Value: Identifier String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `name` property, while associated with an entire radio button group, can be read only from individual buttons in the group, such as

```
btnGroupName = document.forms[0].groupName[2].name
```

In that sense, each radio button element in a group inherits the name of the group. Your scripts have little need to extract the `name` property of a button or group. More often than not, you will hard-wire a button group's name into your script to extract other properties of individual buttons. Getting the `name` property of an object whose name you know is obviously redundant. But understanding the place of radio button group names in the scheme of JavaScript objects is important for all scripters.

Related Items: `value` property.

type

Value: String (`radio`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Use the `type` property to help identify a radio object from an unknown group of form elements.

Related Items: `form.elements` property.

value

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

As described earlier in this chapter for the checkbox object, the `value` property contains arbitrary information that you assign when mapping out the `<INPUT>` definition for an individual radio button. Using this property is a handy shortcut to correlating a radio button label with detailed or related information of interest to your script or CGI program on a server. If you like, the `value` property can contain the same text as the label.

Example on the CD-ROM

Related Items: `name` property.

Methods

click()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The intention of the `click()` method is to enact, via a script, the physical act of clicking a radio button. Unfortunately, this method does not work in Navigator 2 or 3. Even if it worked flawlessly, you better serve your scripts by setting the `checked` properties of all buttons in a group so that you know exactly what the setting of the group is at any time.

Related Items: `checked` property; `onClick` event handler.

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Radio buttons, more than any user interface element available in HTML, are intended for use in making choices that other objects, such as submit or standard buttons, act upon later. You may see cases in Windows or Mac programs in which highlighting a radio button — at most — activates or brings into view additional, related settings (see Listing 24-5).

I strongly advise you not to use scripting handlers that perform significant actions at the click of any radio button. At best, you may want to use knowledge about a user's clicking of a radio button to adjust a global variable or `document.cookie` setting that influences subsequent processing. Be aware, however, that if you script such a hidden action for one radio button in a group, you must also script similar actions for others in the same group. That way, if a user changes the setting back to a previous condition, the global variable is reset to the way it was. JavaScript, however, tends to run fast enough so that a batch operation can make such adjustments after the user clicks a more action-oriented button.

Example (with Listing 24-8) on the CD-ROM

Image Input Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`complete`		
`form`†		
`name`†		
`src`		
`type`		

† See Button object.

Syntax

Accessing image input object properties or methods:

```
(All)        [window.]document.formName.imageName.property |
             method([parameters])
(All)        [window.]document.formName.elements[index].property |
             method([parameters])
(All)        [window.]document.forms[index].imageName.property |
             method([parameters])
(All)        [window.]document.forms["formName"].imageName.property |
             method([parameters])
(All)        [window.]document.forms["formName"].elements[index].property |
             method([parameters])
(IE4+)       [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)   [window.]document.getElementById("elemID").property |
             method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

Browsers with fuller document object models include the image input element among scriptable objects. The image input object most closely resembles the button input object but replaces the `value` property (which defines the label for the button) with the `src` property, which defines the URL for the image that is to be displayed in the form control. This is a much simpler way to define a clickable image icon, for example, than the way required for compatibility with older browsers: wrapping an IMG element inside an A element so that you can use the A element's event handlers.

Although this element loads a regular Web image in the document, you have virtually no control over the image, which the IMG element provides. Be sure the rendering is as you predict.

Properties

complete

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `complete` property works as it does for an IMG element, reporting `true` if the image has finished loading. Otherwise the property returns `false`. Interestingly, there is no `onLoad` event handler for this object.

Related Items: `Image.complete` property.

src

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Like the IMG element object, the image input element's `src` property controls the URL of the image being displayed in the element. The property can be used for image swapping in a form control, just as it is for a regular IMG element. Because the image input element has all necessary mouse event handlers available (for example, `onMouseOver`, `onMouseOut`, `onMouseDown`) you can script rollovers, click-downs, or any other user interface technique that you feel is appropriate for your buttons and images. To adapt code written for link-wrapped images, move the event handlers from the A element to the image input element, and make sure the name of the image input element is the same as your old IMG element.

Older browsers load images into an image input element, but no event handlers are recognized.

Related Items: `Image.src` property.

type

Value: String (`image`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Use the `type` property to help you identify an image input object from an unknown group of form elements.

Related Items: `form.elements` property.

✦ ✦ ✦

CHAPTER 25

Text-Related Form Objects

✦ ✦ ✦ ✦

In This Chapter

Capturing and modifying text field contents

Triggering action by entering text

Capturing individual keystroke events

✦ ✦ ✦ ✦

The document object model for forms includes four text-related user interface objects — text, password, and hidden INPUT element objects, plus the TEXTAREA element object. All four of these objects are used for entry, display, or temporary storage of text data. While all of these objects can have text placed in them by default as the page loads, scripts can also modify the contents of these objects. Importantly, all but the hidden objects retain their user- or script-modified content during a soft reload (for example, clicking the Reload button), except in IE3. Hidden objects revert to their default values on all reloads in all browsers.

A more obvious difference between the hidden object and the rest is that its invisibility removes it from the realm of user events and actions. Therefore, the range of scripted possibilities is much smaller for the hidden object.

The persistence of text and TEXTAREA object data through reloads (and window resizes) makes these objects prime targets for off-screen storage of data that may otherwise be stored temporarily in a cookie. If you create a frame with no size (for example, you set the `COLS` or `ROWS` values of a `<FRAMESET>` tag to let all visible frames occupy 100 percent of the space and assign the rest — * — to the hidden frame), you can populate the frame with fields that act as shopping cart information or other data holders. Therefore, if users have cookies turned off or don't usually respond affirmatively to cookie requests, your application can still make use of temporary client storage. The field contents may survive unloading of the page, but whether this happens and for how many navigations away from the page the contents last depends on the visitor's cache settings (or if the browser is IE3, in which case no values preserve the unloading of a document). If the user quits the browser or closes the browser window, the field entry is lost.

Text Input Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
defaultValue	select()	onAfterUpdate
form		onBeforeUpdate
maxLength		onChange
name		onErrorUpdate
readOnly		onSelect
size		
type		
value		

Syntax

Accessing text INPUT object properties or methods:

```
(All)       [window.]document.formName.fieldName.property | method([parameters])
(All)       [window.]document.formName.elements[index].property |
            method([parameters])
(All)       [window.]document.forms[index].fieldName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].fieldName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].elements[index].property |
            method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

The text INPUT object is the primary medium for capturing single-line, user-entered text. By default, browsers tend to display entered text in a monospaced font (usually Courier or a derivative), so that you can easily specify the width (SIZE) of a field based on the anticipated number of characters that a user may put into the field. Until you get to IE4+ and NN6+, the font is a fixed size and always is left-aligned in the field. In those later browsers, style sheets can control the font characteristics of a text field. If your design requires multiple lines of text, use the TEXTAREA object that comes later in this chapter.

Before document object models in IE4 and NN6 allowed dynamic modification of body content, a common practice was to use text objects to display results of a script calculation or other processing. Such fields may stand alone on a page or be part of a table.

Also prior to IE4 and NN6, these fields could not be made fully write-protected, so it was easy to understand how a novice user may become confused after he or she causes the text pointer or selection to activate a field used exclusively for output, simply by tabbing through a page.

Text object methods and event handlers use terminology that may be known to Windows users but not to Macintosh users. A field is said to have *focus* whenever the user clicks or tabs into the field. When a field has focus, either the text insertion pointer flashes, or any text in the field may be selected. Only one text object on a page can have focus at a time. The inverse user action — clicking or tabbing away from a text object — is called a *blur*. Clicking another object, whether it is another field or a button of any kind, causes a field that currently has focus to blur.

If you don't want the contents of a field to be changed by the user, you have three possibilities — depending on the vintage of browsers you need to support: forcing the field to lose focus; disabling the field; or setting the field's `readOnly` property.

The tactic that is completely backward compatible uses the following event handler in a field you want to protect:

```
onFocus="this.blur()"
```

Starting with IE4 and NN6, the object model provides a `disabled` property for form controls. Setting the property to `true` leaves the element visible on the page, but the user cannot access the control. The same browsers provide a `readOnly` property, which doesn't dim the field, but prevents typing in the field.

Text fields and events

Focus and blur also interact with other possible user actions to a text object: selecting and changing. *Selecting* occurs when the user clicks and drags across any text in the field; *changing* occurs when the user makes any alteration to the content of the field and then either tabs or clicks away from that field.

When you design event handlers for fields, be aware that a user's interaction with a field may trigger more than one event with a single action. For instance, clicking a field to select text may trigger both a `focus` and `select` event. If you have conflicting actions in the `onFocus` and `onSelect` event handlers, your scripts can do some weird things to the user's experience with your page. Displaying alert dialog boxes, for instance, also triggers `blur` events, so a field that has both an `onSelect` handler (which displays the alert) and an `onBlur` handler gets a nasty interaction from the two.

As a result, be very judicious with the number of event handlers you specify in any text object definition. If possible, pick one user action that you want to use to initiate some JavaScript code execution and deploy it consistently on the page. Not all fields require event handlers — only those you want to perform some action as the result of user activity in that field.

Many newcomers also become confused by the behavior of the `change` event. To prevent this event from being sent to the field for every character the user types, any change to a field is determined only *after* the field loses focus by the user's clicking or tabbing away from it. At that point, instead of a `blur` event being sent to the field, only a `change` event is sent, triggering an `onChange` event handler if one is defined for the field. This extra burden of having to click or tab away from a field may entice you to shift any `onChange` event handler tasks to a separate button that the user must click to initiate action on the field contents.

Text Boxes and the Enter/Return Key

Early browsers established a convention that continues to this day. When a form consists of only one text box, a press of the Enter/Return key acts the same as clicking a Submit button for the form. You have probably experienced this many times when entering a value into a single search field of a form. Press the Enter/Return key, and the search request goes off to the server.

The flip side is that if the form contains more than one text box, the Enter/Return key does no submission from any of the text boxes (IE4 for the Mac is an exception: it submits no matter how many text boxes there are). But with the advent of keyboard events, you can script this action (or the invocation of a client-side script) into any text boxes of the form you like. To make it work with all flavors of browsers capable of keyboard events requires a small conversion function that extracts the DOM-specific desired code from the keystroke. The following listing shows a sample page that demonstrates how to implement a function that inspects each keystroke from a text field and initiates processing if the key pressed is the Enter/Return key.

```
<HTML>
<HEAD>
<TITLE>Enter/Return Event Trigger</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// Event object processor for NN4, IE4+, NN6
function isEnterKey(evt) {
    if (!evt) {
        // grab IE event object
        evt = window.event
    } else if (!evt.keyCode) {
        // grab NN4 event info
        evt.keyCode = evt.which
    }
    return (evt.keyCode == 13)
}

function processOnEnter(fld, evt) {
    if (isEnterKey(evt)) {
        alert("Ready to do some work with the form.")
        return false
    }
    return true
}
</SCRIPT>
</HEAD>

<BODY>
<H1>Enter/Return Event Trigger</H1>
<HR>
<FORM>
```

```
Field 1: <INPUT TYPE="text" NAME="field1"
onKeyDown="return processOnEnter(this,event)">
Field 2: <INPUT TYPE="text" NAME="field2"
onKeyDown="return processOnEnter(this,event)">
Field 3: <INPUT TYPE="text" NAME="field3"
onKeyDown="return processOnEnter(this,event)">
</FORM>
</BODY>
</HTML>
```

Notice that to accommodate the NN4+ event models, a reference to the `event` object must be passed as a parameter to the processing function. For more details on event handling, see Chapter 29.

Starting with NN4 and IE4, text fields also have event handlers for keyboard actions, namely `onKeyDown`, `onKeyPress`, and `onKeyUp`. With these event handlers, you can intercept keystrokes before the characters reach the text field. Thus, you can use keyboard events to prevent anything but numbers from being entered into a text box while the user types the characters.

Text field values and persistence

Text objects (including the related TEXTAREA object) have one unique behavior that can be very important to some document and script designs. Even if a default value is specified for the content of a field (in the `VALUE` attribute), any text entered into a field by a user or script persists in that field as long as the document is cached in the browser's memory cache (but Internet Explorer 3 has no such persistence). Therefore, if users of your page enter values into some fields, or your scripts display results in a field, all that data will be there later, even if the user performs a soft reload of the page or navigates to dozens of other Web pages or sites. Navigating back via the Go or Bookmarks menu entries causes the browser to retrieve the cached version (with its field entries). To force the page to appear with its default text object values, use the Open Location or Open File selections in the File menu, or script the `location.reload()` method. These actions cause the browser to load the desired page from scratch, regardless of the content of the cache. After you quit and relaunch the browser, the first time it goes to the desired page, the browser loads the page from scratch — with its default values.

This level of persistence is not as reliable as the `document.cookie` property because a user can reopen a URL at any time, thus erasing whatever was temporarily stored in a text or TEXTAREA object. Still, this method of temporary data storage may suffice for some designs. Unfortunately, you cannot completely hide a text object in case the data you want to store is for use only by your scripts. The `TYPE="hidden"` form element is not an alternative here because script-induced changes to its value do not persist across soft reloads.

If you prefer to use a text INPUT or TEXTAREA object as a storage medium but don't want users to see it, design the page to display in a non-resizable frame of height or width zero. Use proper frame references to store or retrieve values from the fields. Carrying out this task requires a great deal of work. The `document.cookie` may not seem so complicated after all that.

To extract the current content of a text object, summon the property `document.`*`formName`*`.`*`fieldName`*`.value`. After you have the string value, you can use JavaScript's string object methods to parse or otherwise massage that text as needed for your script. If the field entry is a number and you need to pass that value to methods requiring numbers, you have to convert the text to a number with the help of the `parseInt()` or `parseFloat()` global functions.

Properties

`defaultValue`

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Though your users and your scripts are free to muck with the contents of a `text` object by assigning strings to the value property, you can always extract (and thus restore, if necessary) the string assigned to the text object in its `<INPUT>` definition. The `defaultValue` property yields the string parameter of the `VALUE` attribute.

On the CD-ROM

Example (with Listing 25-1) on the CD-ROM

Related Items: `value` property.

`form`

Value: FORM object reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A property of every INPUT element object is a reference to the FORM element that contains the control. This property can be very convenient in a script when you are dealing with one form control that is passed as a parameter to the function and you want to either access another control in the same form or invoke a method of the form. An event handler of any INPUT element can pass `this` as the parameter, and the function can still get access to the form without having to hard-wire the script to a particular form name or document layout.

On the CD-ROM

Example on the CD-ROM

Related Items: FORM object.

maxLength

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `maxLength` property controls the maximum number of characters allowed to be typed into the field. There is no interaction between the `maxLength` and `size` properties. This value is normally set initially via the `MAXLENGTH` attribute of the INPUT element.

On the CD-ROM

Example on the CD-ROM

Related Items: `size` property.

name

Value: Identifier String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Text object names are important for two reasons. First, if your HTML page submits information to CGI scripts, the input device passes the name of the text object along with the data to help the server program identify the data being supplied by the form. Second, you can use a text object's name in its reference within JavaScript coding. If you assign distinctive, meaningful names to your fields, these names will help you read and debug your JavaScript listings (and will help others follow your scripting tactics).

Be as descriptive about your text object names as you can. Borrowing text from the field's on-page label may help you mentally map a scripted reference to a physical field on the page. Like all JavaScript object names, text object names must begin with a letter and be followed by any number of letters or numbers. Avoid punctuation symbols with the exception of the very safe underscore character.

Although I urge you to use distinctive names for all objects you define in a document, you can make a case for assigning the same name to a series of interrelated fields — and JavaScript is ready to help. Within a single form, any reused name for the same object type is placed in an indexed array for that name. For example, if you define three fields with the name entry, the following statements retrieve the value property for each field:

```
data = document.forms[0].entry[0].value
data = document.forms[0].entry[1].value
data = document.forms[0].entry[2].value
```

This construction may be useful if you want to cycle through all of a form's related fields to determine which ones are blank. Elsewhere, your script probably needs to know what kind of information each field is supposed to receive, so that it can process the data intelligently. I don't often recommend reusing object names, but you should be aware of how the object model handles them in case you need this construction. Unfortunately, IE3 does not turn like-named text input objects into arrays. See "Form Element Arrays" in Chapter 23 for more details.

On the CD-ROM

Example on the CD-ROM

Related Items: `form.elements` property; all other form element objects' `name` property.

readOnly

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

To display text in a text field yet prevent users from modifying it, newer browsers offer the `readOnly` property (and tag attribute). When set to `true`, the property prevents users from changing or removing the content of the text field. Unlike a disabled text field, a read-only text field looks just like an editable one.

For older browsers, you can partially simulate this behavior by including the following event handler in the INPUT element:

```
onFocus="this.blur()"
```

The event handler approach is not foolproof, however, in that quick-fingered users may be able to change a field before the event handler completes its task. For NN4, you can also trap for any keyboard events and prevent them from putting characters in the field.

On the CD-ROM

Example on the CD-ROM

Related Items: `disabled` property.

size

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Unless otherwise directed, a text box is rendered to accommodate approximately 20 characters of text for the font family and size assigned to the element's style sheet. You can adjust this under script control (in case the `SIZE` attribute of the tag wasn't enough) via the `size` property, whose value is measured in characters (not pixels). Be forewarned, however, that browsers don't always make completely accurate estimates of the space required to display a set number of characters. If you are setting the `MAXLENGTH` attribute of a text box, making the `SIZE` one or two characters larger is often a safe bet.

On the CD-ROM

Example on the CD-ROM

Related Items: `maxLength` property.

type

Value: String (`text`) Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓			✓	✓	✓	✓

Use the `type` property to help you identify a text input object from an unknown group of form elements.

Related Items: `form.elements` property.

value

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A text object's `value` property is the two-way gateway to the content of the field. A reference to an object's value property returns the string currently showing in the field. Note that all values coming from a text object are string values. If your field prompts a user to enter a number, your script may have to perform data conversion to the number-as-string value ("42" instead of plain, old 42) before a script can perform math operations on it. JavaScript tries to be as automatic about this data conversion as possible and follows some rules about it (see Chapter 34). If you see an error message that says a value is not a number (for a math operation), the value is still a string.

Your script places text of its own into a field for display to the user by assigning a string to the `value` property of a text object. Use the simple assignment operator. For example:

```
document.forms[0].ZIP.value = "90210"
```

JavaScript is more forgiving about data types when assigning values to a text object. JavaScript does its best to convert a value to a string on its way to a text object display. Even Boolean values get converted to their string equivalents `true` or `false`. Scripts can place numeric values into fields without a hitch. But remember that if a script later retrieves these values from the text object, they will come back as strings. About the only values that don't get converted are objects. They typically show up in text boxes as `[object]` or, in some browsers, a more descriptive label for the object.

Storing arrays in a field requires special processing. You need to use the `array.join()` method to convert an array into a string. Each array entry is delimited by a character you establish in the `array.join()` method. Later you can use the `string.split()` method to turn this delimited string into an array.

On the CD-ROM

Example (with Listings 25-2 and 25-3) on the CD-ROM

Related Items: `defaultValue` property.

Methods

blur()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Just as a camera lens blurs when it goes out of focus, a text object blurs when it loses focus — when someone clicks or tabs out of the field. Under script control, `blur()` deselects whatever may be selected in the field, and the text insertion pointer leaves the field. The pointer does not proceed to the next field in tabbing order, as it does if you perform a blur by tabbing out of the field manually.

On the CD-ROM

Example on the CD-ROM

Related Items: `focus()` method; `onBlur` event handler.

focus()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

For a text object, having focus means that the text insertion pointer is flashing in that text object's field (having focus means something different for buttons in a Windows environment). Giving a field focus is like opening it up for human editing.

Setting the focus of a field containing text does not let you place the cursor at any specified location in the field. The cursor usually appears at the beginning of the text (although in IE4+, you can use the `TextRange` object to position the cursor wherever you want in the field, as shown in Chapter 19). To prepare a field for entry to remove the existing text, use both the `focus()` and `select()` methods.

Note

The `focus()` method does not work reliably in Navigator 3 for UNIX clients. While the `select()` method selects the text in the designated field, focus is not handed to the field.

On the CD-ROM

Example on the CD-ROM

Related Items: `select()` method; `onFocus` event handler.

select()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Selecting a field under script control means selecting all text within the text object. A typical application is one in which an entry validation script detects a mistake on the part of the user. After alerting the user to the mistake (via a `window.alert()` dialog box), the script finishes its task by selecting the text of the field in question. Not only does this action draw the user's eye to the field needing attention (especially important if the validation code is checking multiple fields), but it also keeps the old text there for the user to examine for potential problems. With the text selected, the next key the user presses erases the former entry.

Trying to select a text object's contents with a click of a button is problematic. One problem is that a click of the button brings the document's focus to the button, which disrupts the selection process. For more ensured selection, the script should invoke both the `focus()` and the `select()` methods for the field, in that order. No penalty exists for issuing both methods, and the extra insurance of the second method provides a more consistent user experience with the page.

Internet Explorer for Windows is known to exhibit anomalous (meaning buggy) behavior when using the technique of focusing and selecting a text field after the appearance of an alert dialog box. The fix is not elegant, but it works: inserting an artificial delay via the `setTimeout()` method before invoking a separate function that focuses and selects the field. Better-behaved browsers accept the workaround with no penalty.

Selecting a text object via script does *not* trigger the same `onSelect` event handler for that object as the one that triggers if a user manually selects text in the field. Therefore, no event handler script is executed when a user invokes the `select()` method.

On the CD-ROM

Example (with Listing 25-4) on the CD-ROM

Related Items: `focus()` method; `onSelect` event handler.

Event handlers

onAfterUpdate
onBeforeUpdate
onErrorUpdate

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

If you are using IE/Windows data binding on a text element, the element is subject to three possible events in the course of retrieving updated data. The `onBeforeUpdate` and `onAfterUpdate` events fire immediately before and after (respectively) the update takes place. If an error occurs in the retrieval of data from the database, the `onErrorUpdate` event fires.

All three events may be used for advisory purposes. For example, an `onAfterUpdate` event handler may temporarily change the font characteristics of the element to signify the arrival of fresh data. Or an `onErrorUpdate` event handler may fill the field with hyphens because no valid data exists for the field. These events apply only to INPUT elements of type text (meaning not password or hidden types).

Related Items: `dataFld`, `dataSrc` properties (Chapter 15).

onBlur
onFocus
onSelect

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

All three of these event handlers should be used only after you have a firm understanding of the interrelationships of the events that reach text objects. You must use extreme care and conduct lots of user testing before including more than one of these three event handlers in a text object. Because some events cannot occur without triggering others either immediately before or after (for example, an `onFocus` occurs immediately before an `onSelect` if the field did not have focus before), whatever actions you script for these events should be as distinct as possible to avoid interference or overlap.

Note

The `onSelect` event handler does not work in Windows versions of NN at least through Version 4.

In particular, be careful about displaying modal dialog boxes (for example, `window.alert()` dialog boxes) in response to the `onFocus` event handler. Because the text field loses focus when the alert displays and then regains focus after the alert is closed, you can get yourself into a loop that is difficult to break out of. If you get trapped in this manner, try the keyboard shortcut for reloading the page (Ctrl+R or ⌘-R) repeatedly as you keep closing the dialog box window.

A question often arises about whether data-entry validation should be triggered by the `onBlur` or `onChange` event handler. An `onBlur` validation cannot be fooled, whereas an `onChange` one can be (the user simply doesn't change the bad entry as he or she tabs out of the field). What I don't like about the `onBlur` way is it can cause a frustrating experience for a user who wants to tab through a field now and come back to it later (assuming your validation requires data be entered into the field before submission). As in Chapter 43's discussion about form data validation, I recommend using `onChange` event handlers to trigger immediate data checking and then using another last-minute check in a function called by the form's `onSubmit` event handler.

On the CD-ROM

Example (with Listing 25-5) on the CD-ROM

onChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Of all the event handlers for a text object, you will probably use the `onChange` handler the most in your forms (see Listing 25-6). This event is the one I prefer for triggering the validation of whatever entry the user just typed in the field. The potential hazard of trying to do only a batch-mode data validation of all entries before submitting an entire form is that the user's mental focus is away from the entry of a given field as well. When you immediately validate an entry, the user is already thinking about the information category in question. See Chapter 43 for more about data-entry validation.

Note

In NN4 (only), if you have both `onChange` and any keyboard event handlers defined for the same text field tag, the `onChange` event handlers are ignored. This is not true for IE4, where all events fire.

On the CD-ROM

Example (with Listing 25-6) on the CD-ROM

Password Input Object

Properties	*Methods*	*Event Handlers*
See Text Input Object		

Syntax

See Text Input Object.

About this object

A password-style field looks like a text object, but when the user types something into the field, only asterisks or bullets (depending on your operating system) appear in the field. For the sake of security, any password exchanges should be handled by a server-side CGI program.

Many properties of the password object were blocked from scripted access in NN2. Scripts in later browsers can treat a password object exactly like a text INPUT object. This may lead a scripter to capture a user's Web site password for storage in the `document.cookie` of the client machine. A password object value property is returned in plain language, so that such a captured password would be stored in the cookie file the same way. Because a client machine's cookie file can be examined on the local computer (perhaps by a snoop during lunch hour), plain-language storage of passwords is a potential security risk. Instead, develop a scripted encryption algorithm for your page for reading and writing the password in the cookie. Most password-protected sites, however, usually have a CGI program on the server encrypt the password prior to sending it back to the cookie.

See the text object discussion for the behavior of password object's properties, methods, and event handlers. The `type` property for this object returns `password`.

Hidden Input Object

Properties	*Methods*	*Event Handlers*
See Text Input Object		

Syntax

See Text Input Object.

About this object

A hidden object is a simple string holder within a form object whose contents are not visible to the user of your Web page. Despite the long list of properties, methods, and event handlers that this input element type inherits by virtue of being an input element, you will be doing little with a hidden element beyond reading and writing its `value` property.

The hidden object plays a vital role in applications that rely on CGI programs on the server. Very often, the server has data that it needs to convey to itself the next time the client makes a submission (for example, a user ID captured at the application's login page). A CGI program can generate an HTML page with the necessary data hidden from the user but located in a field transmitted to the server at submit time.

Along the same lines, a page for a server application may present a user-friendly interface that makes data-entry easy for the user. But on the server end, the database or other application requires that the data be in a more esoteric format. A script located in the page generated for the user can use the `onSubmit` event handler to perform the last minute assembly of user-friendly data into database-friendly data in a hidden field. When the CGI program receives the request from the client, it passes along the hidden field value to the database.

I am not a fan of the hidden object for use on client-side-only JavaScript applications. If I want to deliver with my JavaScript-enabled pages some default data collections or values, I do so in JavaScript variables and arrays as part of the script.

Because scripted changes to the contents of a hidden field are fragile (for example, a soft reload erases the changes), the only place you should consider making such changes is in the same script that submits a form to a CGI program or in a function triggered by an `onSubmit` event handler. In effect, you're just using the hidden fields as holding pens for the scripted data to be submitted. For more persistent storage, use the `document.cookie` property or genuine text fields in hidden frames, even if just for the duration of the visit to the page.

For information about the properties of the hidden object, consult the earlier listing for the text input object. The `type` property for this object returns `hidden`.

TEXTAREA Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`cols`	`createTextRange()`	`onAfterUpdate†`
`form†`	`select()†`	`onBeforeUpdate†`
`name†`		`onChange`
`readOnly†`		`onErrorUpdate†`

Continued

Properties	Methods	Event Handlers
rows		
type†		
wrap		

† See text input object.

Syntax

Accessing TEXTAREA element object properties or methods:

```
(All)       [window.]document.formName.textareaName.property |
            method([parameters])
(All)       [window.]document.formName.elements[index].property |
            method([parameters])
(All)       [window.]document.forms[index].textareaName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].textareaName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].elements[index].property |
            method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

Although not in the same HTML syntax family as other <INPUT> elements of a form, a TEXTAREA object is indeed a form input element, providing multiple-line text input facilities. Although some browsers let you put a TEXTAREA element anywhere in a document, it really should be contained by a FORM element.

A TEXTAREA object closely resembles a text object, except for attributes that define its physical appearance on the page. Because the intended use of a TEXTAREA object is for multiple-line text input, the attributes include specifications for height (number of rows) and width (number of columns in the monospaced font). No matter what size you specify, the browser displays a textarea with horizontal and vertical scrollbars in older browsers; more recent browsers tend to be smarter about displaying scrollbars only when needed (although there are exceptions). Text entered in the textarea wraps within the visible rectangle of the field if you set the WRAP attribute to virtual or physical in NN and soft or hard in IE; otherwise the text scrolls for a significant distance horizontally (the horizontal scrollbar appears when wrapping has the default off setting). This field is, indeed, a primitive text field by GUI computing standards in that font specifications made possible in newer browsers by way of style sheets apply to all text in the box.

All properties, methods, and event handlers of text objects apply to the TEXTAREA object. They all behave exactly the same way (except, of course, for the type property, which is textarea). Therefore, refer to the previous listings for the text object for scripting details for those items. Discussed next are a handful of additional properties that are unique to the TEXTAREA object.

Carriage returns inside textareas

The three classes of operating systems supported by Netscape Navigator — Windows, Macintosh, and UNIX — do not agree about what constitutes a carriage return character in a text string. This discrepancy carries over to the TEXTAREA object and its contents on these platforms.

After a user enters text and uses Enter/Return on the keyboard, one or more unseen characters are inserted into the string. In the parlance of JavaScript's literal string characters, the carriage return consists of some combination of the new line (`\n`) and return (`\r`) character. The following table shows the characters inserted into the string for each operating system category.

Operating System	*Character String*
Windows	`\r\n`
Macintosh	`\r`
Unix	`\n`

This tidbit is valuable if you need to remove carriage returns from a textarea for processing in a CGI or local script. The problem is that you obviously need to perform platform-specific operations on each. For the situation in which you must preserve the carriage return locations, but your server-side database cannot accept the carriage return values, I suggest you use the `string.escape()` method to URL-encode the string. The return character is converted to `%0D` and the newline character is converted to `%0A`. Of course these characters occupy extra character spaces in your database, so these additions must be accounted for in your database design.

As far as writing carriage returns into textareas, the situation is a bit easier. From NN3 and IE4 onward, if you specify any one of the combinations in the preceding table, all platforms know how to automatically convert the data to the form native to the operating system. Therefore, you can set the value of a TEXTAREA object to `1\r\n2\r\n3` in all platforms, and a columnar list of the numbers 1, 2, and 3 will appear in those fields. Or, if you URL-encoded the text for saving to a database, you can unescape that character string before setting the textarea value, and no matter what platform the visitor has, the carriage returns are rendered correctly. Upon reading those values again by script, you can see that the carriage returns are in the form of the platform (shown in the previous table).

Properties

cols
rows

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The displayed size of a TEXTAREA element is defined by its `COLS` and `ROWS` attributes, which are represented in the object model by the `cols` and `rows` properties, respectively. Values for these properties are integers. For `cols`, the number represents the number of characters that can be displayed without horizontal scrolling of the textarea; for `rows`, the number is the number of lines of text that can be displayed without vertical scrolling.

On the CD-ROM

Example on the CD-ROM

Related Items: `wrap` property.

wrap

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `wrap` property represents the WRAP attribute, which, surprisingly, is not a W3C-sanctioned attribute as of HTML 4.0. In any case, IE4+ lets you adjust the property by scripting. Allowable string values are `soft`, `hard`, and `off`. The browser adds soft returns (the default in IE) to word-wrap the content, but no carriage return characters are actually inserted into the text. A setting for hard returns means that carriage return characters are added to the text (and would be submitted with the value to a server CGI). With wrap set to `off`, text continues to extend beyond the right edge of the textarea until the user manually types the Enter/Return key.

Related Items: `cols` property.

Methods

createTextRange()

Returns: `TextRange` object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `createTextRange()` method for a TEXTAREA operates just as the `document.createTextRange()` method, except that the range consists of text inside the TEXTAREA element, apart from the regular body content. This version of the `TextRange` object comes in handy when you want a script to control the location of the text insertion pointer inside a TEXTAREA element for the user.

On the CD-ROM

Example on the CD-ROM

Related Items: `TextRange` object (Chapter 19).

✦ ✦ ✦

CHAPTER 26

Select, Option, and FileUpload Objects

In This Chapter

Triggering action based on a user's selection in a pop-up or select list

Modifying the contents of SELECT objects

Using the fileUpload object

Selection lists — whether in the form of pop-up menus or scrolling lists — are space-saving form elements in HTML pages. They enable designers to present a lot of information in a comparatively small space. At the same time, users are familiar with the interface elements from working in their own operating systems' preference dialog boxes and application windows.

However, selection lists are more difficult to script, especially in older browsers, because the objects themselves are complicated entities. Scripts find all the real data associated with the form control in OPTION elements that are nested inside SELECT elements. As you can see throughout this chapter, backward-compatible references necessary to extract information from a SELECT element object and its OPTION objects can get pretty long. The results, however, are worth the effort.

The other object covered in this chapter, the fileUpload input object, is frequently misunderstood as being more powerful than it actually is. It is, alas, not the great file transfer elixir desired by many page authors.

SELECT Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`form`†	`options[i].add()`	`onChange`
`length`	`item()`	
`multiple`	`namedItem()`	
`name`†	`options[i].remove()`	
`options`		
`selectedIndex`		
`size`		
`type`		
`value`		

†See text input object (Chapter 25).

Syntax

Accessing SELECT element object properties:

```
(All)       [window.]document.formName.selectName.property |
            method([parameters])
(All)       [window.]document.formName.elements[index].property |
            method([parameters])
(All)       [window.]document.forms[index].selectName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].selectName.property |
            method([parameters])
(All)       [window.]document.forms["formName"].elements[index].property |
            method([parameters])
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

About this object

SELECT element objects are perhaps the most visually interesting user interface elements among the standard built-in objects. In one format, they appear on the page as pop-up lists; in another format, they appear as scrolling list boxes. Pop-up lists, in particular, offer efficient use of page real estate for presenting a list of choices for the user. Moreover, only the choice selected by the user shows on the page, minimizing the clutter of unneeded verbiage.

Compared with other JavaScript objects, SELECT objects are difficult to script — mostly because of the complexity of data that goes into a list of items. What the user sees as a SELECT element on the page consists of both that element and OPTION elements that contain the actual choices from which the user makes a selection. Some properties that are of value to scripters belong to the SELECT object, while others belong to the nested OPTION objects. For example, you can extract the number (index) of the currently selected option in the list — a property of the entire SELECT object. To get the displayed text of the selected option, however, you must zero in further to extract the `text` property of a single option among all options defined for the object.

When you define a SELECT object within a form, the construction of the `<SELECT>...</SELECT>` tag pair is easy to inadvertently mess up. First, most attributes that define the entire object — such as `NAME`, `SIZE`, and event handlers — are attributes of the opening `<SELECT>` tag. Between the end of the opening tag and the closing `</SELECT>` tag are additional tags for each option to be displayed in the list. The following object definition creates a selection pop-up list containing three color choices:

```
<FORM>
<SELECT NAME="RGBColors" onChange="changeColor(this)">
    <OPTION SELECTED>Red
    <OPTION>Green
    <OPTION>Blue
</SELECT>
</FORM>
```

The indented formatting of the tags in the HTML document is not critical. I indent the lines of options merely for the sake of readability.

By default, a SELECT element is rendered as a pop-up list. To make it appear as a scrolled list, assign an integer value greater than 1 to the `SIZE` attribute to specify how many options should be visible in the list without scrolling — how tall the list's box should be, measured in lines. Because scrollbars in GUI environments tend to require a fair amount of space to display a minimum set of clickable areas (including sliding "thumbs"), you should set list-box style sizes to no less than 4. If that makes the list box too tall for your page design, consider using a pop-up menu instead.

Significant differences exist in the way each GUI platform presents pop-up menus. Because each browser sometimes relies on the operating system to display its native pop-up menu style (and sometimes the browser designers go their own way), considerable differences exist among the OS and browser platforms in the size of a given pop-up menu. What fits nicely within a standard window width of one OS may not fit in the window of another OS in a different browser. In other words, you cannot rely on any SELECT object having a precise dimension on a page (in case you're trying to align a SELECT object with an image).

In list-box form, you can set a SELECT object to accept multiple, noncontiguous selections. Users typically accomplish such selections by holding down a modifier key (the Shift, Ctrl, or ⌘ key, depending on the operating system) while clicking additional options. To switch on this capability for a SELECT object, include the `MULTIPLE` attribute constant in the definition.

For each entry in a list, your `<SELECT>` tag definition must include an `<OPTION>` tag plus the text as you want it to appear in the list. If you want a pop-up list to show a default selection when the page loads, you must attach a `SELECTED` attribute to that item's `<OPTION>` tag. Without this attribute, the default item may be empty or the first item, depending on the browser. (I go more in depth about this in the OPTION object discussion later in this chapter.) You can also assign a string to each OPTION's `VALUE` attribute. As with radio buttons, this value can be text other than the wording displayed in the list. In essence, your script can act on that "hidden" value rather than on the displayed text, such as letting a plain-language select listing actually refer to a complex URL. This string value is also the value sent to a CGI program (as part of the name/value pair) when the user submits the SELECT object's form.

One behavioral aspect of the SELECT object may influence your page design. The `onChange` event handler triggers immediately when a user makes a new selection in a pop-up list (except in cases affected by a Navigator 2 bug on Windows versions). If you prefer to delay any action until the user makes other settings in the form, omit an `onChange` event handler in the SELECT object—but be sure to create a button that enables users to initiate an action governed by those user settings.

Modifying SELECT options (NN3+, IE4+)

Script control gives you considerable flexibility in modifying the contents and selection of a SELECT object. These powers are available only in NN3+ or IE4+. Some of this flexibility is rather straightforward, such as changing the *selectObj*`.options[i].text` property to alter the display of a single-option entry. The situation gets tricky, though, when the number of options in the SELECT object changes. Your choices include

✦ Removing an individual option (and thus collapsing the list)

✦ Reducing an existing list to a fewer number of options

✦ Removing all options

✦ Adding new options to a SELECT object

To remove an option from the list, set the specific option to `null`. For example, if a list contains five items and you want to eliminate the third item altogether (reducing the list to four items), the syntax (from the SELECT object reference) for doing that task is this:

```
selectObj.options[2] = null
```

After this statement, *selectObj*`.options.length` equals 4.

In another scenario, suppose that a SELECT object has five options in it and you want to replace it with one having only three options. You first must hard-code the `length` property to `3`:

```
selectObj.options.length = 3
```

Then, set individual `text` and `value` properties for index values `0` through `2`.

Perhaps you want to start building a new list of contents by completely deleting the original list (without harming the SELECT object). To accomplish this, set the `length` to `0`:

```
selectObj.options.length = 0
```

From here, you have to create new options (as you do when you want to expand a list from, say, three to seven options). The mechanism for creating a new option involves an object constructor: `new Option()`. This constructor accepts up to four parameters, which enable you to specify the equivalent of an `<OPTION>` tag's attributes:

- ✦ Text to be displayed in the option
- ✦ Contents of the option's `value` property
- ✦ Whether the item is the `defaultSelected` option (Boolean)
- ✦ Whether the item is selected (Boolean)

You can set any (or none) of these items as part of the constructor and return to other statements to set their properties. I suggest setting the first two parameters (leave the others blank) and then setting the `selected` property separately. The following is an example of a statement that creates a new, fifth entry in a SELECT object and sets both its displayed `text` and `value` properties:

```
selectObj.options[4] = new Option("Yahoo","http://www.yahoo.com")
```

To demonstrate all of these techniques, Listing 26-1 enables you to change the text of a SELECT object — first by adjusting the text properties in the same number of options and then by creating an entirely new set of options. Radio button `onClick` event handlers trigger functions for making these changes — rare examples of when radio buttons can logically initiate visible action.

Listing 26-1: **Modifying SELECT Options**

```
<HTML>
<HEAD>
<TITLE>Changing Options On The Fly</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// flag to reload page for older NNs
var isPreNN6 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) <= 4)

// initialize color list arrays
plainList = new Array(6)
hardList = new Array(6)
plainList[0] = "cyan"
hardList[0] = "#00FFFF"
plainList[1] = "magenta"
hardList[1] = "#FF00FF"
plainList[2] = "yellow"
hardList[2] = "#FFFF00"
plainList[3] = "lightgoldenrodyellow"
hardList[3] = "#FAFAD2"
plainList[4] = "salmon"
hardList[4] = "#FA8072"
plainList[5] = "dodgerblue"
hardList[5] = "#1E90FF"

// change color language set
function setLang(which) {
    var listObj = document.forms[0].colors
```

Continued

Listing 26-1 *(continued)*

```
    // filter out old browsers
    if (listObj.type) {
        // find out if it's 3 or 6 entries
        var listLength = listObj.length
        // save selected index
        var currSelected = listObj.selectedIndex
        // replace individual existing entries
        for (var i = 0; i < listLength; i++) {
            if (which == "plain") {
                listObj.options[i].text = plainList[i]
            } else {
                listObj.options[i].text = hardList[i]
            }
        }
        if (isPreNN6) {
            history.go(0)
        } else {
            listObj.selectedIndex = currSelected
        }
    }
}

// create entirely new options list
function setCount(choice) {
    var listObj = document.forms[0].colors
    // filter out old browsers
    if (listObj.type) {
        // get language setting
        var lang = (document.forms[0].geekLevel[0].checked) ? "plain" : "hard"
        // empty options from list
        listObj.length = 0
        // create new option object for each entry
        for (var i = 0; i < choice.value; i++) {
            if (lang == "plain") {
                listObj.options[i] = new Option(plainList[i])
            } else {
                listObj.options[i] = new Option(hardList[i])
            }
        }
        listObj.options[0].selected = true
        if (isPreNN6) {
            history.go(0)
        }
    }
}
```

```
</SCRIPT>
</HEAD>

<BODY>
<H1>Flying Select Options</H1>
<FORM>
Choose a palette size:
<INPUT TYPE="radio" NAME="paletteSize" VALUE=3
onClick="setCount(this)" CHECKED>Three
<INPUT TYPE="radio" NAME="paletteSize" VALUE=6
onClick="setCount(this)">Six
<P>
Choose geek level:
<INPUT TYPE="radio" NAME="geekLevel" VALUE=""
onClick="setLang('plain')" CHECKED>Plain-language
<INPUT TYPE="radio" NAME="geekLevel" VALUE=""
onClick="setLang('hard')">Gimme hex-triplets!
<P>
Select a color:
<SELECT NAME="colors">
    <OPTION SELECTED>cyan
    <OPTION>magenta
    <OPTION>yellow
</SELECT>
</FORM>
</BODY>
</HTML>
```

In an effort to make this code easily maintainable, the color choice lists (one in plain language, the other in hexadecimal triplet color specifications) are established as two separate arrays. Repeat loops in both large functions can work with these arrays no matter how big they get.

The first two radio buttons (see Figure 26-1) trigger the `setLang()` function. This function's first task is to extract a reference to the SELECT object to make additional references shorter (just `listObj`). Then by way of the `length` property, you find out how many items are currently displayed in the list because you just want to replace as many items as are already there. In the repeat loop, you set the `text` property of the existing SELECT options to corresponding entries in either of the two array listings.

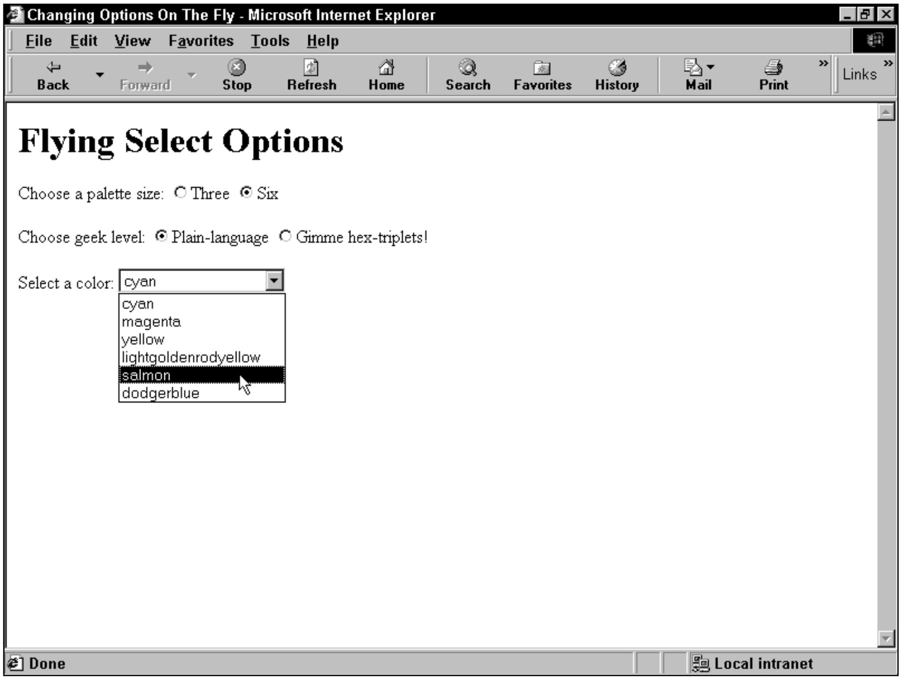

Figure 26-1: Radio button choices alter the contents of the SELECT object on the fly.

In the second pair of radio buttons, each button stores a value indicating how many items should be displayed when the user clicks the button. This number is picked up by the `setCount()` function and is used in the repeat loop as a maximum counting point. In the meantime, the function finds the selected language radio button and zeros out the SELECT object entirely. Options are rebuilt from scratch using the `new Option()` constructor for each option. The parameters are the corresponding display text entries from the arrays. Because none of these new options have other properties set (such as which one should be selected by default), the function sets that property of the first item in the list.

Notice that both functions call `history.go(0)` for NN3 and NN4 browsers after setting up their SELECT objects. The purpose of this call is to give these earlier Navigator versions an opportunity to resize the SELECT object to accommodate the contents of the list. The difference in size here is especially noticeable when you switch from the six-color, plain-language list to any other list. Without resizing, some long items are not readable. IE4+ and NN6, on the other hand, automatically redraw the page to the newly sized form element.

Modifying SELECT options (IE4+)

Microsoft offers another way to modify SELECT element options for IE4+, but the technique involves two proprietary methods of the `options` array property of the SELECT object. Because I cover all other ways of modifying the SELECT element in this section, I cover the IE way of doing things here as well.

The two `options` array methods are `add()` and `remove()`. The `add()` method takes one required parameter and one optional parameter. The required parameter is a reference to an OPTION element object that your script creates in another statement (using the `document.createElement()` method). If you omit the second parameter to `add()`, the new OPTION element is appended to the current collection of items. But you can also specify an index value as the second parameter. The index points to the position in the `options` array where the new item is to be inserted.

Listing 26-2 shows how to modify the two main functions from Listing 26-1 using the IE approach exclusively (changes and additions appear in bold). The script assumes that only IE browsers ever load the page (in other words, there is no filtering for browser brand here). When replacing one set of options with another, there are two approaches demonstrated. In the first (the `setLang()` function), the replacements have the same number of items, so the length of existing options provides a counter and index value for the `remove()` and `add()` methods. But when the number of items may change (as in the `setCount()` function), a tight loop removes all items before they are added back via the `add()` method without a second parameter (items are appended to the list). The approach shown in Listing 26-2 has no specific benefit over that of Listing 26-1.

Listing 26-2: **Modifying SELECT Options (IE4+)**

```
// change color language set
function setLang(which) {
    var listObj = document.forms[0].colors
    var newOpt
    // filter out old IE browsers
    if (listObj.type) {
        // find out if it's 3 or 6 entries
        var listLength = listObj.length
        // save selected index
        var currSelected = listObj.selectedIndex
        // replace individual existing entries
        for (var i = 0; i < listLength; i++) {
            newOpt = document.createElement("OPTION")
            newOpt.text = (which == "plain") ? plainList[i] : hardList[i]
            listObj.options.remove(i)
            listObj.options.add(newOpt, i)
        }
        listObj.selectedIndex = currSelected
    }
}

// create entirely new options list
function setCount(choice) {
    var listObj = document.forms[0].colors
    var newOpt
    // filter out old browsers
    if (listObj.type) {
        // get language setting
```

Continued

Listing 26-2 *(continued)*

```
        var lang = (document.forms[0].geekLevel[0].checked) ? "plain" : "hard"
        // empty options from list
        while (listObj.options.length) {
            listObj.options.remove(0)
        }
        // create new option object for each entry
        for (var i = 0; i < choice.value; i++) {
            newOpt = document.createElement("OPTION")
            newOpt.text = (lang == "plain") ? plainList[i] : hardList[i]
            listObj.options.add(newOpt)
        }
        listObj.options[0].selected = true
    }
}
```

Modifying SELECT options (W3C DOM)

Yet another approach is possible in browsers that closely adhere to the W3C DOM Level 2 standard. In NN6, for example, you can use the `add()` and `remove()` methods of the SELECT element object. They work very much like the same-named methods for the `options` array in IE4+, but these are methods of the SELECT element object itself. The other main difference between the two syntaxes is that the NN6 `add()` method does not use the index value as the second parameter but rather a reference to the OPTION element object before which the new option is inserted. The second parameter is required, so to simply append the new item at the end of the current list, supply `null` as the parameter. Listing 26-3 shows the W3C-compatible version of the SELECT element modification scripts shown in Listings 26-1 and 26-2. I highlight source code lines in bold that exhibit differences between the IE4+ and W3C DOM versions.

Listing 26-3: **Modifying SELECT Options (NN6+)**

```
// change color language set
function setLang(which) {
    var listObj = document.forms[0].colors
    var newOpt
    // filter out old IE browsers
    if (listObj.type) {
        // find out if it's 3 or 6 entries
        var listLength = listObj.length
        // save selected index
        var currSelected = listObj.selectedIndex
        // replace individual existing entries
        for (var i = 0; i < listLength; i++) {
            newOpt = document.createElement("OPTION")
            newOpt.text = (which == "plain") ? plainList[i] : hardList[i]
```

```
            listObj.remove(i)
            listObj.add(newOpt, listObj.options[i])
        }
        listObj.selectedIndex = currSelected
    }
}

// create entirely new options list
function setCount(choice) {
    var listObj = document.forms[0].colors
    var newOpt
    // filter out old browsers
    if (listObj.type) {
        // get language setting
        var lang = (document.forms[0].geekLevel[0].checked) ? "plain" : "hard"
        // empty options from list
        while (listObj.options.length) {
            listObj.remove(0)
        }
        // create new option object for each entry
        for (var i = 0; i < choice.value; i++) {
            newOpt = document.createElement("OPTION")
            newOpt.text = (lang == "plain") ? plainList[i] : hardList[i]
            listObj.add(newOpt, null)
        }
        listObj.options[0].selected = true
    }
}
```

As with the IE version, the W3C version offers no specific benefit over the original, backward-compatible approach. Choose the most modern one that fits the types of browsers you need to support with your page.

Properties

length

Value: Integer Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Like all JavaScript arrays, the `options` array has a `length` property of its own. But rather than having to reference the `options` array to determine its length, the SELECT object has its own `length` property that you use to find out how many items are in the list. This value is the number of options in the object. A SELECT object with three choices in it has a `length` property value of `3`.

In NN3+ and IE4+, you can adjust this value downward after the document loads. This is one way to decrease the number of options in a list. Setting the value to `0` causes the SELECT object to empty but not disappear.

Example on the CD-ROM

Related Item: `options` property.

`multiple`

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `multiple` property represents the `MULTIPLE` attribute setting for a SELECT element object. If the value is `true`, the element accepts multiple selections by the user (for example, Ctrl+clicking in Windows). If you want to convert a pop-up list into a multiple SELECT pick list, you must also adjust the `size` property to direct the browser to render a set number of visible choices in the list.

Example on the CD-ROM

Related Item: `size` property.

`options[`*`index`*`]`

Value: Array of OPTION element objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

You typically don't summon this property by itself. Rather, it is part of a reference to a specific option's properties (or methods in later browsers) within the entire SELECT object. In other words, the `options` property is a kind of gateway to more specific properties, such as the value assigned to a single option within the list. In early versions of NN, displaying an alert that referenced the `options` array showed the HTML for the options. But more recent browsers simply return an indication that the value is an object.

In newer browsers (IE4+ and NN6+), you can reference individual options as separate HTML element objects. These references do not require the reference to the containing FORM or SELECT element objects. For backward compatibility, however, I recommend you stick with the long references through the SELECT objects.

I list the next several properties here in the SELECT object discussion because they are backward-compatible with all browsers, including browsers that don't treat the OPTION element as a distinct object. Be aware that all properties shown here that include `options[`*`index`*`]` as part of their references are also properties of the OPTION element object in IE4+ and NN6+.

On the CD-ROM

Example on the CD-ROM

Related Items: All `options[index].property` items.

options[*index*].defaultSelected

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

If your SELECT object definition includes one option that features the `SELECTED` attribute, that option's `defaultSelected` property is set to `true`. The `defaultSelected` property for all other options is `false`. If you define a SELECT object that allows multiple selections (and whose `SIZE` attribute is greater than `1`), however, you can define the `SELECTED` attribute for more than one option definition. When the page loads, all items with that attribute are preselected for the user (even in noncontiguous groups).

On the CD-ROM

Example on the CD-ROM

Related Item: `options[index].selected` property.

options[*index*].index

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `index` value of any single option in a SELECT object likely is a redundant value in your scripting. Because you cannot access the option without knowing the index anyway (in brackets as part of the options[*index*] array reference), you have little need to extract the index value. The value is a property of the item just the same.

On the CD-ROM

Example on the CD-ROM

Related Item: options property.

options[*index*].selected

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

As mentioned earlier in the discussion of this object, better ways exist for determining which option a user selects from a list than looping through all options and examining the selected property. An exception to that "rule" occurs when you set up a list box to enable multiple selections. In this situation, the selectedIndex property returns an integer of only the topmost item selected. Therefore, your script needs to look at the true or false values of the selected property for each option in the list and determine what to do with the text or value data.

On the CD-ROM

Example (with Listing 26-4) on the CD-ROM

Related Items: options[index].text, options[index].value, selectedIndex properties.

options[*index*].text

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The text property of an option is the text of the item as it appears in the list. If you can pass that wording along with your script to perform appropriate tasks, this property is the one you want to extract for further processing. But if your processing requires other strings associated with each option, assign a VALUE attribute in the definition and extract the options[*index*].value property (see Listing 26-6).

On the CD-ROM

Example (with Listing 26-5) on the CD-ROM

Related Item: `options[index].value` property.

options[*index*].value

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

In many instances, the words in the options list appear in a form that is convenient for the document's users but inconvenient for the scripts behind the page. Rather than set up an elaborate lookup routine to match the `selectedIndex` or `options[index].text` values with the values your script needs, you can easily store those values in the `VALUE` attribute of each `<OPTION>` definition of the SELECT object. You can then extract those values as needed.

You can store any string expression in the `VALUE` attributes. That includes URLs, object properties, or even entire page descriptions that you want to send to a `parent.frames[index].document.write()` method.

Starting with IE4 and NN6, the SELECT element object itself has a `value` property that returns the `value` property of the selected option. But for backward compatibility, be sure to use the longer approach shown in the following example.

On the CD-ROM

Example (with Listing 26-6) on the CD-ROM

Related Item: `options[index].text` property.

selectedIndex

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

When a user clicks a choice in a selection list, the `selectedIndex` property changes to a zero-based number corresponding to that item in the list. The first item has a value of `0`. This information is valuable to a script that needs to extract the value or text of a selected item for further processing.

You can use this information as a shortcut to getting at a selected option's properties. To examine a SELECT object's `selected` property, rather than cycling through every option in a repeat loop, use the object's `selectedIndex` property to fill in the index value for the reference to the selected item. The wording gets kind of long; but from an execution standpoint, this methodology is much more efficient. Note, however, that when the SELECT object is a multiple-style, the `selectedIndex` property value reflects the index of only the topmost item selected in the list.

To script the selection of a particular item, assign an integer value to the SELECT element object's `selectedIndex` property, as shown in Listings 26-1 through 26-3.

On the CD-ROM

Example (with Listing 26-7) on the CD-ROM

Related Item: `options` property.

size

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `size` property represents the `SIZE` attribute setting for a SELECT element object. You can modify the integer value of this property to change the number of options that are visible in a pick list without having to scroll.

On the CD-ROM

Example on the CD-ROM

Related Item: `multiple` property.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Use the `type` property to help you identify a SELECT object from an unknown group of form elements. The precise string returned for this property depends on whether the SELECT object is defined as a single (`select-one`) or multiple (`select-multiple`) type.

Related Item: `form.elements` property.

value

Value: String Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The more recent browsers (and the W3C DOM) provide a `value` property for the SELECT element object. This property returns the string assigned to the `VALUE` attribute (or `value` property) of the currently selected OPTION element. If you do not assign a string to the attribute or property, the `value` property returns an empty string. For these browser generations, you can use this shortcut reference to the SELECT element object's `value` property instead of the longer version that requires a reference to the `selectedIndex` property and the `options` array of the element object.

If you assign a new string to this property (and that string does not match an existing option value), IE accepts the new `value` property and displays an empty item in the list. While this property is technically read/write also in NN6, assigning a string to this property does not override the string returned based on the user selection.

On the CD-ROM

Example on the CD-ROM

Related Item: `options[index].value` property.

Methods

options[*index*].add(*elementRef*[, *index*])
options[*index*].remove()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These two IE-specific methods belong to the `options` array property of a SELECT element object. See the discussion at the opening of the SELECT element object earlier in this chapter to see how to use these methods and their counterparts in other browser versions and object models.

item(*index*)
namedItem("*optionID*")

Returns: OPTION element reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `item()` and `namedItem()` methods are Netscape-specific convenience methods that access OPTION element objects nested inside a SELECT object. In a sense, they provide shortcuts to referencing nested options without having to use the `options` array property and the indexing within that array.

The parameter for the `item()` method is an index integer value. For example, the following two statements refer to the same OPTION element object:

```
document.forms[0].mySelect.options[2]
document.forms[0].mySelect.item(2)
```

If your script knows the ID of an OPTION element, then it can use the `namedItem()` method, supplying the string version of the ID as the parameter, to return a reference to that option element.

Example on the CD-ROM

Related Item: `options` property.

Event handlers

onChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

As a user clicks a new choice in a SELECT object, the object receives a `change` event that the `onChange` event handler can capture. In examples earlier in this section (Listings 26-6 and 26-7, for example), the action is handed over to a separate button. This design may make sense in some circumstances, especially when you use multiple SELECT lists or any list box. (Typically, clicking a list box item does not trigger any action that the user sees.) But for most pop-up menus, triggering the action when the user makes a choice is desirable.

To bring a pop-up menu to life, add an `onChange` event handler to the `<SELECT>` definition. If the user makes the same choice as previously selected, the `onChange` event handler is not triggered. In this case, you can still trigger an action via the `onClick` event handler; but this event works for the SELECT object only in IE4+ and NN6+.

Note

A bug in the Windows versions of Navigator 2 (only) causes the `onChange` event handler in SELECT objects to fail unless the user clicks outside the SELECT object. If your audience includes users of these browsers, then consider adding a special routine that employs `document.write()` to include a "do nothing" button next to the SELECT object. This button should entice the user to click out of the SELECT object. The `onChange` event handler fires at a click of that button (or any other location on the page).

On the CD-ROM

Example (with Listing 26-8) on the CD-ROM

OPTION Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***MethodsEvent Handlers***
`defaultSelected`	
`form†`	
`label`	
`selected`	
`text`	
`value`	

†See text input object (Chapter 25).

Syntax

Accessing OPTION object properties:

```
(All)        [window.]document.formName.selectName.options[index].property |
             method([parameters])
(All)        [window.]document.formName.elements[index].options[index].property |
              method([parameters])
(All)        [window.]document.forms[index].selectName.options[index].property |
             method([parameters])
(All)        [window.]document.forms["formName"].selectName.
             options[index].property | method([parameters])
(All)        [window.]document.forms["formName"].elements[index].
             options[index].property | method([parameters])
(IE4+)       [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6+)  [window.]document.getElementById("elemID").property |
             method([parameters])
(NN6)        [window.]document.forms[index].selectName.item(index).property |
             method([parameters])
(NN6)        [window.]document.forms["formName"].selectName.namedItem(elemID).
             property | method([parameters])
```

About this object

OPTION elements are nested inside SELECT elements. Each option represents an item in the list of choices presented by the SELECT element. Properties of the OPTION element object let scripts inspect whether a particular option is currently selected or is the default selection. Other properties enable you to get or set the hidden value associated with the option as well as the visible text. For more details about the interaction between the SELECT and OPTION element objects, see the discussion about the SELECT object earlier in this chapter as well as the discussion of the properties and methods associated with the `options` array returned by the SELECT object's `options` property.

I discuss all backward-compatible OPTION object properties (`defaultSelected`, `selected`, `text`, and `value`) among the `options` property descriptions in the SELECT object section. The only items listed in this section are those that are unique to the OPTION element object defined in newer browsers.

In NN3+ and IE4+, there is a provision for creating a new `option` object via an `Option` object constructor function. The syntax is as follows:

```
var newOption = new Option("text","value")
```

Here, *text* is the string that is displayed for the item in the list, and *value* is the string assigned to the `value` property of the new option. This new `option` object is not added to a SELECT object until you assign it to a slot in the `options` array of the SELECT object. You can see an example of this approach to modifying options in Listing 26-1.

Properties

`label`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	

The `label` property corresponds to the HTML 4.0 `LABEL` attribute of an OPTION element. This attribute (and property) enables you to assign alternate text for an option. The property is implemented in IE5/Mac and NN6.

In IE5/Mac, any string assigned to the `LABEL` attribute or corresponding property overrides the display of text found between the start and end tags of the OPTION element. Therefore, you can assign content to both the attribute and tag, but only browsers adhering to the HTML 4.0 standard for this element display the value assigned to the label. While the `label` property is implemented in NN6, the browser does not modify the option item's text to reflect the property's setting.

On the CD-ROM

Example on the CD-ROM

Related Item: `text` property.

OPTGROUP Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`form`†		
`label`		

†See text input object (Chapter 25).

Syntax

Accessing OPTGROUP object properties:

```
(IE5/Mac)   [window.]document.all.elemID".property | method([parameters])
(NN6)       [window.]document.getElementById("elemID").property |
            method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)				(✓)	

About this object

An OPTGROUP element in the HTML 4.0 specification enables authors to group options into subgroups within a SELECT list. The label assigned to the OPTGROUP element is rendered in the list as a non-selectable item, usually differentiated from the selectable items by some alternate display. In NN6, OPTGROUP items by default are shown in bold italic, while all OPTION elements nested within an OPTGROUP are indented but with normal font characteristics. The OPTGROUP element object has fewer properties, methods, and event handlers than most elements because (as of this writing) it is not part of the IE DOM in Windows versions — although it is implemented in IE5/Mac to provide nicely formatted hierarchical menus.

Browsers not recognizing this element ignore it. All options are presented as if the OPTGROUP elements are not there.

Properties

`label`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)				(✓)	

The `label` property corresponds to the HTML 4.0 `LABEL` attribute of an OPTGROUP element. This attribute (and property) enables you to assign text to the label that encompasses a group of nested OPTION elements in the pop-up list display.

Note

IE5/Mac exhibits a bug that prevents scripts from assigning values to the last OPTGROUP element inside a SELECT element.

On the CD-ROM

Example (with Listing 26-9) on the CD-ROM

Related Item: `OPTION.label` property.

File Input Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
defaultValue†	select()†	onchange†
form†		
name†		
readOnly†		
size†		
type†		
value†		

†See text input object (Chapter 25).

Syntax

Accessing file INPUT element object properties:

```
(NN3+/IE4+)    [window.]document.formName.inputName.property |
               method([parameters])
(NN3+/IE4+)    [window.]document.formName.elements[index].property |
               method([parameters])
(NN3+/IE4+)    [window.]document.forms[index].inputName.property |
               method([parameters])
(NN3+/IE4+)    [window.]document.forms["formName"].inputName.property |
               method([parameters])
(NN3+/IE4+)    [window.]document.forms["formName"].elements[index].property |
               method([parameters])
(IE4+)         [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)     [window.]document.getElementById("elemID").property |
               method([parameters])
```

About this object

Some Web sites enable you to upload files from the client to the server, typically by using a form-style submission to a CGI program on the server. The INPUT element whose type is set to `"file"` (also known as a fileUpload object) is merely a user interface that enables users to specify which file on their PC they want to upload. Without a server process capable of receiving the file, the file input element does nothing. Moreover, you must also set two FORM element attributes as follows:

```
METHOD="POST"
ENCTYPE="multipart/form-data"
```

This element displays a field and a Browse button. The Browse button leads to an Open file dialog box (in the local operating system's interface vernacular) where a user can select a file. After you make a selection, the filename (or pathname, depending on the operating system) appears in the file input element's field. The `value` property of the object returns the filename.

You do not have to script much for this object on the client side. The `value` property, for example, is read-only in earlier browsers; in addition, a form cannot surreptitiously upload a file to the server without the user's knowledge or consent.

Listing 26-10 helps you see what the element looks like. The syntax is compatible in NN3+ and IE4+.

Listing 26-10: **File Input Element**

```
<HTML>
<HEAD>
<TITLE>FileUpload Object</TITLE>
</HEAD>
<BODY>
<FORM METHOD="POST" ACTION="yourCGIURL" ENCTYPE="multipart/form-data">
File to be uploaded:
<INPUT TYPE="file" SIZE=40 NAME="fileToGo"><P>
<INPUT TYPE="button" VALUE="View Value"
onClick="alert(this.form.fileToGo.value)">
</FORM>
</BODY>
</HTML>
```

In a true production environment, a Submit button and a URL to your CGI process are specified for the `ACTION` attribute of the `<FORM>` tag.

✦ ✦ ✦

27

CHAPTER

Table and List Objects

In This Chapter

Modifying table cell content

Adding and deleting table rows

TABLE, CAPTION, TBODY, TFOOT, THEAD, COL, COLGROUP, TH, TR, and TD element objects

OL, UL, LI, and DL list element objects

Tables are incredibly popular HTML constructions. When you consider that a lot of CGI programs search SQL databases and display data gathered from SQL tables, it's not unusual to find the table concept carried over from data storage to data display. Spreadsheet programs certainly put the notion of tabular display into the minds of most computer users.

One of the truly beneficial properties of tables in HTML is that they pack a lot of page organization and alignment punch in just a few tags and attributes. Even if you're not a graphics designer or a dedicated HTML jockey, you can get rows and columns of text and images to line up perfectly on the page. This behavior also lures many page designers to sculpt elaborately detailed pages out of what appear to be positioned elements. Earlier browsers didn't offer positioning facilities, so borderless tables were torqued into performing all kinds of placement tricks with the help of precisely sized, transparent images creating the illusion of white space between carefully placed elements. If you use some of the WYSIWYG authoring tools for HTML pages, you may not realize how much table-related HTML code is generated for you as you use the tool to drag an image to a particular location on the page.

Someone probably could write an entire book on the HTML aspects of tables by themselves, especially when taking into account the variability of rendering that can occur. But that's not the task at hand. The first part of this chapter focuses on the scriptable aspects of TABLE element objects and the shopping list of elements that support tables. All of these objects became scriptable objects in browsers starting with IE4 and NN6. Later in the chapter, I discuss element objects that create formatted lists in pages.

The Table Object Family Hierarchy

The repertoire of table-related elements expanded a bit with the HTML 4.0 specification, and the W3C DOM built upon that foundation. While most of this discussion is best left to HTML texts, the structure of a full-fledged table and the relationships among the elements — particularly the parent-child relationships — may affect your scripting and event handling.

You are probably well familiar with the most basic table structure that predates HTML 4.0. Such a table (in a 2×2 layout) can have the following form:

```
<TABLE>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
</TABLE>
```

If you want to place a row of cells at the top of each column such that the contents of the cells act as headers for each column, then add such a row as follows:

```
<TABLE>
    <TR>
        <TH></TH>
        <TH></TH>
    </TR>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
</TABLE>
```

You can also include a caption associated with the table. Its tag goes immediately after the TABLE element's start tag:

```
<TABLE>
    <CAPTION></CAPTION>
    <TR>
        <TH></TH>
        <TH></TH>
    </TR>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
    <TR>
        <TD></TD>
        <TD></TD>
    </TR>
</TABLE>
```

In line with its emphasis on providing contextual tags, HTML 4.0 includes three tags that enable you to define groups of table rows according to whether they are the header, body, or footer of the table (THEAD, TBODY, and TFOOT elements, respectively). A table footer, for example, can display column totals. The only seemingly illogical rule about these elements is that you should define the TFOOT element and its row contents before the TBODY element(s) in the table. Even with this source code placement, the TFOOT row appears at the bottom of the table.

Some browsers produce visual dividers between these sections (IE5+ for Windows does a nice job of this). Moreover, you can have multiple TBODY sections within a table. Some browsers render dividers between these TBODY sections (again, IE5+ for Windows does it well). Regardless of the built-in divider support, these contextual groupings also enable you to assign style sheets to HTML tag selectors rather than having to dream up a scheme of class and ID names tied to style sheet rules. Building upon the skeletal table shown thus far, you add the THEAD and TBODY elements like this:

```
<TABLE>
    <CAPTION></CAPTION>
    <THEAD>
        <TR>
            <TH></TH>
            <TH></TH>
        </TR>
    </THEAD>
    <TBODY>
        <TR>
            <TD></TD>
            <TD></TD>
        </TR>
        <TR>
            <TD></TD>
            <TD></TD>
        </TR>
    </TBODY>
</TABLE>
```

That's the extent of table-oriented HTML containers. The remaining two elements, COLGROUP and COL, provide a different "slice" of the table for style sheets and other visual groupings. One of the most obvious purposes of these two elements is to assign a width or other style to all cells in a particular column or group of columns. You can also use these elements to group adjacent columns so that dividers are drawn between groups of columns — if the browser (such as IE5+ for Windows) supports dividers between column groups — without specifying global table borders. You can see an example of the HTML for a complex table in the HTML 4.0 specification (`http://www.w3.org/TR/REC-html40/struct/tables.html#h-11.5`). Elsewhere on that same page, you can find the formal specification for all table-related tags and attributes as defined by the W3C.

Populating table cells

Source material for a table's content can come from many different places. Most of the tables you see on the Web are hard-coded in the HTML. That is to say, the content of the table is fixed inside a static HTML file on the server.

But tables may also convey content from live databases or content that changes more frequently than the Web site's author manually updates other content. The source and your Web development infrastructure (not to mention your technical skills) dictate other avenues for populating tables.

After hard-coded HTML files, the next most common way to generate tables is through server-based CGI programs. These programs (written in Perl, C, and many other languages, including server-side JavaScript on those few servers that support it) generally compose a query for the database and then repackage the data returned from the database into HTML-formatted pages.

A more client-side-oriented approach is to let JavaScript apply the `document.write()` method to compose the table's tags as the page loads. Data for the cells can come from JavaScript arrays defined at the beginning of the document or defined in external `.js` library files that are linked in as the page loads. In the newest browsers, the data may come from blocks of XML-formatted data stuffed into the document. These solutions can work in situations where you need to update the table data periodically, but the table delivered to the client does not reflect the instantaneous state of a database. For example, a daily batch program on a server can capture the day's sales totals and write out a `.js` text file to a known place on the server. The file consists entirely of JavaScript array definitions. When the HTML page loads, the current `.js` file is automatically loaded into the page, and `document.write()` statements compose the table's HTML from the data supplied in the arrays. While the script that assembles the HTML for the tables might appear formidable to a nonscripter, a nonscripter can also manually update the array data by following a template format supplied by the programmer.

Finally, if your page visitors run IE4+ for Windows (only), you can take advantage of a Windows-specific technology called *data binding*. Data binding invokes the powers of one or more ActiveX controls that come with the IE browser. These objects (collectively called Data Source Objects) let HTML pages access ODBC databases (as well as some formatted text files). As the page loads, the table fills with data pulled live from the database. You can see an example of data binding in Chapter 15 under the description of the data binding property: `dataFld`. The HTML file carries tags for only one row of cells, but data binding fills in the rest of the rows and cells.

Modifying table cell content

You can modify the HTML content of a table cell directly in IE4+ and NN6+. Some tricks with positioned elements in NN4 can, under some circumstances, make it appear to the user as if the table content is being modified.

By far, the most compatible way to modify a table cell's content in IE4+ and NN6+ is via the TD element's `innerHTML` property (a Microsoft invention that is not sanctioned by the W3C DOM Level 2 but is supported in NN6). Even if the content is simply text that is to inherit the style format of the surrounding TD element, you can still use the `innerHTML` property. If the size of the new content affects the dimensions of the cell's column width or row height, the browser reflows the rest of the table content around the new content.

If you prefer to follow the W3C DOM form of modifying an element's content (for IE5+ and NN6), then you can generate the new content via the `document.createElement()` sequence and assign that new content to the cell by way of the TD element's `replaceChild()` method.

The situation for NN4 is quite gnarled because the content you replace must be within its own layer (either a LAYER element or positioned container element, such as a DIV or SPAN). No matter how you create the layer in your HTML, you must overcome the problem that a layer floats in its own plane and must be positioned precisely where the table cell is. Table cells are not objects in NN4, so you must create a positioning context in the cell by first creating a relative-positioned layer that can contain nothing more than an "invisible" nonbreaking space character (` `). The layer displaying the content must be absolute-positioned with respect to that relative-positioned layer. Nesting of layers in NN4 causes headaches, especially when scripts reference the deeply nested content — content that is, essentially, an HTML document inside the nested layer.

Listing 27-1 shows a synthesis of different techniques to effect cell content replacement, including script code branches that emulate the appearance of replacement in NN4. The table represents only one line of what might be an order form for several products. As the user makes a selection of the quantity, the extended total is displayed in the rightmost column.

You can find the key features of the NN4 implementation in the script that dynamically writes the table cell content within the HTML as the page loads. The cell begins with a relative-positioned SPAN element. This SPAN is positioned at the top left of the table cell, as planned. That spot now is the positioning context for the absolute-positioned SPAN nested inside it. This second span is the layer whose document contains the displayed content. The content, itself, is yet another SPAN element because it simplifies the application of a style sheet rule (to display the total in red) when you replace the content. Because a newly written NN4 layer does not inherit the style sheet of its next outermost layer, you must apply the style as part of the new content.

The initial SPAN content contains a series of nonbreaking space characters that force NN4 to open space for eventual replacement content. Recall that an NN4 page does not reflow the page to accommodate resized content. This means that whatever you intend to insert in the table cell can be no larger than the original space allocated for it.

Although the page shown in Listing 27-1 consists of only one row of data, the scripts and naming conventions are intended to be carried out among multiple rows. The product name appears in several object names and IDs in each row, and the scripts count on the convention being followed throughout. In fact, the regularity of the namings can allow the content for a table's row to form a script function that is invoked for each table row. The product code name can be passed as the parameter, and all object names and IDs can be assembled in that function. The regularity of table content often lends itself to script-generated construction.

Note

For NN4, when the table gets complicated, you will have more success defining the absolute-positioned elements outside of the table entirely. They should be defined on their own at the bottom of the BODY. You can still position them with respect to the relative-positioned elements in the table, but all such layers are now only one level deep within the main document.

Listing 27-1: Replacing Table Cell Content

```
<HTML>
<HEAD>
<TITLE>Modifying Table Cell Content</TITLE>
<STYLE TYPE="text/css">
.absoluteWrap {position:absolute}
.relativeWrap {position:relative}
.total {color:red}
</STYLE>

<SCRIPT LANGUAGE="JavaScript">
var Ver4 = parseInt(navigator.appVersion) == 4
var Ver4Up = parseInt(navigator.appVersion) >= 4
var Nav4 = ((navigator.appName == "Netscape") && Ver4)
var modifiable

// calculate and display a row's total
function showTotal(qtyList) {
    var qty = qtyList.options[qtyList.selectedIndex].value
    var prodID = qtyList.name
    var total = "US$" +
        (qty * parseFloat(qtyList.form.elements[prodID + "Price"].value))
    var newCellHTML = "<SPAN CLASS='total'>" + total + "</SPAN>"

    if(Nav4) {
        document.layers[prodID + "TotalWrapper"].document.layers[prodID +
            "Total"].document.write(newCellHTML)
        document.layers[prodID + "TotalWrapper"].document.layers[prodID +
            "Total"].document.close()
    } else if (modifiable) {
        if (document.all) {
            document.all(prodID + "Total").innerHTML = newCellHTML
        } else {
            document.getElementById(prodID + "Total").innerHTML = newCellHTML
        }
    }
}

// initialize global flag for browsers capable of modifiable content
function init() {
    modifiable  = (Ver4Up && document.body && document.body.innerHTML)
}

// display content for all products (e.g., in case of Back navigation)
function showAllTotals(form) {
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].type == "select-one") {
            showTotal(form.elements[i])
        }
    }
}
</SCRIPT>
</HEAD>
```

```
<BODY onLoad="init(); showAllTotals(document.orderForm)">
<H1>Modifying Table Cell Content</H1>
<HR>
<FORM NAME="orderForm">
<TABLE BORDER=1>
<COLGROUP WIDTH=150>
<COLGROUP WIDTH=100>
<COLGROUP WIDTH=50>
<COLGROUP WIDTH=100
<TR>
    <TH>Product Description</TH>
    <TH>Price Each</TH>
    <TH>Quantity</TH>
    <TH>Total</TH>
</TR>
<TR>
    <TD>Wonder Widget 9000</TD>
    <TD>US$125.00</TD>
    <TD><SELECT NAME="ww9000" onChange="showTotal(this)">
        <OPTION VALUE="0">0
        <OPTION VALUE="1">1
        <OPTION VALUE="2">2
        <OPTION VALUE="3">3
        </SELECT>
        <INPUT TYPE="hidden" NAME="ww9000Price" VALUE="125.00"></TD>
    <TD>
    <SCRIPT LANGUAGE="JavaScript">
    if (Nav4) {
        var placeHolder = "        "
        placeHolder += "       "
        document.write("<SPAN ID='ww9000TotalWrapper' CLASS='relativeWrap'>")
        document.write("<SPAN ID='ww9000Total' CLASS='absoluteWrap'></SPAN>")
        document.write("<SPAN>" + placeHolder + "</SPAN></SPAN>")
    } else {
        document.write("<SPAN ID='ww9000Total' CLASS='relativeWrap'>" +
          "<P> </P></SPAN>")
    }
    </SCRIPT>
    </TD>
</TR>
</TABLE>
</FORM>
</BODY>
</HTML>
```

Modifying table rows

In IE4+ and NN6+, all table-related elements are full-fledged objects within the browser's object model. This means that you are free to use your choice of DOM element modification techniques on the row and column makeup of a table. But due to the frequent complexity of tables and all of their nested elements, the code required to manage a table can balloon in size. To the rescue come some methods that enable you to add and remove rows and cells from a table. Despite minor differences in the implementations of these methods across DOMs, the syntax exhibits sufficient unanimity to allow one set of code to work on both browsers — especially for adding elements to a table.

Table 27-1 provides a quick summary of the key methods used to add or remove elements within a TABLE, a table section (THEAD, TBODY, or TFOOT), and a row (TR). For simple tables (in other words, those that do not define THEAD or TFOOT segments), you can work exclusively with the row modification methods of the TABLE element object (and then the cell modification methods of the rows within the TABLE element). The reason for the duplication of the row methods in the table section objects is that instead of having to worry about row index numbers lining up among the combined total of head, body, and foot rows, you can treat each segment as a distinct unit. For example, if you want to add a row just to the beginning of the TFOOT section, you can use the `insertRow()` method for the TFOOT element object and not have to count up the TR elements and perform arithmetic to arrive at the desired row number. Instead, simply use the `insertRow()` method on the TFOOT element object and supply the method with parameters that ensure the row is inserted as the first row of the element.

Note

IE5 for the Macintosh offers unpredictable results when inserting rows of a table via these methods. The browser does behave when modifying the HTML elements by accumulating the HTML for a row as a string and then adding the row to the table via IE DOM methods such as `insertAdjacentHTML()`. If your pages must modify the composition of tables after the page loads — and your audience includes IE5/Mac users — then use the element and node insertion techniques rather than the methods shown in Table 27-1 and techniques described next.

Table 27-1 IE4+ and NN6 Table Modification Methods

TABLE	*THEAD, TBODY, TFOOT*	*TR*
`insertRow()`	`insertRow()`	`insertCell()`
`deleteRow()`	`deleteRow()`	`deleteCell()`
`createTHead()`		
`deleteTHead()`		
`createTFoot()`		
`deleteTFoot()`		
`createCaption()`		
`deleteCaption()`		

The basic sequence for inserting a row into a table entails the following steps:

1. Invoke `insertRow()` and capture the returned reference to the new, unpopulated row.
2. Use the reference to the row to invoke `insertCell()` for each cell in the row, capturing the returned reference to each new, unpopulated cell.
3. Assign values to properties of the cell, including its content.

The following code fragment appends a new row to a table (`myTABLE`) and supplies information for the two cells in that row:

```
// parameter of -1 appends to table
// (you can use document.all.myTABLE.insertRow(-1) for IE4+ only)
var newRow = document.getElementById("myTABLE").insertRow(-1)
// parameter of 0 inserts at first cell position
var newCell = newRow.insertCell(0)
newCell.innerHTML = "Mighty Widget 2000"
// parameter of 1 inserts at second cell position
newCell = newRow.insertCell(1)
newCell.innerHTML = "Release Date TBA"
```

A key point to note about this sequence is that the `insertRow()` and `insertCell()` methods do their jobs before any content is handed over to the table. In other words, you first create the HTML space for the content and then add the content.

Listing 27-2 presents a living environment that adds and removes THEAD, TR, and TFOOT elements to an empty table in the HTML. The only subelement inside the TABLE element is a TBODY element, which directs the insertion of table rows so as not to disturb any existing THEAD or TFOOT elements. You can also see how to add or remove a caption from a table via caption-specific methods.

Note

The first release version of NN6 does not behave well when scripts excessively modify tables. After some scripted changes, the browser reflows the page while ignoring TABLE element attributes, such as `CELLSPACING`.

Each table row consists of the hours, minutes, seconds, and milliseconds of a time stamp generated when you add the row. The color of any freshly added row in the TBODY is a darker color than the normal TBODY rows. This is so you can see what happens when you specify an index value to the `insertRow()` method. Some of the code here concerns itself with enabling and disabling form controls and updating SELECT elements, so don't be deterred by the length of Listing 27-2.

Listing 27-2: **Inserting/Removing Row Elements**

```
<HTML>
<HEAD>
<TITLE>Modifying Table Cell Content</TITLE>
<STYLE TYPE="text/css">
```

Continued

Listing 27-2 *(continued)*

```
THEAD {background-color:lightyellow; font-weight:bold}
TFOOT {background-color:lightgreen; font-weight:bold}
#myTABLE {background-color:bisque}
</STYLE>

<SCRIPT LANGUAGE="JavaScript">
var theTable, theTableBody
function init() {
    theTable = (document.all) ? document.all.myTABLE :
        document.getElementById("myTABLE")
    theTableBody = theTable.tBodies[0]
}
function appendRow(form) {
    insertTableRow(form, -1)
}

function addRow(form) {
    insertTableRow(form, form.insertIndex.value)
}

function insertTableRow(form, where) {
    var now = new Date()
    var nowData = [now.getHours(), now.getMinutes(), now.getSeconds(),
        now.getMilliseconds()]
    clearBGColors()
    var newCell
    var newRow = theTableBody.insertRow(where)
    for (var i = 0; i < nowData.length; i++) {
        newCell = newRow.insertCell(i)
        newCell.innerHTML = nowData[i]
        newCell.style.backgroundColor = "salmon"
    }
    updateRowCounters(form)
}

function removeRow(form) {
    theTableBody.deleteRow(form.deleteIndex.value)
    updateRowCounters(form)
}

function insertTHEAD(form) {
    var THEADData = ["Hours","Minutes","Seconds","Milliseconds"]
    var newCell
    var newTHEAD = theTable.createTHead()
    newTHEAD.id = "myTHEAD"
    var newRow = newTHEAD.insertRow(-1)
    for (var i = 0; i < THEADData.length; i++) {
        newCell = newRow.insertCell(i)
        newCell.innerHTML = THEADData[i]
    }
```

```
    updateRowCounters(form)
    form.addTHEAD.disabled = true
    form.deleteTHEAD.disabled = false
}

function removeTHEAD(form) {
    theTable.deleteTHead()
    updateRowCounters(form)
    form.addTHEAD.disabled = false
    form.deleteTHEAD.disabled = true
}

function insertTFOOT(form) {
    var TFOOTData = ["Hours","Minutes","Seconds","Milliseconds"]
    var newCell
    var newTFOOT = theTable.createTFoot()
    newTFOOT.id = "myTFOOT"
    var newRow = newTFOOT.insertRow(-1)
    for (var i = 0; i < TFOOTData.length; i++) {
        newCell = newRow.insertCell(i)
        newCell.innerHTML = TFOOTData[i]
    }
    updateRowCounters(form)
    form.addTFOOT.disabled = true
    form.deleteTFOOT.disabled = false
}

function removeTFOOT(form) {
    theTable.deleteTFoot()
    updateRowCounters(form)
    form.addTFOOT.disabled = false
    form.deleteTFOOT.disabled = true
}

function insertCaption(form) {
    var captionData = form.captionText.value
    var newCaption = theTable.createCaption()
    newCaption.innerHTML = captionData
    form.addCaption.disabled = true
    form.deleteCaption.disabled = false
}

function removeCaption(form) {
    theTable.deleteCaption()
    form.addCaption.disabled = false
    form.deleteCaption.disabled = true
}

// housekeeping functions
function updateRowCounters(form) {
    var sel1 = form.insertIndex
    var sel2 = form.deleteIndex
    sel1.options.length = 0
```

Continued

Listing 27-2 *(continued)*

```
    sel2.options.length = 0
    for (var i = 0; i < theTableBody.rows.length; i++) {
        sel1.options[i] = new Option(i, i)
        sel2.options[i] = new Option(i, i)
    }
    form.removeRowBtn.disabled = (i==0)
}

function clearBGColors() {
    for (var i = 0; i < theTableBody.rows.length; i++) {
        for (var j = 0; j < theTableBody.rows[i].cells.length; j++) {
            theTableBody.rows[i].cells[j].style.backgroundColor = ""
        }
    }
}

</SCRIPT>
</HEAD>

<BODY onLoad="init()">
<H1>Modifying Tables</H1>
<HR>
<FORM NAME="controls">
<FIELDSET>
<LEGEND>Add/Remove Rows</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" VALUE="Append 1 Row"
    onClick="appendRow(this.form)"></TD>
<TD><INPUT TYPE="button" VALUE="Insert 1 Row" onClick="addRow(this.form)"> at
index:
    <SELECT NAME="insertIndex">
        <OPTION VALUE="0">0
    </SELECT></TD>
<TD><INPUT TYPE="button" NAME="removeRowBtn" VALUE="Delete 1 Row" DISABLED
    onClick="removeRow(this.form)"> at index:
    <SELECT NAME="deleteIndex">
        <OPTION VALUE="0">0
    </SELECT></TD>
</TR>
</TABLE>
</FIELDSET>
<FIELDSET>
<LEGEND>Add/Remove THEAD and TFOOT</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" NAME="addTHEAD" VALUE="Insert THEAD"
    onClick="insertTHEAD(this.form)"><BR>
    <INPUT TYPE="button" NAME="deleteTHEAD" VALUE="Remove THEAD" DISABLED
        onClick="removeTHEAD(this.form)">
</TD>
```

```
<TD><INPUT TYPE="button" NAME="addTFOOT" VALUE="Insert TFOOT"
    onClick="insertTFOOT(this.form)"><BR>
    <INPUT TYPE="button" NAME="deleteTFOOT" VALUE="Remove TFOOT" DISABLED
        onClick="removeTFOOT(this.form)">
</TD>
</TR>
</TABLE>
</FIELDSET>
<FIELDSET>
<LEGEND>Add/Remove Caption</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" NAME="addCaption" VALUE="Add Caption"
    onClick="insertCaption(this.form)"></TD>
<TD>Text: <INPUT TYPE="text" NAME="captionText" SIZE=40 VALUE="Sample Caption">
<TD><INPUT TYPE="button" NAME="deleteCaption" VALUE="Delete Caption" DISABLED
    onClick="removeCaption(this.form)"></TD>
</TR>
</TABLE>
</FIELDSET>
</FORM>
<HR>
<TABLE ID="myTABLE" CELLPADDING=10 BORDER=1>
<TBODY>
</TABLE>
</BODY>
</HTML>
```

Modifying table columns

Unlike the table row-oriented elements, such as TBODY, the COL and COLGROUP elements are not containers of cells. Instead, these elements serve as directives for the rendering of columns within a table. But through scripting, you can add or remove one or more columns from a table on the fly. There is no magic to it; you simply insert or delete the same-indexed cell from every row of the table.

Listing 27-3 demonstrates adding and removing a left-hand column of a table. The table presents the four longest rivers in Africa, and the new column provides the numeric ranking. Thanks to the regularity of this table, the values for the rankings can be calculated dynamically. Note, too, that the `className` property of each new table cell is set to a class that has a style sheet rule defined for it. Instead of inheriting the style of the table, the cells obey the more specific background color and font weight rules defined for the cells. (The early release of NN6 does not render the enabling and disabling of the buttons in this example correctly, but the buttons operate as intended.)

Listing 27-3: Modifying Table Columns

```
<HTML>
<HEAD>
<TITLE>Modifying Table Columns</TITLE>
<STYLE TYPE="text/css">
THEAD {background-color:lightyellow; font-weight:bold}
.rankCells {background-color:lightgreen; font-weight:bold}
#myTABLE {background-color:bisque}
</STYLE>

<SCRIPT LANGUAGE="JavaScript">
var theTable, theTableBody
function init() {
    theTable = (document.all) ? document.all.myTABLE :
        document.getElementById("myTABLE")
    theTableBody = theTable.tBodies[0]
}

function insertColumn(form) {
    var oneRow, newCell, rank
    if (theTable.tHead) {
        oneRow = theTable.tHead.rows[0]
        newCell = oneRow.insertCell(0)
        newCell.innerHTML = "Ranking"
    }
    rank = 1
    for (var i = 0; i < theTableBody.rows.length; i++) {
        oneRow = theTableBody.rows[i]
        newCell = oneRow.insertCell(0)
        newCell.className = "rankCells"
        newCell.innerHTML = rank++
    }
    form.addColumn.disabled = true
    form.removeColumn.disabled = false
}

function deleteColumn(form) {
    var oneRow
    if (theTable.tHead) {
        oneRow = theTable.tHead.rows[0]
        oneRow.deleteCell(0)
    }
    for (var i = 0; i < theTableBody.rows.length; i++) {
        oneRow = theTableBody.rows[i]
        oneRow.deleteCell(0)
    }
    form.addColumn.disabled = false
    form.removeColumn.disabled = true
}
</SCRIPT>
```

```
</HEAD>

<BODY onLoad="init()">
<H1>Modifying Table Columns</H1>
<HR>
<FORM NAME="controls">
<FIELDSET>
<LEGEND>Add/Remove Left Column</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" NAME="addColumn" VALUE="Insert Left Column"
    onClick="insertColumn(this.form)"></TD>
<TD><INPUT TYPE="button" NAME="removeColumn" VALUE="Remove Left Column"
    DISABLED onClick="deleteColumn(this.form)"></TD>
</TR>
</TABLE>
</FIELDSET>
</TABLE>
</FIELDSET>
</FORM>
<HR>
<TABLE ID="myTABLE" CELLPADDING=5 BORDER=1>
<THEAD ID="myTHEAD">
<TR>
    <TD>River<TD>Outflow<TD>Miles<TD>Kilometers
</TR>
</THEAD>
<TBODY>
<TR>
    <TD>Nile<TD>Mediterranean<TD>4160<TD>6700
</TR>
<TR>
    <TD>Congo<TD>Atlantic Ocean<TD>2900<TD>4670
</TR>
<TR>
    <TD>Niger<TD>Atlantic Ocean<TD>2600<TD>4180
</TR>
<TR>
    <TD>Zambezi<TD>Indian Ocean<TD>1700<TD>2740
</TR>
</TABLE>
</BODY>
</HTML>
```

W3C DOM table object classes

If you ever read the W3C DOM Level 2 specification, notice that the objects defined for tables do not align themselves fully with the actual elements defined in the HTML 4.0 specification. That's not to say the DOM scoffs at the HTML spec; rather, the needs of a DOM with respect to tables differ a bit. For example, as far as the W3C DOM is concerned, the THEAD, TBODY, and TFOOT are all regarded as table sections and are thus known as `HTMLTableSectionElement` objects. In other words, in the W3C DOM, there is no particular distinction among the types of table section elements. They're all lumped together, and they bear the same properties and methods. With its strong adherence to the W3C DOM, the NN6 DOM sticks to the W3C DOM object constructions.

When you work in both the IE and W3C DOMs at the same time, it's helpful to know the relationships between the object naming conventions used in each. Table 27-2 provides a quick cross-reference between the object types in both DOMs. None of terminology in Table 27-2 affects the way scripts construct references to elements or the way elements are nested within one another. The containment hierarchy is driven by the HTML element containment — and that remains the same regardless of DOM exposure.

Table 27-2 **Table Object Classifications**

W3C DOM (NN6)	*IE4+ and HTML*
HTMLTableElement	TABLE
HTMLTableCaptionElement	CAPTION
HTMLTableColElement	COL, COLGROUP
HTMLTableSectionElement	TBODY, TFOOT, THEAD
HTMLTableRowElement	TR
HTMLTableCellElement	TD, TH

While the following object-specific discussions list the objects according to their HTML tag name, I group these objects according to the W3C DOM classifications because element objects that share a classification also share the same properties, methods, and event handlers.

TABLE Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
align	createCaption()	onScroll
background	createTFoot()	
bgColor	createTHead()	
border	deleteCaption()	
borderColor	deleteRow()	
borderColorDark	deleteTFoot()	
borderColorLight	deleteTHead()	
caption	firstPage()	

Properties	Methods	Event Handlers
cellPadding	insertRow()	
cellSpacing	lastPage()	
cells	moveRow()	
cols	nextPage()	
datePageSize	previousPage()	
frame	refresh()	
height		
rows		
rules		
summary		
tBodies		
tFoot		
tHead		
width		

Syntax

Accessing TABLE element object properties and methods:

```
(IE4+)        [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)    [window.]document.getElementById("elemID").property |
              method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

The TABLE element object is the outermost container of table-related information. The HTML element has a large number of attributes, most of which are echoed by their counterpart properties in the object model. You rarely will modify these properties if the values are set in the tag's attributes. However, if you construct a new TABLE element object for insertion into the page, use these properties to assign values to the equivalents of the element's attributes.

A number of additional properties return collections of cell, row, and row section objects; still more properties return references to other, singular objects within the table (such as the CAPTION element object). For example, if your script needs to iterate through all rows within just the TBODY elements (in other words, without affecting the rows in the THEAD element), your script can perform a nested `for` loop to access each row:

```
var oneTBody, oneRow
for (var i = 0; i < tableRef.tBodies.length; i++) {
    oneTBody = tableRef.tBodies[i]
    for (var j = 0; j < oneTBody.rows.length; j++) {
        oneRow = oneTBody.rows[j]
        // more stuff working on each row
    }
}
```

For a simple table that does not define table row sections, you can iterate through the `rows` collection property of a TABLE element object. You can even access cells directly; but it may be easier to keep track of cells in a loop by going through them row by row (via the `cells` property of each TR element object).

A large number of methods enable you to modify the structure of a table (as described earlier in this chapter), but they primarily work with rows. Column modifications require a different approach, as also demonstrated earlier.

Properties

align

Value: String (`center`, `left`, `right`) Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property controls the horizontal alignment of the table with respect to the next outermost container that provides positioning context. Most typically, the next outermost positioning container is the BODY element. Modifications to this property on an existing table cause the surrounding content to reflow on the page. Be sure you test the consequences of any modification with a variety of browser window sizes.

On the CD-ROM

Example on the CD-ROM

Related Item: `style.align` property.

background

Value: URL String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Only IE4+ makes a provision for assigning a background image to a table, and the `background` property controls that value. You can swap out an image by assigning a new URL to the `background` property. The image appears in front of any background color assigned to the table. Thus, you can assign attributes for both characteristics so that there is at least a background color (and an image for IE users).

On the CD-ROM

Example on the CD-ROM

Related Item: `IMG.src` property.

bgColor

Value: Color Value String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `bgColor` attribute controls the background color of a table (the `BGCOLOR` attribute). Colors assigned to the entire table are overridden if colors are assigned to row, row groups, or cells within the table. If you set the `bgColor` property, the `backgroundColor` style property is not affected. Assign values in any acceptable color string format, such as hexadecimal triplets (for example, "`#FCFC00`") or the generally recognized plain-language names (for example, "`cornflowerblue`").

On the CD-ROM

Example on the CD-ROM

Related Item: `style.backgroundColor` property.

border

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `border` property controls the thickness of the table's borders. Values indicate the number of pixels thick the border should be. A value of zero removes all visible borders surrounding the table. Different browsers render table cell borders differently depending on background colors and other visual attributes of tables and table elements. Be sure to verify the appearance on as many browsers and operating systems as possible.

On the CD-ROM

Example on the CD-ROM

Related Item: `borderColor` property.

borderColor
borderColorDark
borderColorLight

Value: Color Value String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+ provides attributes and corresponding properties to control the border colors of a table. When table borders have enough thickness to display a three-dimensional raised look, the appearance is created by generating two dark and two light edges (simulating a light source coming from the upper-left or lower-right corner). If you want to do a better job of specifying the color combinations for the light and dark edges, you can control them individually via the `borderColorLight` and `borderColorDark` properties, respectively. You can assign colors in any valid color value (hexadecimal triplet or plain-language name); but when you read the property, the value is returned as a hexadecimal triplet (for example, `"#008000"`).

On the CD-ROM

Example on the CD-ROM

Related Item: `TD.borderColor` property.

caption

Value: CAPTION element object reference Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `caption` property returns a reference to the CAPTION element object that is nested inside the current table. If there is no CAPTION element, the value is `null`. You can use this property as a shortcut reference to the CAPTION element if you need to read or modify that element's properties. The property is read/write in NN6, provided you create a valid CAPTION element object and assign that new object to the `caption` property.

On the CD-ROM

Example on the CD-ROM

Related Item: CAPTION element object.

cellPadding
cellSpacing

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `cellPadding` property is a table-wide specification for the blank space inserted between the edge of a table cell and the content of the cell. One value affects the padding on all four sides. The effect of cell padding is especially apparent when there are borders between cells; in this case, the padding provides welcome breathing space between the border and content. The `cellSpacing` property influences the thickness of borders between cells. If no visible borders are present between cells in a table, you can usually set either `CELLPADDING` or `CELLSPACING` to provide the desired blank space between cells.

On the CD-ROM

Example on the CD-ROM

Related Item: `border` property.

cells

Value: Array Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `cells` property (not implemented in IE5/Mac) returns an array (collection) of all TD and TH element objects within the entire table. From the perspective of the TABLE element object, this "view" encompasses all cells — whether they are inside a table row segment (for example, a THEAD) or in a freestanding row. In the W3C DOM (and NN6), the `cells` collection is accessible only as a property of a TR object. However, a `rows` collection is available from all table container elements, thus enabling you to iterate through all cells of all rows.

On the CD-ROM

Example on the CD-ROM

Related Items: `rows`, `TR.cells` properties.

cols

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `cols` property represents the IE-specific `COLS` attribute for TABLE elements. Specifying this attribute should speed table rendering. If you don't specify the attribute explicitly in your HTML, the property has a value of zero — the property does not tell you dynamically the size of your table. Although this property is read/write, you cannot use this property to add or remove columns from a table. Instead, use the table modification methods discussed later in this section.

Related Item: `rows` property.

dataPageSize

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

When using IE4+ data binding to obtain table data from a data source, there may be more rows or data (records) than you wish to display in one table. If so, you can define the number of rows (records) that constitutes a “page” of data within the table. With this limit installed for the table, you can then use the `firstPage()`, `previousPage()`, `nextPage()`, and `lastPage()` methods to access another page relative to the currently viewed page. While you usually establish this value via the `DATAPAGESIZE` attribute of the TABLE element, you can adjust it later via the `dataPageSize` property to show more or fewer records per “page” in the table.

On the CD-ROM

Example on the CD-ROM

Related Items: `dataSrc`, `dataFld` properties; `firstPage()`, `lastPage()`, `nextPage()`, `previousPage()` methods.

frame

Value: String Constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `frame` property enables you to control which side or sides of the table’s border should be displayed. Values for this property can be any of a fixed set of string constants. Table 27-3 lists the acceptable values. Hiding or showing table border edges under script control can have an effect on the layout and placement of both the table and surrounding elements.

Table 27-3 Table frame Property Values

Value	***Description***
`above`	Top edge only
`below`	Bottom edge only
`border`	All four sides (same as box)
`box`	All four sides (same as border)
`hsides`	Horizontal (top and bottom) edges only
`lhs`	Left-hand side edge only
`rhs`	Right-hand side edge only
`void`	No borders
`vsides`	Vertical (left and right) edges only

On the CD-ROM

Example (with Listing 27-4) on the CD-ROM

Related Items: `border`, `borderColor`, `rules` properties.

height
width

Value: Integer or Length String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `height` (IE4+) and `width` (IE4+/NN6+) properties represent the `HEIGHT` and `WIDTH` attributes assigned to the TABLE element. If no values are assigned to the element in the tag, the properties do not reveal the rendered size of the table (use the `offsetHeight` and `offsetWidth` properties for that information). Values for these properties can be integers representing pixel dimensions or strings containing percentage values, just like the attribute values. Scripts can shrink the dimensions of a table no smaller than the minimum space required to render the cell content. Notice that only the `width` property is W3C DOM-sanctioned (as well as the corresponding property in the HTML 4.0 specification).

On the CD-ROM

Example on the CD-ROM

Related Items: `offsetHeight`, `offsetWidth` properties.

rows

Value: Array of Row Objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `rows` property returns an array (collection) of TR element objects in the current table. This array includes rows in the THEAD, TBODY, and TFOOT row sections if the table is segmented. You can use the `rows` property to create a cross-browser script that accesses each cell of a table. Such a nested `for` loop looks like the following:

```
var oneCell
for (var i = 0; i < tableRef.rows.length; i++) {
    for (var j = 0; j < tableRef.rows[i].cells.length; j++) {
        oneCell = tableRef.rows[i].cells[j]
        // more statements working with the cell
    }
}
```

If you want to limit the scope of the `rows` property to rows within a row segment (for example, just in the TBODY), you can access this property for any of the three types of row segment objects.

On the CD-ROM

Example on the CD-ROM

Related Items: `TBODY.rows`, `TFOOT.rows`, `THEAD.rows` properties.

rules

Value: String Constant   Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

In contrast to the `frame` property, the `rules` property governs the display of borders between cells. Values for this property can be any of a fixed set of string constants. Table 27-4 lists the acceptable values. Hiding or showing table cell border edges under script control can have an effect on the layout and placement of both the table and surrounding elements. Early versions of NN6 may not render scripted changes to the `rules` property, but reading or writing the property does not cause errors.

Table 27-4 Table rules Property Values

Value	***Description***
`all`	Borders around every cell
`cols`	Vertical borders between columns
`groups`	Vertical borders between column groups; horizontal borders between row groups
`none`	No borders between cells
`rows`	Horizontal borders between row groups

On the CD-ROM

Example (with Listing 27-5) on the CD-ROM

Related Items: `border`, `borderColor`, `frame` properties.

summary

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `summary` property represents the HTML 4.0 `SUMMARY` attribute. The text assigned to this attribute is intended for use by browsers that present a page's content through nonvisual means. For example, a browser equipped to use speech synthesis to read the page aloud can use the text of the summary to describe the table for the user.

Related Item: `caption` property.

tBodies

Value: Array of TBODY element objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `tBodies` property returns an array of all TBODY elements in the table. Even if you don't specify a TBODY element, every table contains an implied TBODY element. Thus, to access a batch of rows of a simple table other than the THEAD and TFOOT sections, you can use the `tBodies[0]` array notation. From there, you can get the rows of the table body section via the `rows` property. This property is not available in IE4/Mac.

On the CD-ROM

Example on the CD-ROM

Related Items: `tFoot`, `tHead` properties.

tFoot
tHead

Value: Row segment element object Read/Write (see text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Each table can have (at most) one TFOOT and one THEAD element. If you specify one of these for the table, the `tFoot` and `tHead` properties, respectively, return references to those element objects. These properties are read-only in IE, but NN6 enables you to assign valid TFOOT and THEAD element objects to these properties in order to insert or replace the elements in the current table. The process for doing this is similar to the sequence described in the `caption` property. For either of these two elements, however, you have to construct the desired number of table cell objects (and row objects if you want multiple rows) for the newly created row segment object. See the discussions of these two objects for details on accessing rows and cells of the segments.

Related Items: TBODY, TFOOT, THEAD objects.

width

See `height`.

Methods

createCaption()
deleteCaption()

Returns: Reference to new CAPTION element object; Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `createCaption()` and `deleteCaption()` convenience methods enable you to add or remove a CAPTION element object from the current table. When you create a new caption, the action simply inserts the equivalent of a blank CAPTION element tag into the TABLE element (this may not, however, be reflected in the source view of the page). You must populate the CAPTION element with text or HTML before it appears on the page. Because the method returns a reference to the newly created object, you can use that reference to assign content to its `innerHTML` property or you can append a child text node.

Because a table can have only one CAPTION element nested within, the `deleteCaption()` method belongs to the TABLE element object. The method returns no value.

Example

See Listing 27-2 for an example of creating, inserting, and removing a CAPTION element object from a table.

Related Item: CAPTION element object.

createTFoot()
createTHead()
deleteTFoot()
deleteTHead()

Returns: Element references (create methods); Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			(✓)	✓	✓

These four methods enable you to add or remove TFOOT and THEAD table row section objects. When you create a THEAD or TFOOT element, the methods return references to the newly inserted elements. But, as with `createCaption()`, these methods do nothing to display content. Instead, use the returned references to populate the row(s) of the header and footer with cells. Regardless of the number of rows associated with a THEAD or TFOOT element, the `deleteTFoot()` and `deleteTHead()` methods remove all associated rows and return no values.

While these methods are available in IE4, you may not have complete write access to the properties of the objects returned by the creation methods. For example, you may not be able to assign a value to the `id` property of the TFOOT or THEAD element returned by their respective creation methods.

Example

See Listing 27-2 for an example of creating, inserting, and removing TFOOT and THEAD elements object from a table.

Related Items: TFOOT, THEAD element objects.

deleteRow(*rowIndex*)
insertRow(*rowIndex*)

Returns: Nothing; Reference to newly created row.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `insertRow()` and `deleteRow()` convenience methods assist in adding TR elements to, and removing them from, a TABLE element. Inserting a row does little more than the equivalent of inserting a pair of empty TR element tags into the HTML (although you may not see them in the source view of the page). It is up to the rest of your scripts to assign properties to the row and populate it with new cells (see the `insertCell()` method of the TR element object).

Attributes for both methods are zero-based index numbers. In the case of `insertRow()`, the number indicates the row *before* which the new row is to be inserted. To append the row to the end of the table, use `-1` as a shortcut parameter. To delete a row, use the index value for that row. Be aware that if you intend to employ `deleteRow()` to remove all rows from a table (presumably to repopulate the table with a new set), the most efficient way is to use a `while` loop that continues to remove the first row until there are no more:

```
while (tableRef.rows.length > 0) {
    tableRef.deleteRow(0)
}
```

Example

See Listing 27-2 for examples of inserting and deleting table rows.

Related Item: `TD.insertCell()` method.

firstPage()
lastPage()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

For tables that are bound to external data sources via IE4+ data binding, the `firstPage()` and `lastPage()` methods zoom to the first and last pages of the data, respectively. You must specify the table's data page size for the Data Source Object to know how many records to assign to a "page" of data. Note that while related methods — `nextPage()` and `previousPage()` — are available in IE4, these two methods were available in IE5 first.

Related Items: `dataPageSize`, `dataSrc`, `dataFld` properties; `nextPage()`, `previousPage()` methods.

moveRow(*sourceRowIndex*, *destinationRowIndex*)

Returns: Row element object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The IE5+ `moveRow()` convenience method enables you to move a row from one position to another within the same table. Both parameters are integer index values. The first parameter is the index of the row you want to move; the second is the index of the row to where you want to move the row. Because no movement takes place when the method is invoked, the removal of the source row does not impact the index count of the destination row. But after the method executes, the row that was in the destination row is now pushed down one row. This method returns a reference to the moved row.

You can accomplish this same functionality in W3C DOM compatible syntax (for both IE5+ and NN6+) via the `replaceChild()` method of the TABLE element.

On the CD-ROM

Example on the CD-ROM

Related Item: `replaceChild()` method.

nextPage()
previousPage()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

For tables that are bound to external data sources via IE4+ data binding, the `nextPage()` and `previousPage()` methods jump ahead and back one page of the data, respectively. You must specify the table's data page size for the Data Source Object to know how many records to assign to a "page" of data. Typically, navigational buttons associated with the table invoke these methods.

Related Items: `dataPageSize`, `dataSrc`, `dataFld` properties; `firstPage()`, `lastPage()` methods.

refresh()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

For tables that are bound to external data sources via IE4+ data binding, the `refresh()` method retrieves the current data source data for display in the table. A script can use `setTimeout()` to invoke a function that calls this method at an interval of your desire. If you frequently update the database associated with the table, this method can help keep the table up to date without requiring the client to download the entire page (and perhaps run into cache conflicts).

Related Items: `dataPageSize`, `dataSrc`, `dataFld` properties.

TBODY, TFOOT, and THEAD Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`align`†	`deleteRow()`†	
`bgColor`†	`insertRow()`†	
`ch`	`moveRow()`†	
`chOff`		
`rows`†		
`vAlign`		

†See TABLE element object.

Syntax

Accessing TBODY, TFOOT, and THEAD element object properties and methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

Accessing TBODY element object properties and methods:

```
(IE4+)      [window.]document.all.tableID.tBodies[i].property |
            method([parameters])
(IE5+/NN6)  [window.]document.getElementById("tableID").tBodies[i].property |
            method([parameters])
```

Accessing TFOOT element object properties and methods:

```
(IE4+)      [window.]document.all.tableID.tFoot.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("tableID").tFoot.property |
            method([parameters])
```

Accessing THEAD element object properties and methods:

```
(IE4+)      [window.]document.all.tableID.tHead.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("tableID").tHead.property |
            method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			(✓)	✓	✓

About these objects

Each of these element objects represents a row grouping within a TABLE element (an `HTMLTableSectionElement` in the syntax of the W3C DOM specification). A table can have only one THEAD and one TFOOT, but it can have as many TBODY elements as your table organization requires.

These elements share many properties and methods with the TABLE element in that they all contain rows. The benefit of defining table segments is apparent if you use table rules (see the `TABLE.rules` property earlier in this chapter) and if you wish to limit the scope of row activities only to rows within one segment. For instance, if your table has a THEAD that is to remain static, your scripts can merrily loop through the rows of only the TBODY section without coming anywhere near the row(s) in the THEAD.

None of these elements are available in IE4 for the Macintosh.

Properties

ch
chOff

Value: One-Character String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `ch` and `chOff` properties are defined for NN6, but they may be serving as placeholders for future implementation. These properties represent the optional `CHAR` and `CHAROFF` attributes of table row section elements in the HTML 4.0 specification. If these are implemented in a future browser, they will help align cell content within a column or column group similar to the way word processers allow for formatting features such as decimal tabs. For details on these attributes, see `http://www.w3.org/TR/REC-html40/struct/tables.html#adef-char`.

Related Items: COL, COLGROUP objects.

vAlign

Value: String Constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Providing the cell-oriented `vAlign` property for a table row section enables you to specify a vertical alignment to apply to all cells within that section rather than specify the `VALIGN` attribute for each TD element. By default, browsers render cell content with a middle vertical alignment within the cell. If you want to modify the setting for an existing table section (or assign it to a new one you create), the values must be one of the following string constants: `baseline`, `bottom`, `middle`, or `top`.

On the CD-ROM

Example on the CD-ROM

Related Item: `TD.vAlign` property.

CAPTION Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`align`†		
`vAlign`††		

†See TABLE element object.

††See TBODY element object.

Syntax

Accessing CAPTION element object properties and methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

A CAPTION element is a simple HTML container whose only prerequisite is that it must be nested inside a TABLE element. That nesting allows the TABLE element object to control insertion and removal of a CAPTION element at will. You can modify the content of a CAPTION element just like you do any HTML element (in DOMs that allow such modification). You can see an example of how the TABLE element object uses some of its methods to create and remove a CAPTION element in Listing 27-2.

The only properties that lift the CAPTION element object above a mere contextual element (described in Chapter 15) are `vAlign` (IE4+) and the W3C DOM-sanctioned `align` (IE4+ and NN6+). I describe these properties and their values for other objects in this chapter.

COL and COLGROUP Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
`align`†		
`ch`††		
`chOff`††		
`span`		
`vAlign`††		
`width`		

†See TABLE element object.

††See TBODY element object.

Syntax

Accessing COL and COLGROUP element object properties and methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About these objects

The purpose of the COL and COLGROUP elements is to allow cells within one or more columns to be treated as a single entity for purposes of style sheet and other style-related control. In other words, if you want one column of a table to be all boldface, you can assign that style sheet rule to the COL element that encompasses that column. All cells within that column inherit the style sheet rule definition. Having two different element names allows for the nesting of column groups, which can come in handy for complex tables. For instance, consider a table that reports the forecasted and actual sales for a list of products across four quarters of a year. The left column of the table stands alone with the product item numbers. To the right is one large grouping of eight columns that encompasses the four pairs of forecasted/actual sales pairs. All eight columns of cells are to be formatted with a particular font style to help differentiate the pairs of columns for each quarter. You also want to assign a different background color. Therefore, you designate each pair of columns as its own subgroup within the eight-column master grouping. The COLGROUP and COL tags for this nine-column table are as follows:

```
<COL ID="productIDs">
<COLGROUP ID="fiscalYear" SPAN="8" WIDTH="40">
    <COL ID="Q1" SPAN="2">
    <COL ID="Q2" SPAN="2">
    <COL ID="Q3" SPAN="2">
    <COL ID="Q4" SPAN="2">
</COLGROUP>
```

Up in the HEAD section of this document are style sheet rules similar to the following:

```
<STYLE TYPE="text/css">
#productIDs {font-weight:bold}
#fiscalYear {font-family: Courier, "Courier New", monospace}
#Q1 {background-color: lightyellow}
#Q2 {background-color: pink}
#Q3 {background-color: lightblue}
#Q4 {background-color: lightgreen}
</STYLE>
```

The HTML code for the column groups demonstrates the two key attributes: `SPAN` and `WIDTH`. Both of these attributes are reflected as properties of the objects, and I describe them in the following section. Notice, however, that COL and COLGROUP elements act cumulatively and in source code order to define the column groups for the table. In other words, if the style of the left-hand column is not important, the table still requires the initial one-column COL element before the eight-column COLGROUP element. Otherwise, the browser makes the first eight columns the column group. Therefore, it is a good idea to account for every column with COL and/or COLGROUP elements if you intend to use any column grouping in your table.

From a scripter's point of view, you are more likely to modify styles for a column or column group than you are to alter properties such as `span` or `width`. But, if your scripts generate new tables, you may create new COL or COLGROUP elements whose properties you definitely should initialize with values.

Properties

span

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `span` property represents the number of columns that the column group should encompass. Don't confuse this property with the `colSpan` property of TD and TH elements. A COL or COLGROUP `span` does not have any impact on the rendering or combination of multiple cells into one. It simply draws an imaginary lasso around as many columns as are specified, signifying that these columns can be treated as a group for style purposes (and also for drawing of divider rules, if you set the table's `rules` property to `groups`).

On the CD-ROM

Example on the CD-ROM

Related Item: `width` property.

width

Value: Length String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The only reason the `width` property is highlighted for these objects is that the property (and corresponding attribute) impacts the width of table cells inside the scope of the column grouping. For example, if you assign a width of 50 pixels to a COLGROUP whose `SPAN` attribute is set to `3`, all cells in all three columns inherit the 50-pixel width specification. For more details on the values acceptable to this property, see the `TABLE.width` property description earlier in this chapter.

Related Item: `TABLE.width` property.

TR Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align†`	`deleteCell()`	
`bgColor†`	`insertCell()`	
`borderColor†`		
`borderColorDark†`		
`borderColorLight†`		
`cells`		
`ch††`		
`chOff††`		
`height`		
`rowIndex`		
`sectionRowIndex`		
`vAlign††`		

†See TABLE element object.

††See TBODY element object.

Syntax

Accessing TR element object properties and methods:

```
(IE4+)       [window.]document.all.elemID.property | method([parameters])
(IE4+)       [window.]document.all.tableID.rows[i].property | method([parameters])
(IE4+)       [window.]document.all.tableRowSectionID.rows[i].property |
             method([parameters])
(IE5+/NN6)   [window.]document.getElementById("elemID"). property |
             method([parameters])
(IE5+/NN6)   [window.]document.getElementById("tableID").rows[i].property |
             method([parameters])
(IE5+/NN6)   [window.]document.getElementById("tableRowSectionID").
             rows[i].property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

Table rows are important objects within the complex nesting of table-related elements and objects. When a table represents server database data, one row usually equals one record. And, although you can employ scripting to add columns to a table, the more common table modifications are to add or delete rows — hence the presence of the TABLE element object's `insertRow()` and `deleteRow()` methods.

The primary job of the TR element is to act as a container for TD elements. All the cells in a row inherit some attributes and properties that you apply to that row. An array of cell objects is available for iteration via `for` loops. A TR element object, therefore, also has methods that insert and remove individual cells in that row.

The number of columns in a row is determined by the number of TD elements or, more specifically, by the number of columns that the cells intend to span. One row can have four TD elements, while the next row can have only two TD elements — each of which is defined to occupy two columns. The row of the table with the most TD elements and column reservations determines the column width for the entire table.

Of the properties just listed, the ones related to border color are available in IE4+ only. In IE4+, the border is drawn around each cell of the row rather than the entire row. The HTML 4.0 specification (and the W3C DOM Level 2 specification by extension) does not recognize border colors for rows alone, nor are style sheet border rules inherited by the cell children of a row. However, you can define borders for individual cells or classes of cells.

Properties

cells

Value: Array of TD element objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `cells` property returns an array (collection) of TD element objects nested inside the current TR object. The `length` property of this array indicates the number of actual TD elements in the row, which may not be the number of columns if one or more cells occupy multiple columns.

Use the `cells` property in `for` loops to iterate through all cells within a row. Assuming your script has a reference to a single row, the loop should look like the following:

```
for (var i = 0; i < rowRef.cells.length; i++) {
    oneCell = rowRef.cells[i]
    // more statements working with the cell
}
```

On the CD-ROM

Example on the CD-ROM

Related Items: `TABLE.rows`, `TD.cellIndex` properties.

height

Value: Integer or Length String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

IE4+ enables page authors to predefine a height for a table row; this attribute is echoed by the `height` property. The value can be a number of pixels or a percentage length value. Note that this property does not reveal the rendered height of the row unless you explicitly set the attribute in the HTML. To get the actual height (in IE4+ and NN6+), use the `offsetHeight` property. You cannot adjust the `height` property to be smaller than the table normally renders the row.

On the CD-ROM

Example on the CD-ROM

Related Item: `offsetHeight` property (Chapter 15).

rowIndex
sectionRowIndex

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Each row occupies a position within the collection of rows in the table as well as within the collection of rows for a table section (THEAD, TBODY, or TFOOT). The `rowIndex` property returns the zero-based index value of the row inside the `rows` collection for the entire table, regardless of table section composition. In contrast, the `sectionRowIndex` property returns the zero-based index value of the row inside its row section container. If the table has no row sections defined for it, a single, all-encompassing TBODY element is assumed; in this case, the `sectionRowIndex` and `rowIndex` values are equal.

These properties serve in functions that are passed a reference to a row. However, the functions might also need to know the position of the row within the table or section. While there is no TR object property that returns a reference to the next outermost table row section or the table itself, the `parent` and parent's `parent` elements, respectively, can reference these objects.

On the CD-ROM

Example on the CD-ROM

Related Items: `TABLE.rows`, `TBODY.rows`, `TFOOT.rows`, `THEAD.rows` properties.

Methods

deleteCell(*cellIndex*)
insertCell(*cellIndex*)

Returns: Nothing; Reference to New Cell.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The act of inserting a row into a table is not complete until you also insert cells into the row. The `insertCell()` method does just that, with a parameter indicating the zero-based index of the cell's position among other cells in the row. A value of `-1` appends the cell to the end of existing cells in the row.

When you invoke the `insertCell()` method, it returns a reference to the new cell. This gives you the opportunity to adjust other properties of that cell before moving onto the next cell. For example, if you want to insert a cell that has a column span of `2`, you adjust the `colSpan` property of the cell whose reference just returned, as in the following:

```
var oneCell = tableRowRef.insertCell(-1)
oneCell.colSpan = 2
```

Scripts that add rows and cells must make sure that they add the identical number of cells (or cell column spaces) from one row to the next. Otherwise, you have an unbalanced table with ugly blank spaces where you probably don't want them.

To remove a cell from a row, use the `deleteCell()` method. The parameter is a zero-based index value of the cell you want to remove. If all you want to do is replace the content of a cell, apply the new content to the `innerHTML` property of the TD element. This is smoother and safer than deleting and reinserting a cell because any execution error that occurs in the process results in an unbalanced table. Finally, to rid yourself of all cells in a row, use the `deleteRow()` method of the TABLE and table row section element objects.

Example

See Listing 27-2 for an example of inserting cells during the row insertion process.

Related Item: `TABLE.insertRow()` method.

TD and TH Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`abbr`		
`align†`		
`axis`		
`background†`		
`bgColor†`		
`borderColor†`		
`borderColorDark†`		
`borderColorLight†`		
`cellIndex`		
`ch††`		

Properties	Methods	Event Handlers
chOff††		
colSpan		
headers		
height		
noWrap		
rowSpan		
vAlign††		
width		

†See TABLE element object.

††See TBODY element object.

Syntax

Accessing TD and TH element object properties and methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE4+)      [window.]document.all.tableID.cells[i].property |
            method([parameters])
(IE4+)      [window.]document.all.tableRowSectionID.cells[i].property |
            method([parameters])
(IE4+)      [window.]document.all.tableRowID.cells[i].property |
            method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID"). property |
            method([parameters])
(IE5+/NN6) [window.]document.getElementById("tableID").cells[i].property |
            method([parameters])
(IE5+/NN6) [window.]document.getElementById("tableRowSectionID").
            cells[i].property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("tableRowID").rows[i].property |
            method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About these objects

TD (table data) and TH (table header) elements create cells within a table. By common convention, a TH element is rendered in today's browsers with a distinctive style — usually with a bold font and center alignment. A table cell is as deeply nested as you can get with table-related elements.

Properties of cells that are delivered in the HTML of the page are rarely modified (with the exception of the `innerHTML` property). But you still need full access to properties of cells if your scripts add rows to a table dynamically. After creating each blank table cell object, your scripts can adjust `colSpan`, `rowSpan`, `noWrap`, and other properties that influence the characteristics of that cell within the table.

See the beginning of this chapter for discussions and examples of how to add rows of cells and modify cell content under script control.

Properties

abbr
axis
headers

Value: See Text Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

These three properties are defined for table cell element objects in the W3C DOM and NN6. They all represent attributes for these elements in the HTML 4.0 specification. The purposes of these attributes and properties are geared toward browsers that provide alternate means of rendering content, such as through speech synthesis. While these properties are definitely valid for NN6, they have no practical effect. Perhaps other versions of browsers built upon the same Mozilla engine as NN6 will use these attributes to good effect. For general application, however, you can ignore these properties — but also avoid using them as data storage spaces while a page loads. Consider them reserved for future use.

cellIndex

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `cellIndex` property returns an integer indicating the zero-based count of the current cell within its row. Thus, if a script is passed a reference to a cell, the `cellIndex` property reveals its position within the row. Inserting or deleting cells in the row at lower index values influences the `cellIndex` value after the alteration.

On the CD-ROM

Example on the CD-ROM

Related Item: `TR.rowIndex` property.

colSpan
rowSpan

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `colSpan` and `rowSpan` properties represent the `COLSPAN` and `ROWSPAN` attributes of table cell elements. Assign values to these properties only when you are creating new table rows and cells — and you are firm in your table cell design. If you fail to assign the correct values to either of these properties, your table cell alignment will get out of whack. Modifying these property values on an existing table is extremely risky unless you are performing other cell manipulation to maintain the balance of rows and columns. Values for both properties are integers greater than or equal to 1.

On the CD-ROM

Example on the CD-ROM

Related Item: `COL.span` property.

height
width

Value: Integer and Length String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Table cells may be specified to be larger than their default rendered size. This usually happens in the `HEIGHT` and `WIDTH` attributes of the cell. Settings of the `WIDTH` attribute of a COL or COLGROUP element (IE4+ and NN6+) may also govern the width of a cell. A cell's height can be inherited from the `HEIGHT` attribute setting of a table row or row section (IE4+). Both `HEIGHT` and `WIDTH` attributes are deprecated in HTML 4.0 in favor of the `height` and `width` style sheet attributes. That said, the `height` and `width` properties of a table cell echo only the settings of the explicit attributes in the cell's tag. If a style sheet in the element tag governs a cell's dimensions, then visit the cell object's `style` property to determine the dimensions. Explicit attributes override style sheet rules.

Values for these two properties are length values. These can be pixel integers or percentage values as strings. Attempts to set the sizes smaller than their default rendered size results in a cell of default size. Also be aware that enlarging a cell affects the width of the entire column and/or height of the entire row occupied by that cell.

On the CD-ROM

Example on the CD-ROM

Related Items: `COL.width`, `TR.height` properties.

noWrap

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The default behavior of a table cell is to wrap text lines within the cell if the text would extend beyond the right edge of the cell as calculated from the width of the entire table. But you can force the table to be wider to accommodate the text in an unwrapped line of text by setting the `noWrap` property (or `NOWRAP` attribute) of the cell to `true`. The `NOWRAP` attribute is deprecated in HTML 4.0.

On the CD-ROM

Example on the CD-ROM

rowSpan

See `colSpan`.

width

See `height`.

OL Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`compact`		
`start`		
`type`		

Syntax

Accessing OL element object properties and methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID"). property |
           method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

The OL (ordered list) element is a container of LI (list item) elements. An *ordered list* means that the list items have a sequence and are preceded by a number or letter to signify the position within the sequence. The few element-specific attributes are being deprecated in favor of style sheet definitions. For the sake of backward compatibility with existing content, however, it is likely that many future generations of browsers will continue to support these deprecated attributes. These attributes are therefore available as properties of the element object.

Most of the special appearance of a list (notably indentation) is handled automatically by the browser's interpretation of how an ordered list should look. You have control over the numbering or lettering schemes and the starting point for those sequences.

Properties

`compact`

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Although the properties are defined for the browsers just shown (not IE4/Mac, however), the `compact` property (and the deprecated attribute it echoes) has no impact on the density of the listing.

`start`

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `start` property governs which number or letter begins the sequence of leading characters for nested LI items. If the `TYPE` attribute specifies numbers, then the corresponding number is used; if it specifies letters, then the letter of the alphabet corresponding to the number becomes as the starting character. You can change the numbering in the middle of a sequence via the `LI.value` property.

It is an extremely rare case that requires you to modify this property for an existing OL element. But if your script is creating a new element for a segment of ordered list items that has some other content intervening from an earlier OL element, you can use the property to assign a starting value to the OL group.

On the CD-ROM

Example on the CD-ROM

Related Items: `type`, `LI.value` properties.

type

Value: String Constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

An OL element can use any of five different numbering schemes. Each scheme has a type code, whose value you can use for the `type` property. The following table shows the property values and examples:

Value	***Example***
`A`	`A, B, C, ...`
`a`	`a, b, c, ...`
`I`	`I, II, III, ...`
`i`	`i, ii, iii, ...`
`1`	`1, 2, 3, ...`

The default value is `1`. You are free to adjust the property after the table has rendered, and you can even stipulate a different type for specific LI elements nested inside (see the `LI.type` property). If you want to have further nesting with a different numbering scheme, you can nest the OL elements and specify the desired type for each nesting level, as shown in the following HTML example:

```
<OL TYPE="A">
    <LI>One
    <LI>Two
```

```
    <LI>Three
        <OL TYPE="a">
            <LI>Sub One
            <LI>Sub Two
            <LI>Sub Three
        </OL>
    <LI>Four
</OL>
```

Indenting the HTML is optional, but it may help you to keep the nesting straight.

On the CD-ROM

Example on the CD-ROM

Related Items: `start`, `UL.type`, `LI.type` properties.

UL Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`compact`†		
`type`		

†See OL Element Object.

Syntax

Accessing UL element object properties and methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID").property |
           method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

The UL (unordered list) element is a container of LI (list item) elements. An *unordered list* means that the list items have no sequence and are preceded by symbols that don't signify any particular order. The few element-specific attributes are being deprecated in favor of style sheet definitions. For the sake of backward compatibility with existing content, however, it is likely that many future generations of browsers will continue to support these deprecated attributes. These attributes are therefore available as properties of the element object.

Most of the special appearance of a list (notably indentation) is handled automatically by the browser's interpretation of how an ordered list should look. You have control over the three possible characters that precede each item.

Properties

type

Value: String Constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

A UL element can use any of three different leading characters. Each character type has a type code whose value you can employ for the `type` property. Property values are `circle`, `disc`, and `square`. The difference between a `circle` and `disc` is that the `circle` is unfilled, while the `disc` is solid. The default value is `disc`.

On the CD-ROM

Example on the CD-ROM

Related Items: `OL.type`, `UL.type` properties.

LI Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`type`		
`value`		

Syntax

Accessing LI element object properties and methods:

```
(IE4+)      [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6)  [window.]document.getElementById("elemID").property |
            method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

An LI (list item) element contains the HTML that is displayed for each item within an OL or UL list. Note that you can put any HTML you want inside a list item, including images. Attributes and properties of this element enable you to override the specifications declared in the OL or UL containers (except in IE/Mac).

Properties

`type`

Value: String Constant Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Because either an OL or UL container can own an LI element, the `type` property accepts any of the values that you assign to the `type` properties of both the OL and UL element objects. See the `OL.type` and `UL.type` properties earlier in this chapter for lists of those values.

Exercise caution, however, if you attempt to mix and match types. For example, if you try to set the `LI.type` property of an LI element to `circle` inside an OL element, the results vary from browser to browser. NN6, for example, follows your command; however, IE may display some other characters.

On the CD-ROM

Example on the CD-ROM

Related Items: `OL.type`, `UL.type` properties.

`value`

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `value` property governs which number or letter is used for the current list item inside an ordered list. Employ this attribute and property to override the natural progression. Because these sequence characters can be letters, numbers, or Roman numerals, the integer you specify for this property is converted to the numbering scheme in force by the LI or OL element's `type` property.

On the CD-ROM

Example on the CD-ROM

Related Item: `OL.start` property.

DL, DT, and DD Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`compact`†		

†See OL Element Object.

Syntax

Accessing DL, DT, and DD element object properties and methods:

```
(IE4+)          [window.] document.all.elemID.property | method([parameters])
(IE5+/NN6+)     [window.] document.getElementById("elemID"). property |
                method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About these objects

Three elements — DL, DT, and DD — provide context and (optionally) formatting for definitions in a document. The DL element is the outer wrapper signifying a definition list. Each definition term should be inside a DT element, while the definition description should be in the nested DD element. The HTML for a simple definition list has the following structure:

```
<DL>
    <DT>First term
    <DD>First term's definition
    <DT>Second  term
    <DD>Second  term's definition
</DL>
```

While there are no specific requirements for rendering definition lists by convention, the term and description are usually on different lines with the description indented.

All three of these elements are treated as element objects, sharing the same properties, methods, and event handlers of generic element objects. The only one of the three that has anything special is the DL element, which has a `compact` property. IE4+ for Windows does respond to this attribute and property by putting the description and term on the same line if the term is shorter than the usual indentation space of the description.

DIR and MENU Element Objects

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`compact`†		

†See OL Element Object.

Syntax

Accessing DIR and MENU element object properties and methods:

```
(IE4+)     [window.]document.all.elemID.property | method([parameters])
(IE5+/NN6) [window.]document.getElementById("elemID"). property |
           method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About these objects

The DIR and MENU elements are treated in modern browsers as if they were UL elements for unordered lists of items. Both elements are deprecated in HTML 4.0; yet, because they are acknowledged in that standard, they are also acknowledged in the W3C DOM (and the IE DOM, too). Originally intended to assist in creating single and double columns of text (long since supplanted by tables), usage of these elements has fallen out of favor and is discouraged.

✦ ✦ ✦

CHAPTER 28

The Navigator and Other Environment Objects

✦ ✦ ✦ ✦

In This Chapter

Determining which browser the user has

Branching scripts according to the user's operating system

Detecting plug-in support

✦ ✦ ✦ ✦

Client-side scripting primarily focuses on the document inside a browser window and the content of the document. As discussed in Chapter 16, the window, too, is an important part of how you apply JavaScript on the client. But stepping out even one more level is the browser application itself. Scripts sometimes need to know about the browser and the computing environment in which it runs so that they can tailor dynamic content for the current browser and operating system.

To that end, browsers provide objects that expose as much about the client computer and the browser as is feasible within accepted principles of preserving a user's privacy. In addition to providing some of the same information that CGI programs on the server receive as environment variables, these browser-level objects also include information about how well equipped the browser is with regard to plug-ins and Java. Another object defined for NN4+ and IE4+ reveals information about the user's video monitor, which may influence the way your scripts calculate information displayed on the page.

The objects in this chapter don't show up on the document object hierarchy diagrams, except as freestanding groups (see Appendix A). The IE4+ object model, however, incorporates these environmental objects as properties of the `window` object. Because the `window` reference is optional, you can omit it for IE and wind up with a cross-browser, compatible script in many cases.

Where the IE (for Windows anyway) and NN environments diverge significantly is in the way scripts can find out whether a particular plug-in or support for a particular MIME type is available in the current browser. As you learn in this chapter, the IE for Windows methodology can be a bit roundabout. And yet the Macintosh version of IE5+ has adopted the approach initiated by NN3. Go figure.

clientInformation Object (IE4+) and navigator Object (All)

Properties	*Methods*	*Event Handlers*
`appCodeName`	`javaEnabled()`	
`appMinorVersion`	`preference()`	
`appName`	`taintEnabled()`	
`appVersion`		
`browserLanguage`		
`cookieEnabled`		
`cpuClass`		
`language`		
`mimeTypes`		
`onLine`		
`oscpu`		
`platform`		
`plugins`		
`product`		
`productSub`		
`securityPolicy`		
`systemLanguage`		
`userAgent`		
`userLanguage`		
`userProfile`		
`vendor`		
`vendorSub`		

Syntax

Accessing `clientInformation` and `navigator` object properties and methods:

```
(All)        navigator.property | method()
(IE4+/NN6)   [window.]navigator.property | method()
(IE4+)       [window.]clientInformation.property | method()
```

About this object

In Chapter 16, I repeatedly mention that the `window` object is the top banana of the document object hierarchy. In other programming environments, you likely can find a level higher than the window — perhaps referred to as the *application level*. You may think that an object known as the `navigator` object is that all-encompassing object. That is not the case, however.

Although Netscape originally invented the `navigator` object for the Navigator 2 browser, Microsoft Internet Explorer also supports this object in its object model. For those who exhibit partisan feelings toward Microsoft, IE4+ provides an alternate object — `clientInformation` — that acts as an alias to the `navigator` object. You are free to use the IE-specific terminology if your development is intended only for IE browsers. All properties and methods of the `navigator` and `clientInformation` objects are identical. In the rest of this section, all references to the `navigator` object also apply to the `clientInformation` object.

Be aware that the number of properties for this object has grown with virtually every browser version. Moreover, other than some basic items that have been around since the early days, most of the more recent properties are browser-specific. Observe the compatibility ratings for each of the following properties very carefully.

Most of the properties of the `navigator` object deal with the browser program the user runs to view documents. Properties include those for extracting the version of the browser and the platform of the client running the browser. Because so many properties of the `navigator` object are related to one another, I begin this discussion by grouping four of the most popular ones together.

Properties

appCodeName
appName
appVersion
userAgent

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

These four properties reveal just about everything that browser-sniffing code needs to know about the user's browser brand, version, and other tidbits. Of these four, only the last three are particularly valuable. The first property in the list, `appCodeName`, defines a class of client that encompasses essentially every standard browser. The value returned by browsers, `Mozilla`, is the code name of the first browser engine on which NN and IE browsers at one time were based (the NCSA Mosaic browser). This information does nothing to help your scripts distinguish among browser flavors, so you can ignore the property. But the other three properties are the ones with all the goodies.

The appName property returns the official name for the browser application. For Netscape browsers, the appName value is Netscape; for Internet Explorer, the value is Microsoft Internet Explorer.

The appVersion and userAgent properties provide more meaningful detail. I start with the appVersion property because it is revealing and, at times, misleading.

Using the appVersion property

A typical appVersion property value looks like the following (one from NN6, one from IE5):

```
5.0 (Windows; en-US)
4.0 (compatible; MSIE 5.5; Windows 98; compat; DigExt)
```

Because most version decisions are based on numeric comparisons (for example, the version is equal to or greater than 4), you frequently need to extract just the number part of the string returned by the appVersion property. The cleanest way to do this is via the parseInt() or parseFloat() methods. Use

```
parseInt(navigator.appVersion)
```

if you are interested only in the number to the left of the decimal; to get the complete leading floating-point number, use

```
parseFloat(navigator.appVersion)
```

All other characters after the leading numbers are ignored.

Also notice that the number does not always accurately represent the version of the browser at hand. For instance, IE5.5 reports that it is version 4.0. The number is more indicative of a broad generation number rather than a specific browser version number. In other words, the browser exhibits characteristics of the first browsers to wear the appVersion of 4 (IE 4.0, it turns out). While this means that IE5.5 can use everything that is in the language and object model of IE4, this obviously doesn't help your script to know if the browser is capable of IE5.5 scripting features.

At the same time, however, buried elsewhere in the appVersion string is the wording MSIE 5.5—the "true" version of the browser. IE uses this technique to distinguish the actual version number from the generational number. Therefore, for IE, you may have to dig deeper by using string methods such as indexOf() to see if the appVersion contains the desired string. For example, to see if the browser is a variant of IE5, you can test for just "MSIE 5" as follows:

```
var isIE5x = navigator.appVersion.indexOf("MSIE 5") != -1
```

Or to know if the browser is IE5.5, include more of the string:

```
var isIE5_5 = navigator.appVersion.indexOf("MSIE 5.5") != -1
```

There is a hazard in doing this kind of testing, however. Going forward, your code will break if future versions of IE have larger version numbers. Therefore, if you want to use IE5 features with an IE6 browser (assuming such a browser becomes available), your testing for the presence of "MSIE 5" fails and the script thinks that it cannot use IE5 features even though they most certainly would be available in IE6. To find out if the current IE browser is the same or newer than a particular version, you must use JavaScript string parsing to deal with the MSIE x.x substring of the appVersion (or userAgent) property. The following example shows one function that extracts the precise IE version name and another function that confirms whether the version is at least IE5.0 for Windows.

```
var ua = navigator.userAgent
function getIEVersion() {
    var IEOffset = ua.indexOf("MSIE ")
    return parseFloat(ua.substring(IEOffset + 5, ua.indexOf(";", IEOffset)))
}
function qualifyBrowser() {
    var qualified = false
    if (navigator.appName == "Microsoft Internet Explorer") {
        if (parseInt(getIEVersion()) >= 5) {
            if (ua.indexOf("Windows") != -1) {
                qualified = true
            }
        }
    }
    if (!qualified) {
        var msg = "These scripts are currently certified to run on:\n"
        msg += " - MS Internet Explorer 5.0 or later for Windows\n"
        alert(msg)
    }
    return qualified
}
```

As clever as the code above looks, using it assumes that the version string surrounding the MSIE characters will be immutable in the future. We do not have that kind of guarantee, so you have to remain vigilant for possible changes in future versions.

Thus, with each browser generation's pollution of the appVersion and userAgent properties, the properties become increasingly less useful for browser sniffing—unless you wish to burden your code with a lot of general-purpose sniffing code, very little of which any one browser uses.

Even NN is not free of problems. For example, the main numbering in the appVersion property for NN6 is 5 (in other words, the fifth generation of Mozilla). Buried elsewhere in the property value is the string Netscape6. A potentially thornier problem arises due to Netscape's decision to eliminate some nonstandard NN4 DOM features from the NN6 DOM (layer objects and some event object behaviors). Many scripters followed the previously recommended technique of "prepare for the future" by using an appVersion of 4 as a minimum:

```
var isNN4 = parseInt(navigator.appVersion) >= 4
```

But any code that relies on the isNN4 variable to branch to code that talks to the dead-end NN4 objects and properties breaks when it runs in NN6.

The bottom line question is, "What do I do for browser version detection?" Unfortunately, there are dozens of answers to that question, depending on what you need browser detection to do and what level of code you produce.

At one end of the spectrum is code that tries to be many things to many browsers, implementing multiple levels of features for many different generations of browser. This is clearly the most difficult tactic, and you have to create quite a long list of variables for the conditions for which you establish branches. Some branches may work on one combination of browsers, while you may need to split other branches differently because the scripted features have more browser-specific implementations.

At the other end of the spectrum is the code that tries to support, say, only IE5+ and NN6+ with W3C DOM-compatible syntax to the extent that both browser families implement the object model features. Life for this scripter is much easier in that the amount of branching is little or none depending on what the scripts do with the objects.

Between these two extremes, situations call for many different solutions. Object detection (for example, seeing if `document.images` exists before manipulating image objects) is a good solution at times, but not so much for determining the browser version as for knowing whether some code that addresses those objects works. As described in Chapter 14, it is hazardous to use the existence of, say, `document.all` as an indicator that the browser is IE4+. Some other browser in the future may also implement the `document.all` property, but not necessarily all the other IE4+ objects and syntax. Code that thinks it's running in IE4+ just because `document.all` exists can easily break if `document.all` is implemented in another browser but not all the rest of the IE4+ DOM. Using object detection to branch code that addresses the detected objects is, however, very desirable in the long run because it frees your code from getting trapped in the ever-changing browser version game.

Don't write off the `appVersion` and `userAgent` properties entirely. The combination of features that you script may benefit from some of the data in that string, especially when the decisions are made in concert with the `navigator.appName` property. A number of other properties implemented in IE4+ and NN6 can also provide the sufficient clues for your code to perform the branching that your application needs. For instance, it may be very helpful to your scripts to know whether the `navigator.platform` property informs them that they are running in a Windows or Macintosh environment because of the way each operating system renders fonts.

userAgent property details

The string returned by the `navigator.userAgent` property contains a more complete rundown of the browser. The `userAgent` property is a string similar to the `USER_AGENT` header that the browser sends to the server at certain points during the connection process between client and server.

Unfortunately, there is no standard for the way information in the `userAgent` property is formatted. It may be instructive, however, to view what kinds of values come from a variety of browsers on different platforms. Table 28-1 shows some of the values that your scripts are likely to see. This table does not include, of course, the many values that are not reflected by browsers that do not support JavaScript. The purpose of the table is to show you just a sampling of data that the property can contain from a variety of browsers and operating systems (particularly enlightening if you do not have access to Macintosh or UNIX computers).

Table 28-1 Typical navigator.userAgent Values

navigator.userAgent	*Description*
`Mozilla/5.0 (Windows; U; Win98; en-US) Netscape6/6.0`	Navigator 6 for Windows, running under Windows 98; U.S. English edition and U.S. encryption
`Mozilla/4.74 [en] (X11; U; Linux 2.2.154mdksmp i686)`	Navigator 4.74, English edition for Linux with U.S. encryption
`Mozilla/4.73 (Macintosh; U; PPC)`	Navigator 4.73 for PowerPC Macintosh with U.S. encryption
`Mozilla/4.02 [en] (Win95; I; Nav)`	Navigator-only version of Communicator 4.02, English edition for Windows 95, and export encryption
`Mozilla/4.01 [fr] (Win95; I)`	Navigator 4.01, French edition for Windows 95, export encryption
`Mozilla/3.01Gold (Win95; I)`	Navigator 3.01 Gold for Windows 95
`Mozilla/3.01 (Macintosh; I; PPC)`	Navigator 3.01 for PowerPC Macintosh
`Mozilla/3.01 (X11; I; HP-UX A.09.05 9000/720)`	Navigator 3.01 for HP-UX on RS-9000
`Mozilla/3.01 (X11; I; SunOS 5.4 sun4m)`	Navigator 3.01 for SunOS 5.4
`Mozilla/3.01Gold [de] (Win16; I)`	Navigator 3.01, German edition for Windows 3.0*x*
`Mozilla/4.0 (compatible; MSIE 5.0; Windows 98; DigExt)`	IE 5.0 for Windows 98 with digital signature
`Mozilla/4.0 (compatible; MSIE 5.5; Windows NT 5.0)`	IE 5.5 running under Windows NT 5.0
`Mozilla/4.0 (compatible; MSIE 5.0; Mac_PowerPC)`	IE 5.0 running on a PowerPC-equipped Macintosh
`Mozilla/3.0 WebTV/1.2 (compatible; MSIE 2.0)`	IE 2 built into a WebTV box, emulating Navigator 3 (its scripting compatibility with Navigator 3 is in question)
`Mozilla/2.0 (compatible; MSIE 3.0; AOL 3.0; Windows 3.1)`	IE 3 (version for America Online software version 3) for Windows 3.1, emulating Navigator 2
`Mozilla/2.0 (compatible; MSIE 3.02; Update a; Windows 95)`	IE 3.02, Update a for Windows 95, emulating Navigator 2
`Mozilla/2.0 (compatible; MSIE 3.0B; Windows NT)`	IE 3 (beta) emulating Navigator 2

Because the `userAgent` property contains a lot of the same information as the `appVersion` property, the same cautions just described apply to the `userAgent` string and the environment data it returns.

Speaking of compatibility and browser versions, the question often arises whether your scripts should distinguish among incremental releases within a browser's generation (for example, 3.0, 3.01, 3.02, and so on). The latest incremental release occasionally contains bug fixes and (rarely) new features on which you may rely. If that is the case, then I suggest you look for this information when the page loads and recommend to the user that he or she download the latest browser version. Beyond that, I suggest scripting for the latest version of a given generation and not bothering with branching for incremental releases.

See Chapters 13 and 14 for more information about designing pages for cross-platform deployment.

On the CD-ROM

Example (with Listing 28-1) on the CD-ROM

Related Items: `appMinorVersion`, `cpuClass`, `oscpu`, `platform` properties.

appMinorVersion

Value: One-Character String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

In IE parlance, the *minor version* is indicated by the first digit to the right of the decimal in a full version number. But the "version number" referred to here is the number that the `navigator.appVersion` property reports, not the actual version of the browser. For example, although IE5.5 seems to have a version number of 5 and a minor version number of 5, the `appVersion` reports version 4.0. In this case, the `minorAppVersion` reports 0. Thus, you cannot use the `appMinorVersion` property to detect differences between, say, IE5 and IE5.5. That information is buried deeper within the string returned by `appVersion` and `userAgent`.

On the CD-ROM

Example on the CD-ROM

Related Item: `appVersion` property.

browserLanguage

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `browserLanguage` property in IE4+ (and the `language` property in NN4+) returns the identifier for a localized language version of the program (it has nothing to do with scripting or programming language). The value of the `browserLanguage` property almost always is the same as the other IE language-related properties, unless the user changes the Windows control panel for regional settings after installing IE. In that case, `browserLanguage` returns the original language of the browser application, while the other properties report the language indicated in the system-level preferences panel.

Note Users of the multilanguage version of Windows 2000 can choose alternate languages for menus and dialog boxes. The `browserLanguage` property returns the language you choose for those settings.

These short strings may resemble, but are not identical to, the URL suffixes for countries. Moreover, when a language has multiple dialects, the dialect can also be a part of the identifier. For example, `en` is the identifier for English. However, `en-us` (or `en-US`) represents the American dialect of English, while `en-gb` (or `en-GB`) represents the dialect recognized in Great Britain. NN sometimes includes these values as part of the `userAgent` data as well. Table 28-2 shows a sampling of language identifiers used for all language-related properties of the `navigator` object.

Table 28-2 Sample navigator.browserLanguage Values

navigator.language	*Language*
`en`	English
`de`	German
`es`	Spanish
`fr`	French
`ja`	Japanese
`da`	Danish
`it`	Italian
`ko`	Korean
`nl`	Dutch
`pt`	Brazilian Portuguese
`sv`	Swedish

You can assume that a user of a particular language version of the browser or system is also interested in content in the same language. If your site offers multiple language paths, then you can use this property setting to automate the navigation to the proper section for the user.

Related Items: `navigator.userAgent`, `navigator.language`, `navigator.systemLanguage`, `navigator.userLanguage` properties.

cookieEnabled

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `cookieEnabled` property allows your scripts to determine easily if the browser has cookie functionality turned on. You can surround cookie-related statements with an `if` construction as follows:

```
if (navigator.cookieEnabled) {
    // do cookie stuff here
}
```

This works reliably only on browsers that implement the property. Because older browsers do not have this `navigator` object property, the `if` condition appears `false` (even though cookies may be turned on).

You can still check for cookie functionality in older browsers, but only clumsily. The technique entails assigning a "dummy" cookie value to the `document.cookie` property and attempting to read back the cookie value. If the value is there, then cookies are enabled.

On the CD-ROM

Example on the CD-ROM

Related Item: `document.cookie` property.

cpuClass

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `cpuClass` property returns one of several fixed strings that identifies the family of central processing units running IE. Possible values and their meanings are as follows:

cpuClass	***Description***
`x86`	Intel processor (and some emulators)
`PPC`	Motorola Power PC processor (for example, Macintosh)
`68K`	Motorola 68000-family processor (for example, Macintosh)
`Alpha`	Digital Equipment Alpha processor
`Other`	Other processors, such as SPARC

The processor is not a good guide to determining the operating system because you can run multiple operating systems on most of the preceding processor families. Moreover, the `cpuClass` value represents the processor that the browser "thinks" it is running on. For example, when a Windows version of IE is hosted by the *Virtual PC* emulator on a PowerPC Macintosh, the `cpuClass` is reported as `x86` even though the actual hardware processor is `PPC`.

On the CD-ROM

Example on the CD-ROM

Related Item: `navigator.oscpu` property.

`language`

Value: String   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The NN4+ `language` property returns the language code for the browser application. While the comparable IE property (`navigator.browserLanguage`) has morphed in later versions to focus on the operating system language, NN's property deals exclusively with the language for which the browser application is written.

Related Item: `navigator.browserLanguage` property.

`mimeTypes`

Value: Array of mimeType objects   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			(✓)	(✓)	(✓)

A *MIME (Multipurpose Internet Mail Extension)* type is a file format for information that travels across the Internet. Browsers usually have a limited capability for displaying or playing information beyond HTML text and one or two image standards (`.gif` and `.jpg` are the most common formats). To fill in the gap, browsers maintain an internal list of MIME types with corresponding instructions on what to do when information of a particular MIME type arrives at the client. For example, when a CGI program serves up an audio stream in an audio format, the browser locates that MIME type in its table (the MIME type is among the first chunk of information to reach the browser from the server) and then launches a helper application or activates a plug-in capable of playing that MIME type. Your browser is not equipped to display every MIME type, but it does know how to alert you when you don't have the helper application or plug-in needed to handle an incoming file. For instance, the browser may ask if you want to save the file for later use or switch to a Web page containing more information about the necessary plug-in.

The `mimeTypes` property of the `navigator` object is simply the array of MIME types about which your browser knows (see the "MimeType object" section later in this chapter). NN3+ come with dozens of MIME types already listed in their tables (even if the browser doesn't have the capability to handle all those items automatically). If you have third-party plug-ins in Navigator's plug-ins directory/folder or helper applications registered with Navigator, that array contains these new entries as well.

If your Web pages are media-rich, you want to be sure that each visitor's browser is capable of playing the media your page has to offer. With JavaScript and NN3+, you can cycle through the `mimeTypes` array to find a match for the MIME type of your media. Then use the properties of the `mimeType` object (detailed later in this chapter) to ensure the optimum plug-in is available. If your media still requires a helper application instead of a plug-in, the array only lists the MIME type; thus, you can't determine whether a helper application is assigned to this MIME type from the array list.

You may have noticed that the preceding discussion focuses on Netscape Navigator, yet the compatibility chart shows that IE4+ supports the `mimeTypes` property. The actual situation is more complex. The Windows version of IE4+ supports this property only in so far as to return an empty array. In other words, the property is defined, but it does not contain `mimeType` objects — a nonexistent object in IE for Windows. But on the Macintosh side, IE5+ supports the way Netscape Navigator allows script inspection of MIME types and plug-ins. To see ways of determining plug-in support for IE/Windows, see the section "Plug-in detection in IE/Windows" later in this chapter.

On the CD-ROM

Example on the CD-ROM

Related Item: `navigator.plugins` property; `mimeType` object.

onLine

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `onLine` property lets scripts determine the state of the offline browsing setting for the browser. Bear in mind that this property does not reveal whether the page is accessed via the Net or a local hard disk. The browser can be in online mode and still access a local page; in this case, the `onLine` property returns `true`.

With the offline browsing capabilities of IE4+, users may prefer to download copies of pages they wish to reference frequently (perhaps on a disconnected laptop computer). In such cases, your pages may want to avoid network-reliant content when accessed offline. For example, if your page includes a link to a live audio feed, you can dynamically generate that link with JavaScript — but do so only if the user is online:

```
if (navigator.onLine) {
    document.write("<A HREF='broadcast.rna'>Listen to Audio</A>")
}
```

On the CD-ROM

Example on the CD-ROM

Related Items: None.

oscpu

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 `oscpu` property returns a string that reveals OS- or CPU-related information about the user's environment. The precise string varies widely with the client OS. For instance, a Windows 98 machine reports `Win98`, while a Macintosh reports `PPC`. The string formats for Windows NT versions are not standardized, so they offer values such as `WinNT4.0` and `Windows NT 5.0`. UNIX platforms reveal more details, such as the system version and hardware.

On the CD-ROM

Example on the CD-ROM

Related Item: `navigator.cpuClass` property.

platform

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `navigator.platform` value reflects the operating system according to the codes established initially by Netscape for its `userAgent` values. Table 28-3 lists typical values of several operating systems.

In the long list of browser detection functions in Listing 28-1, I elected not to use the `navigator.platform` property because it is not backward-compatible. Meanwhile, the other properties in that listing are available to all scriptable browsers.

Table 28-3 Sample navigator.platform Values

navigator.platform	*Operating System*
`Win98`	Windows 98
`WinNT`	Windows NT
`Win16`	Windows 3.*x*
`Mac68k`	Mac (680x0 CPU)
`MacPPC`	Mac (PowerPC CPU)
`SunOS`	Solaris

Notice that the `navigator.platform` property does not go into versioning of the operating system. Only the raw name is provided.

On the CD-ROM

Example on the CD-ROM

Related Item: `navigator.userAgent` property.

plugins

Value: Array of Plug-in Objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			(✓)	(✓)	(✓)

You rarely find users involved with Web page design who have not heard about *plug-ins* — the technology that enables you to embed new media types and foreign file formats directly into Web documents. For instance, instead of requiring you to view a video clip in a separate window atop the main browser window, a plug-in enables you to make that viewer as much a part of the page design as a static image. The same goes for audio players, 3-D animation, chat sessions — even the display of Microsoft Office documents, such as PowerPoint and Word.

When many browsers launch, they create an internal list of available plug-ins located in a special directory/folder (the name varies with the browser and operating system). The `navigator.plugins` array lists the items registered at launch time. Each plug-in is, itself, an object with several properties.

The Windows version of IE4+ supports this property only to return an empty array. In other words, the property is defined, but it does not contain `plugin` objects — a nonexistent object in IE for Windows. But on the Macintosh side, IE5+ supports the way Netscape Navigator allows script inspection of MIME types and plug-ins. To see ways of determining plug-in support for IE/Windows, see the section "Plug-in detection in IE/Windows" later in this chapter.

Having your scripts investigate the visitor's browser for a particular installed plug-in is a valuable capability if you want to guide the user through the process of downloading and installing a plug-in (if the system does not have it currently).

Example

For examples of the `plugins` property and for details about using the plugin object, see the section "plugin object" later in this chapter. Also see Chapter 32 on embedded element objects.

Related Items: `navigator.mimeTypes` property; `plugin` object.

`product`
`productSub`
`vendor`
`vendorSub`

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

With the browser engine behind Navigator 6 being developed in an Open Source environment, any number of vendors might adapt the engine for any number of browser products. Some distributors of the browser, such as ISPs and computer manufacturers, may also tailor the browser slightly for their customers. These four properties can reveal some of the pedigree of the browser currently running scripts on the page.

Two categories of properties — one for the product, one for the vendor — each have a pair of fields (a primary and secondary field) that can be populated as the vendor sees fit. Some of this information may contain data, such as an identifying number of the *build* (development version) used to generate the product. A script at a computer maker's Web site page may look for a particular series of values in these properties to welcome the customer or to advise the customer of a later build version that is recommended as an upgrade.

On the CD-ROM

Example on the CD-ROM

Related Item: `navigator.userAgent` property.

securityPolicy

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The Netscape-specific `securityPolicy` property returns a string that indicates which cryptographic scheme is implemented in the current browser. Typical string values include `US and CA domestic policy` and `export policy`. Each policy indicates the number of bits used for encryption, usually governed by technology export laws. While the property returns a value in NN4, it returns only an empty string in the first release of NN6. The corresponding IE property is `document.security`.

Related Item: `document.security` property.

systemLanguage
userLanguage

Value: Language Code String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

These two IE-specific properties report the language code of the written language specified for the operating system. For most operating system versions, these two values are the same. Some Windows versions enable you to set system preferences differently for the base operating system and the language for a given user. Both of these property values can differ from the `navigator.browserLanguage` property if the user downloads and installs the browser with the system set to one language and then changes the system settings to another language.

Example on the CD-ROM

Related Item: `navigator.browserLanguage` property.

userAgent

See `appCodeName`.

userLanguage

See `systemLanguage`.

userProfile

Value: `userProfile` Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `userProfile` property returns a reference to the IE `userProfile` object. This object provides scripted access to a limited range of user profile settings with the user's permission. For details, see the `userProfile` object discussion later in this chapter.

Related Item: `userProfile` object.

vendor
vendorSub

See `product`.

Methods

javaEnabled()

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Although most modern browsers ship with Java support turned on, a user can easily turn it off in a preferences dialog box (or even elect not to install it with the browser). Some corporate installations may also turn off Java as the default setting for their users. If your pages specify Java applets, you don't normally have to worry about this property because the applet tag's alternate text fills the page in the places where the applet normally goes. But if you script applets from JavaScript (via LiveConnect, Chapter 44), you don't want your scripts making calls to applets or Java classes if Java support is turned off. In a similar vein, if you create a page with JavaScript, you can fashion two different layouts depending on the availability of Java.

The `navigator.javaEnabled()` method returns a Boolean value reflecting the preferences setting. This value does not reflect Java support in the browser necessarily (and especially not the Java version supported), but rather whether Java is turned on inside the browsers for which this method is supported. A script cannot change the browser's preference setting, but its value does change immediately upon toggling the Preference setting.

Related Items: `navigator.preference()` method; LiveConnect (Chapter 44).

preference(*name* [, *val*])

Returns: Preference value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The user normally sets browser preferences. Until NN4 and the advent of signed scripts, almost all settings were completely out of view of scripts — even when it made sense to expose them. But with signed scripts and the `navigator.preference()` method, many NN preferences are now viewable and settable with the user's permission. These preferences were exposed to scripting primarily for the purposes of centralized configuration administration for enterprise installations. I don't recommend altering the browser preferences of a public Web site visitor, even if given permission to do so — the user may not know how much trouble you can cause.

When you want to read a particular preference setting, you pass only the preference name parameter with the method. Reading a preference requires a signed script with the target of `UniversalPreferencesRead` (see Chapter 46). To change a preference, pass both the preference name and the value (with a signed script target of `UniversalPreferencesWrite`).

Table 28-4 shows a handful of scriptable preferences in NN4+ (learn more about these settings at `http://developer.netscape.com/docs/manuals/communicator/preferences/`). Most items have corresponding entries in the preferences window in NN4+ (shown in parentheses). Notice that the preference name uses dot syntax. The cookie security level is a single preference value with a matrix of integer values indicating the level.

Table 28-4 navigator.preference() Values Sampler

navigator.preference	*Value*	*Preference Dialog Listing*
`general.always_load_images`	Boolean	(Advanced) Automatically loads images
`security.enable_java`	Boolean	(Advanced) Enables Java
`javascript.enabled`	Boolean	(Advanced) Enables JavaScript
`browser.enable_style_sheets`	Boolean	(Advanced) Enables style sheets
`autoupdate.enabled`	Boolean	(Advanced) Enables AutoInstall
`navigator.preference`	Value	Preference Dialog Listing
`network.cookie.cookieBehavior`	`0`	(Advanced) Accepts all cookies
`network.cookie.cookieBehavior`	`1`	(Advanced) Accepts only cookies that get sent back to the originating server
`network.cookie.cookieBehavior`	`2`	(Advanced) Disables cookies
`network.cookie.warnAboutCookies`	Boolean	(Advanced) Warns you before accepting a cookie

Tip

One preference to watch out for is the one that disables JavaScript. If you disable JavaScript, only the user can reenable JavaScript by manually changing the setting in the Navigator preferences dialog box.

On the CD-ROM

Example (with Listing 28-2) on the CD-ROM

Related Item: `navigator.javaEnabled()` method.

`taintEnabled()`

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Navigator 3 featured a partially implemented security feature called *data tainting*, which was turned off by default. This feature was replaced by signed scripts; but for backward compatibility, the `navigator.taintEnabled()` method is available in more modern browsers that don't employ tainting (in which case, the method always returns `false`). Do not employ this method in your scripts.

mimeType Object

Properties	*Methods*	*Event Handlers*
`description`		
`enabledPlugin`		
`type`		
`suffixes`		

Syntax

Accessing mimeType properties:

```
navigator.mimeTypes[i].property
navigator.mimeTypes["MIMEtype"].property
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

About this object

A mimeType object is essentially an entry in the internal array of MIME types about which the browser knows. NN3+, for example, ships with an internal list of more than five dozen MIME types. Only a handful of these types are associated with helper applications or plug-ins. But add to that list all of the plug-ins and other helpers you've added, and the number of MIME types can grow to more than a hundred.

The MIME type for the data is usually among the first bits of information to arrive at a browser from the server. A MIME type consists of two pieces of information: type and subtype. The traditional way of representing these pieces is as a pair separated by a slash, as in

```
text/html
image/gif
audio/wav
video/quicktime
application/pdf
application/x-zip-compressed
```

If a file does not contain the MIME type "header" (or a CGI program sending the file does not precede the transmission with the MIME type string), the browser receives the data as a text/plain MIME type. When you load the file from a local hard drive, the browser looks to the filename's extension (the suffix after the period) to figure out the file's type.

Regardless of the way it determines the MIME type of the incoming data, the browser then acts according to instructions it maintains internally. You can see these settings by looking at preferences settings usually associated with the name “Applications.”

By having the mimeType object available to JavaScript, your page can query a visitor’s NN3+ or IE5+/Mac browser to discover whether it has a particular MIME type listed currently and whether the browser has a corresponding plug-in installed and enabled. In such queries, the mimeType and plugin objects work together to help scripts make these determinations. (For plug-in detection for IE/Windows, see the section “Plug-in detection in IE/Windows” later in this chapter.)

Because of the close relationship between mimeType and plugin objects, I save the examples of using these objects and their properties for a section later in this chapter. There you can see how to build functions into your scripts that enable you to examine how well a visitor’s NN3+ and IE5+/Mac browser is equipped for either a MIME type or data that requires a specific plug-in. In the meantime, be sure that you understand the properties of both objects.

Properties

`description`

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

While registering with the browser at launch time, plug-ins provide the browser with an extra field of information: a plain-language description of the plug-in. If a particular MIME type has a plug-in associated with it and enabled for it, the plug-in’s description passes through to become the description of the mimeType object. For example, the Adobe Acrobat plug-in (whose MIME type is `application/pdf`) supplies the following description fields:

```
(NN3/NN4)    Acrobat
(NN6)        Acrobat (*.pdf)
```

When a MIME type does not have a plug-in associated with it (either no plug-in is installed or a helper application is used instead), you often see the type property repeated in the description field.

Related Items: None.

`enabledPlugin`

Value: plugin Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

The descriptions of the mimeType and plugin objects seem to come full circle when you reach the `mimeType.enabledPlugin` property. The reason is that the property is a vital link between a known MIME type and the plug-in that the browser engages when data of that type arrives.

Knowing which plug-in is associated with a MIME type is very important when you have more than one plug-in capable of playing a given MIME type. For example, the Crescendo MIDI audio plug-in can take the place of the default audio plug-in if you set up your browser that way. Therefore, all MIDI data streams play through the Crescendo plug-in. If you prefer to have your Web page's MIDI sound played only through another plug-in, such as LiveAudio in NN, your script needs to know which plug-in is set to receive your data and perhaps alert the user accordingly. These kinds of conflicts are not common, except where there is strong competition for players of various audio and video media. For other kinds of content, each plug-in developer typically creates a new type of data that has a unique MIME type. But you have no guarantee of such uniqueness, so I highly recommend a careful check of MIME type and plug-in if you want your page to look professional.

The `enabledPlugin` property evaluates to a plugin object. Therefore, you can dig a bit deeper with this information to fetch the name or filename properties of a plug-in directly from a mimeType object. You can use The Evaluator (with NN3+ and IE5+/Mac) to study the relationship between mimeType and plugin objects:

1. Enter the following statement into the bottom text box to examine the properties of a mimeType object:

   ```
   navigator.mimeTypes[0]
   ```

   Notice that the `enabledPlugin` property returns an object.

2. Inspect the plugin object from the bottom text box.

   ```
   navigator.mimeTypes[0].enabledPlugin
   ```

   You then see properties and values for a plugin object (described later in this chapter).

3. Check the plugin object for a different mimeType object by using a different index value:

   ```
   navigator.mimeTypes[7].enabledPlugin
   ```

The `mimeTypes` array index values vary almost with every browser, depending on what the user has installed. Therefore, do not rely on the index position in a script to assume that a particular mimeType object is in that position on all browsers.

Example

See the section "Looking for MIME Types and Plug-ins" later in this chapter.

Related Item: `plugin` object.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

A mimeType object's `type` property is the combination of the type and subtype commonly used to identify the kind of data coming from the server. CGI programs, for example, typically precede a data transmission with a special header string in the following format:

```
Content-type: type/subtype
```

This string prompts a browser to look up how to treat an incoming data stream of this kind. As you see later in this chapter, knowing whether a particular MIME type is listed in the `navigator.mimeTypes` array is not enough. A good script must dig deeper to uncover additional information about what is truly available for your data.

The `type` property has a special place in the mimeType object in that its string value can act as the index to the `navigator.mimeTypes` array. Therefore, to get straight to the mimeType object for, say, the `audio/wav` MIME type, your script can reference it directly through the `mimeTypes` array:

```
navigator.mimeTypes["audio/wav"]
```

This same reference can then get you straight to the enabled plug-in (if any) for the MIME type:

```
navigator.mimeTypes["audio/wav"].enabledPlugin
```

Example

See the section "Looking for MIME Types and Plug-ins" later in this chapter.

Related Item: `description` property.

suffixes

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

Every MIME type has one or more filename extensions, or suffixes, associated with it. You can read this information for any mimeType object via the `suffixes` property. The value of this property is a string. If the MIME type has more than one suffix associated with it, the string contains a comma-delimited listing as in

```
mpg, mpeg, mpe
```

Multiple versions of a suffix have no distinction among them. Those MIME types that are best described in four or more characters (derived from a meaningful acronym, such as mpeg) have three-character versions to accommodate the "8-dot-3" filename conventions of MS-DOS and its derivatives.

Example

See the section "Looking for MIME Types and Plug-ins" later in this chapter.

Related Items: None.

plugin Object

Properties	*Methods*	*Event Handlers*
`name`	`refresh()`	
`filename`		
`description`		
`length`		

Syntax

Accessing plugin object properties or method:

```
navigator.plugins[i].property | method()
navigator.plugins["plugInName"].property | method()
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

About this object

Understanding the distinction between the data embedded in documents that summon the powers of plug-ins and those items that browsers consider to be plug-ins is important. The former are made part of the `document` object by way of `<EMBED>` tags. If you want to control the plug-in via LiveConnect, you can gain access through the `document.embedName` object (see Chapter 44).

The subject here, however, is the way the plug-ins work from the browser's perspective: The software items registered with the browser at launch time stand ready for any matching MIME type that comes from the Net. One of the main purposes of having these objects scriptable is to let your scripts determine whether a desired plug-in is currently registered with the browser and to help with installing a plug-in.

The close association between the plugin and mimeType objects, demonstrated by the `mimeType.enabledPlugin` property, is equally visible coming from the direction of the plug-in. A `plugin` object evaluates to an array of MIME types that the plug-in interprets. Use The Evaluator (Chapter 13) to experiment with MIME types from the point of view of a plug-in. Begin by finding the name of the plug-in that your browser uses for a common audio MIME type:

1. Enter the following statement into the top text box:

   ```
   navigator.mimeTypes["audio/wav"].enabledPlugin.name
   ```

   If you use NN3+, the value returned is probably `"LiveAudio"`; for IE5+/Mac, the name is probably a version of QuickTime. Copy the name into the clipboard so that you can use it in subsequent statements. The remaining examples show `"LiveAudio"` where you should paste in your plug-in's name.

2. Enter the following statement into the top text box:

   ```
   navigator.plugins["LiveAudio"].length
   ```

   Instead of the typical index value for the array notation, use the actual name of the plug-in. This expression evaluates to a number indicating the total number of different MIME types that the plug-in recognizes.

3. Look at the first MIME type specified for the plug-in by entering the following statement into the top text box:

   ```
   navigator.plugins["LiveAudio"][0].type
   ```

The two successive pairs of square brackets is not a typo: Because the entry in the `plugins` array evaluates to an array itself, the second set of square brackets describes the index of the array returned by `plugins["LiveAudio"]`—a period does not separate the sets of brackets. In other words, this statement evaluates to the `type` property of the first mimeType object contained by the LiveAudio plug-in.

I doubt that you will have to use this kind of construction much; if you know the name of the desired plug-in, you know what MIME types it already supports. In most cases, you come at the search from the MIME type direction and look for a specific, enabled plug-in. See the section “Looking for MIME Types and Plug-ins” later in this chapter for details on how to use the plugin object in a production setting.

Properties

name
filename
description
length

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

The first three properties of the plugin object provide descriptive information about the plug-in file. The plug-in developer supplies the name and description. It's unclear whether future versions of plug-ins will differentiate themselves from earlier ones via either of these fields. Thus, while there is no explicit property that defines a plug-in's version number, that information may be part of the string returned by the `name` or `description` properties.

Be aware that plug-in authors may not assign the same name to every OS platform version of a plug-in. Be prepared for discrepancies across platforms. You should hope that the plug-in that you're interested in has a uniform name across platforms because the value of the `name` property can function as an index to the `navigator.plugins` array to access a particular plugin object directly.

Another piece of information available from a script is the plug-in's filename. On some platforms, such as Windows, this data comes in the form of a complete pathname to the plug-in DLL file; on other OS platforms, only the plug-in filename appears.

Finally, the `length` property of a plugin object counts the number of MIME types that the plug-in recognizes (but is not enabled for necessarily). Although you can use this information to loop through all possible MIME types for a plug-in, a more instructive way is to have your scripts approach the issue via the MIME type (as discussed later in this chapter).

Example

See the section "Looking for MIME Types and Plug-ins" later in this chapter.

Related Item: `mimeType.description` property.

Methods

refresh()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓				(✓)	(✓)

You may have guessed that many browsers determine their lists of installed plug-ins while they launch. If you drop a new plug-in file into the plug-ins directory/folder, you have to quit the browser and relaunch it before the browser sees the new plug-in file. But that isn't a very friendly approach if you take pains to guide a user through downloading and installing a new plug-in file. The minute the user quits the browser, you have a slim chance of getting that person right back. That's where the `refresh()` method comes in.

The `refresh()` method is directed primarily at the browser, but the syntax of the call reminds the browser to refresh just the plug-ins:

```
navigator.plugins.refresh()
```

Interestingly, this command works only for adding a plug-in to the existing collection. If the user removes a plug-in and invokes this method, the removed one stays in the `navigator.plugins` array — although it may not be available for use. Only the act of quitting and relaunching the browser makes a plug-in removal take full effect.

Related Items: None.

Looking for MIME Types and Plug-ins

If you go to great lengths to add new media and data types to your Web pages, then you certainly want your visitors to reap the benefits of those additions. But you cannot guarantee that they have the requisite plug-ins installed to accommodate that fancy data. Most modern browser versions provide a bit of internal "smarts" by noticing when data requiring an uninstalled plug-in is about to load and trying to help the user install a missing plug-in. You may wish, however, to take more control over the process by examining the user's browser plug-in functionality prior to loading the external data file.

The best source of information, when available, is the software developer of the plug-in. Macromedia, for example, provides numerous technical notes on its Web site (`www.macromedia.com`) about plug-in detection for its various plug-ins and versions. Unfortunately, that kind of assistance is not always easy to find from other vendors.

A lot of the discussion thus far in this chapter addresses the objects that make plug-in and MIME type support detection possible in some browsers. Netscape for NN3 initially introduced these objects. Since then, they have been adopted by IE5 for the Macintosh only. Microsoft makes it possible — but not easy — to determine whether a particular plug-in is available for IE/Windows. The approach for IE/Windows is entirely different from what I have covered so far; if you wish to perform cross-browser detection, you have to branch your code accordingly. I outline each approach next in its own section, starting with the NN3+ and IE5+/Mac way.

Overview: using mimeType and plugin objects

The value of performing your own inspection of plug-in support is that you can maintain better control of your site visitors who don't have the necessary plug-in yet. Rather than merely providing a link to the plug-in's download site, you can build a more complete interface around the download and installation of the plug-in without losing your visitor. I have some suggestions about such an interface at the end of this discussion.

How you go about inspecting a visitor's plug-in library depends on what information you have about the data file or stream and how precise you must be in locating a particular plug-in. Some plug-ins may override MIME type settings that you normally expect to find in a browser. For example, a newly installed audio plug-in may take over for Netscape's LiveAudio plug-in (often without the user's explicit permission). Another issue that complicates matters is that the same plug-in may have a different name (`navigator.plugins[i].name` property), depending on the operating system. Therefore, searching your script for the presence of a plug-in by name is not good enough if the name differs from the Macintosh version to the Windows version. With luck, this naming discrepancy will resolve itself over time as plug-in developers understand the scripter's need for consistency across platforms.

One other point that can help you decide the precise approach to take is which information about the plug-in — support for the data MIME type or the presence of a particular plug-in — is important to your page and scripts. If your scripts rely on the existence of a plug-in that you can script via LiveConnect, then be sure that the plug-in is present and enabled for the desired MIME type (so that the plug-in is ensured of loading when it encounters a reference to the URL of the external data). But if you care only that a plug-in of any kind supports your data's MIME type, then you can simply make sure that any plug-in is enabled for your MIME type.

To help you jump-start the process in your scripts, I discuss three utility functions you can use in your own scripts. These functions are excerpts from a long listing (Listing 28-3), which is located in its entirety on the book's CD-ROM. The pieces not shown here are merely user interface elements that enable you to experiment with these functions.

Verifying a MIME type

Listing 28-3a is a function whose narrow purpose is to determine if the browser currently has plug-in support enabled for a given MIME type (in the *type/subtype* format as a string). The first `if` construction verifies that there is a mimeType object for the supplied MIME type string. If such an object exists, then the next `if` construction determines whether the `enabledPlugin` property of the mimeType object returns a valid object. If so, the function returns `true` — meaning that the MIME type has a plug-in (of unknown supplier) available to play the external media.

Listing 28-3a: **Verifying a MIME Type**

```
// Pass "<type>/<subtype>" string to this function to find
// out if the MIME type is registered with this browser
// and that at least some plug-in is enabled for that type.
function mimeIsReady(mime_type) {
    if (navigator.mimeTypes[mime_type]) {
        if (navigator.mimeTypes[mime_type].enabledPlugin) {
            return true
        }
    }
    return false
}
```

Verifying a plug-in

In Listing 28-3b, you let JavaScript see if the browser has a specific plug-in registered in the `navigator.plugins` array. This method approaches the installation question from a different angle. Instead of querying the browser about a known MIME type, the function inquires about the presence of a known plug-in. But because more than one registered plug-in can support a given MIME type, this function explores one step further to see whether at least one of the plug-in's MIME types (of any kind) is enabled in the browser.

Listing 28-3b: **Verifying a Plug-in**

```
// Pass the name of a plug-in for this function to see
// if the plug-in is registered with this browser and
// that it is enabled for at least one MIME type of any kind.
function pluginIsReady(plug_in) {
    plug_in = plug_in.toLowerCase()
    for (var i = 0; i < navigator.plugins.length; i++) {
        if (navigator.plugins[i].name.toLowerCase().indexOf(plug_in) != -1) {
            for (var j = 0; j < navigator.plugins[i].length; j++) {
                if (navigator.plugins[i][j].enabledPlugin) {
                    return true
                }
            }
            return false
        }
    }
    return false
}
```

The parameter for the `pluginIsReady()` function is a string consisting of the plug-in's name. As discussed earlier, the precise name may vary from OS to OS or from version to version. The function here assumes that you aren't concerned about plug-in versioning. It also assumes (with reasonably good experience behind the assumption) that a brand-name plug-in contains a string with the brand in it. Thus, the `pluginIsRead()` function simply looks for the existence of the passed name within the plugin object's `name` property. For example, this function accepts `"QuickTime"` as a parameter and agrees that there is a match with the plug-in named `"QuickTime Plug-in 4.1.1"`. The script loops through all registered plug-ins for a substring comparison (converting both strings to all lowercase to help overcome discrepancies in capitalization).

Next comes a second repeat loop, which looks through the MIME types associated with a plug-in (in this case, only a plug-in whose name contains the parameter string). Notice the use of the strange, double-array syntax for the most nested `if` statement: For a given plug-in (denoted by the `i` index), you have to loop through all items in the MIME types array (`j`) connected to that plug-in. The conditional phrase for the last `if` statement has an implied comparison against `null` (see another way of explicitly showing the `null` comparison in Listing 28-3a). The conditional statement evaluates to either an object or `null`, which JavaScript can accept as `true` or `false`, respectively. The point is that if an enabled plug-in is found for the given MIME type of the given plug-in, then this function returns `true`.

Verifying both plug-in and MIME type

The last utility function (Listing 28-3c) is the safest way of determining whether a visitor's browser is equipped with the "right stuff" to play your media. This function requires both a MIME type and plug-in name as parameters and also makes sure that both items are supported and enabled in the browser before returning `true`.

Listing 28-3c: **Verifying Plug-in and MIME Type**

```
// Pass "<type>/<subtype>" and plug-in name strings for this
// function to see if both the MIME type and plug-in are
// registered with this browser, and that the plug-in is
// enabled for the desired MIME type.
function mimeAndPluginReady(mime_type, plug_in) {
   if (mimeIsReady(mime_type)) {
       var plugInOfRecord = navigator.mimeTypes[mime_type].enabledPlugin
       plug_in = plug_in.toLowerCase()
       for (var i = 0; i < navigator.plugins.length; i++) {
           if (navigator.plugins[i].name.toLowerCase().indexOf(plug_in) != -1) {
               if (navigator.plugins[i] == plugInOfRecord) {
                   return true
               }
           }
       }
   }
   return false
}
```

This function starts by calling the `mimeIsReady()` function from Listing 28-3a. After that, the function resembles the one in Listing 28-3b until you reach the most nested statements. Here, instead of looking for any old MIME type, you insist on the existence of an explicit match between the MIME type passed as a parameter and an enabled MIME type associated with the plug-in. To see how these functions work on your NN3+ or IE5+/Mac browser, open the complete file (`lst28-03.htm`) from the CD-ROM. The actual listing also includes code that branches around IE for Windows and other browsers that don't support this way of inspecting MIME types and plug-ins.

Managing manual plug-in installation

If your scripts determine that a visitor does not have the plug-in your data expects, you may want to consider providing an electronic guide to installing the plug-in. One way to do this is to open a new frameset (in the main window). One frame can contain step-by-step instructions with links to the plug-in's download site. The download site's page can appear in the other frame of this temporary window. The steps must take into account all installation requirements for every platform, or, alternatively, you can create a separate installation document for each unique class of platform. For instance, you must decode Macintosh files frequently from binhex format and then uncompress them before you move them into the plug-ins folder. Other plug-ins have their own, separate installation program. The final step should include a call to

```
navigator.plugins.refresh()
```

to make sure that the browser updates its internal listings. After that, the script can return to the `document.referrer`, which should be the page that sends the visitor to the installation pages. All in all, the process is cumbersome — it's not like downloading a Java applet. But if you provide some guidance, you stand a better chance of the user returning to play your cool media. Also consider letting the browser's own updating facilities handle the job (albeit not as smoothly in many cases) by simply loading the data into the page ready or not.

"Plug-in" detection in IE/Windows

IE4+ provides some built-in facilities that may take the place of plug-in detection in some circumstances. First of all, it's important to recognize that IE/Windows does not use the term "plug-in" in the same way that Netscape and IE/Mac use it. Due to the integration between IE and the Windows operating system, IE/Windows employs system-wide ActiveX controls to handle the job of rendering external content. Some of these controls are designed to be accessed from outside their walls, thus allowing client-side scripts to get and set properties or invoke methods built into the controls. These controls behave a lot like plug-ins, so you frequently see them referenced as "plug-ins," as they are in this book.

IE/Windows prefers the `<OBJECT>` tag for both loading the plug-in (ActiveX control) and assigning external content to it. One of the attributes of the OBJECT element is `CLASSID`, which points to a monstrously long string of hexadecimal numbers known as the GUID (Globally Unique Identifier). When the browser encounters one of these GUIDs, it looks into the Windows Registry to get the path to the actual plug-in file. If the plug-in is not installed on the user's machine, then the object doesn't load and any other HTML nested inside the `<OBJECT>` tag renders instead. Thus, you can display a static image placeholder or HTML message about the lack of the plug-in. But plug-in detection comes in most handy when your scripts need to communicate with the plug-in, such as directing an embedded Windows Media Player plug-in to change sound files or to play. When you build code around a scriptable plug-in, your scripts should make sure that the plug-in object is indeed present so they don't generate errors.

The idea of using the `<OBJECT>` tag instead of the `<EMBED>` tag is that the `<OBJECT>` tag loads a specific plug-in, whereas the MIME type of the data referenced by the `<EMBED>` tag lets the browser determine which plug-in to use for that MIME type. It's not uncommon, therefore, to see an `<OBJECT>` tag definition surround an `<EMBED>` tag — both referencing the same external data file. If the optimum plug-in fails to load, the `<EMBED>` tag is observed, and the browser tries to find any plug-in for the file's MIME type.

With an OBJECT element as part of the HTML page, the element itself is a valid object — even if the plug-in fails to load. Therefore, you must do more to validate the existence of the loaded plug-in than simply test for the existence of the OBJECT element. To that end, you need to know at least one scriptable property of the plug-in. Unfortunately, not all scriptable plug-ins are fully documented, so you occasionally must perform some detective work to determine which scriptable properties are available. While you're on the search for clues, you can also determine the version of the plug-in and make it a minimum version that your OBJECT element allows to load.

Tracking down plug-in details

Not everyone has access to the Microsoft programming development environments (for example, Visual Basic) through which you can find out all kinds of information about an installed ActiveX control. If you don't have access, you can still dig deep to get most (if not all) of the information you need. The tools you can use include the Windows Registry Editor (`regedit`), The Evaluator (Chapter 13), and, of course, your text editor and IE4+/Windows browser. The following steps take you through finding out everything you need to know about the Windows Media Player control.

1. If you don't know the GUID for the Media Player (most people get it by copying someone else's code that employs it), you can use the Registry Editor (`regedit.exe`) to find it. Open the Registry Editor (in Win95/98/NT, choose Run from the Start menu and enter `regedit`; if that option is not available in your Windows version, search for the file named `regedit`).
2. Expand the `HKEY_CLASSES_ROOT` folder.
3. Scroll down to the nested folder named `CLSID`, and click that folder.
4. Choose Edit/Find, and enter **`Windows Media Player`**. If you were searching for a different plug-in, you would enter an identifying name (usually the product name) in this place.
5. Keep pressing F3 (Find Next) until the editor lands upon a folder whose default value (in the right side of the Registry Editor window) shows `Windows Media Player`.
6. The number inside curly braces next to the highlighted folder is the plug-in's GUID. Right-click the number and choose Copy Key Name. Paste the number into your document somewhere for future reference. Eventually, it will be part of the value assigned to the `CLASSID` attribute of the OBJECT element.
7. Expand the highlighted folder.
8. Click the folder named `InprocServer32`. The default value should show a pathname to the actual ActiveX control for the Windows Media Player plug-in.
9. Right-click the (`Default`) name for the path and choose Modify. The full pathname is visible in an editable field.
10. Armed with this pathname information, open My Computer and locate the actual file inside a directory listing.
11. Right-click the file and choose Properties.
12. Click the Version tab (if present).
13. Copy the version number (generally four sets of numbers delimited by commas), and paste it into your document for future reference. Eventually, it will be assigned to the `CODEBASE` attribute of the OBJECT element.

    You are now ready to try loading the plug-in as an object and look for properties you can test for.
14. Add an OBJECT tag to The Evaluator source code. This can go inside the HEAD or just before the `</BODY>` tag. For example, your tag should look something like the following:

```
<OBJECT ID="wmp" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=1,0,0,0">
</OBJECT>
```

Copy and paste the numbers for the GUID and version. Two points to watch out for: First, be sure that the GUID value is preceded by `CLSID:` in the value assigned to `CLASSID`; second, be sure the version numbers are preceded by the prefix shown.

15. Load (or reload) the page in IE4+/Windows.

At this point, the `wmp` object should exist. If the associated plug-in loads successfully, then the `wmp` object's properties include properties exposed by the plug-in.

16. Enter **wmp** into the bottom text box to inspect properties of the `wmp` object. Be patient: It may take many seconds for the retrieval of all properties.

In case you can't readily distinguish between the OBJECT element object properties and properties of the scriptable plug-in, scroll down to the `wmp.innerHTML` property and its values. When an object loads successfully, any parameters that it accepts are reflected in the `innerHTML` for the OBJECT element. Each PARAM element has a name—the name of one of the scriptable properties of the plug-in.

17. Look for one of the properties that has some kind of value by default (in other words, other than an empty string or `false`). In Windows Media Player, this can be `CreationDate`. Use this property as an object detection condition in scripts that need to access the Windows Media Player properties or methods:

```
if (wmp && wmp.CreationDate) {
    // statements that "talk to" plug-in
}
```

Setting a minimum version number

The four numbers that you grab in Step 13 in the previous section represent the version of the plug-in as installed on your computer. Unless you have a way of verifying that your external content runs on earlier versions of the plug-in (if there are earlier versions), you can safely specify *your* version as the minimum.

Specificity rankings for the four numbers of a version decrease as you move from left to right. For example, version 1,0,25,2 is later than 1,0,0,0; version 2,0,0,0 is later than both of them. If you specify 1,0,25,2, and the user has 1,0,24,0 installed, the plug-in does not load and the object isn't available for scripting. On the other hand, a user with 1,0,26,0 has the object present because the `CODEBASE` attribute for the version specifies a minimum allowable version to load.

When an object requires VBScript

Not all objects that load via the OBJECT element are scriptable through JScript. Occasionally, an object is designed so that its properties are exposed only to VBScript. This happens, for example, with the Microsoft Windows Media Rights Manager (DRM) object. To find out if the browser (operating system) is equipped with DRM, your page loads the object via the OBJECT element as usual; however, a separate VBScript section must access the object to test for the existence of one of its properties. Because script segments written in either language can access each other, this isn't a problem provided you know what the property or method is for the object. The following fragment from the Head section of a document demonstrates how JavaScript and VBScript can interact so that JavaScript code can branch based on the availability of DRM:

```
<HEAD>
<OBJECT ID="drmObj" HEIGHT="1" WIDTH="1"
CLASSID="CLSID:760C4B83-E211-11D2-BF3E-00805FBE84A6"></OBJECT>
<SCRIPT LANGUAGE="VBScript">
function hasDRM()
    on error resume next
    drmObj.StoreLicense("")
    if (err.number = 0) then
        hasDRM = true
    else
        hasDRM = false
    end if
end function
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript">
var gHasDRM
if (drmObj && hasDRM()) {
    gHasDRM = true
} else {
    gHasDRM = false
}
</SCRIPT>
</HEAD>
```

The JavaScript segment sets a Boolean global variable to indicate whether the object has loaded correctly. Part of the job is accomplished via the `hasDRM()` function in the VBScript segment. From VBScript, the `drmObj` object responds to the `StoreLicense()` method call, but it throws a VBScript error indicating that no parameter was sent along with the method. Any subsequent scripts in this page can use the `gHasDRM` global variable as a conditional expression before performing any actions requiring the object (which works in tandem with the Windows Media Player).

screen Object

Properties	***Methods***	***Event Handlers***
`availHeight`		
`availLeft`		
`availTop`		
`availWidth`		
`bufferDepth`		
`colorDepth`		
`fontSmoothingEnabled`		
`height`		

Properties	*Methods*	*Event Handlers*
`pixelDepth`		
`updateInterval`		
`width`		

Syntax

Accessing `screen` object properties:

```
(All)         screen.property
(IE4+/NN6)    [window.]navigator.screen.property
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

About this object

Browsers other than from the earliest generations provide a `screen` object that lets your scripts inquire about the size and color settings of the video monitor used to display a page. Properties are carefully designed to reveal not only the raw width and height of the monitor (in pixels), but also what the available width and height are once you take into account the operating system's screen-hogging interface elements (for example, the Windows taskbar and the Mac menu bar).

You can also access some of these property values in Navigator 3 if you use LiveConnect to access Java classes directly. Example code for this approach appears in the individual property listings.

Internet Explorer 4 provides a `screen` object, although it appears as a property of the `window` object in the IE4+ object model. Only three properties of the IE4+ `screen` object — `height`, `width`, and `colorDepth` — share the same syntax as NN4+'s `screen` object.

Properties

availHeight
availWidth
height
width

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

With the availability of window sizing methods in version 4 browsers and later, your scripts may want to know how large the user's monitor is. This is particularly important if you set up an application to run in kiosk mode, which occupies the entire screen. Two pairs of properties let scripts extract the dimensions of the screen. All dimensions are in pixels.

You can extract the gross height and width of the monitor from the `screen.height` and `screen.width` properties. Thus, a monitor rated as an 800 × 600 monitor returns values of 800 and 600 for `width` and `height`, respectively.

But not every pixel of the screen's gross size is available as displayable area for a window. To the rescue come the `screen.availWidth` and `screen.availHeight` properties. For example, 32-bit Windows operating systems display the taskbar. The default location for this bar is at the bottom of the window, but users can reorient it along any edge of the screen. If the default behavior of always showing the taskbar is in force, the bar takes away from the screen real estate available for window display (unless you intentionally size or position a window so that part of the window extends under the bar). When along the top or bottom edge of the screen, the taskbar occupies 28 vertical pixels; when positioned along one of the sides, the bar occupies 60 horizontal pixels. On the Macintosh platform, the 20-pixel-deep menu bar occupies a top strip of the screen. While you can position and size windows so the menu bar partially covers them, it is not a good idea to open a window in (or move a window into) that location.

You can use the available screen size values as settings for window properties. For example, to arrange a window so that it occupies all available space on the monitor, you must position the window at the top left of the screen and then set the outer window dimensions to the available sizes as follows:

```
function maximize() {
    window.moveTo(0,0)
    window.resizeTo(screen.availWidth, screen.availHeight)
}
```

The preceding function positions the window appropriately on the Macintosh just below the menu bar so that the menu bar does not obscure the window. If, however, the client is running Windows and the user positions the taskbar at the top of the screen, the window is partially hidden under the taskbar (you cannot query the available screen space's coordinates). Also in Windows, the appearance is not exactly the same as a maximized window. See the discussion of the `window.resizeTo()` method in Chapter 16 for more details. Note that IE/Mac generally returns a value for `screen.availHeight` that is about 24 pixels fewer than the actual available height (even after taking into account the Mac menu bar).

For Navigator 3, you can use LiveConnect to access a native Java class that reveals the overall screen size (not the available screen size). If the user runs Navigator 3 and Java is enabled, you can place the following script fragment in the Head portion of your document to set variables with screen width and height:

```
var toolkit = java.awt.Toolkit.getDefaultToolkit()
var screenSize = toolkit.getScreenSize()
```

The `screenSize` variable is an object whose properties (`width` and `height`) contain the pixel measures of the current screen. This LiveConnect technique works only in NN3+ (IE does not provide direct access to Java classes). In fact, you can also extract the screen resolution (pixels per inch) in the same manner. The following statement, added after the preceding ones, sets the variable resolution to that value:

```
var resolution = toolkit.getScreenResolution()
```

Related Items: `window.innerHeight`, `window.innerWidth`, `window.outerHeight`, `window.outerWidth` properties; `window.moveTo()`, `window.resizeTo()` methods.

availLeft
availTop

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The `availLeft` and `availTop` properties return the pixel measure of where (on the Windows OS) the available space of the screen begins. The only time these values are anything other than zero is when a user positions the taskbar along the left or top edges of the screen. For example, if the user positions the taskbar along the top of the screen, you do not want to position a window any higher than the 28 pixels occupied by the taskbar. Oddly, the `availTop` measure does not take into account the Macintosh menu bar, but Mac browsers treat the 0,0 coordinate for a window movement to be just below the menu bar anyway. Therefore, for NN4+, you can use the `availLeft` and `availTop` properties to move the window in a position where you can resize it to occupy the screen:

```
window.moveTo(screen.availLeft, screen.availTop)
window.resizeTo(screen.availWidth, screen.availHeight)
```

There are no corresponding properties for IE.

On the CD-ROM

Example on the CD-ROM

Related Items: `screen.availWidth`, `screen.availHeight` properties; `window.moveTo()` method.

bufferDepth

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

By default, IE does not use any offscreen buffering of page content. But adjusting the `bufferDepth` property enables you to turn on offscreen buffering and control the color depth of the buffer. Using offscreen buffering may improve the smoothness of path-oriented animation through positioning.

The default value (buffering turned off) is `0`. By setting the property to `-1`, you instruct IE to set the color depth of the offscreen buffer to the same color depth as the screen (as set in the control panel). This should be the optimum value, but you can also force the offscreen buffer to have one of the following bit depths: `1`, `4`, `8`, `15`, `16`, `24`, or `32`.

Related Items: `screen.colorDepth`, `screen.pixelDepth` properties.

colorDepth
pixelDepth

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

You can design a page with different color models in mind because your scripts can query the client to find out how many colors the user sets the monitor to display. This is helpful if you have more subtle color schemes that require 16-bit color settings or images tailored to specific palette sizes.

Both the `screen.colorDepth` and `screen.pixelDepth` properties return the number of color bits to which the color client computer's video display control panel is set. The `screen.colorDepth` value may take into account a custom color palette; so for NN4+, you may prefer to rely only on the `screen.pixelDepth` value. (IE4+, however, supports only the `screen.colorDepth` property of this pair.) You can use this value to determine which of two image versions to load, as shown in the following script fragment that runs as the document loads.

```
if (screen.colorDepth > 8 ) {
    document.write("<IMG SRC='logoHI.jpg' HEIGHT='60' WIDTH='100'")
} else {
    document.write("<IMG SRC='logoLO.jpg' HEIGHT='60'WIDTH='100'")
}
```

In this example, the `logoHI.jpg` image is designed for 16-bit displays or better, while the colors in `logoLO.jpg` are tuned for 8-bit display.

While LiveConnect in NN3 has a way to extract what appears to be the `pixelDepth` equivalent, the Java implementation is flawed. You do not always get the correct value, so I don't recommend that NN3 users rely on this tactic.

Related Item: `screen.bufferDepth` property.

fontSmoothingEnabled

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Some versions of the Windows OS have a Display control panel setting for "Smooth Edges" on screen fonts. The `fontSmoothingEnabled` property lets your script see the state of that setting. This setting can affect, for example, which style sheet you enable because it has font specifications that look good only when smoothing is enabled. A default installation of Windows has this feature turned off. This property is not available on non-Windows versions of IE.

Related Items: None.

updateInterval

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `updateInterval` property is the number of milliseconds between screen updates. The default value of zero lets IE arbitrate among the demands for screen updates in a highly animated setting. If you set this value to a large number, then more screen updates are accumulated in a buffer — preventing some animated steps from updating the screen.

Related Items: None.

userProfile Object

Properties	*Methods*	*Event Handlers*
	`addReadRequest()`	
	`clearRequest()`	
	`doReadRequest()`	
	`getAttribute()`	

Syntax

Accessing `userProfile` object methods:

```
(IE4+)  [window.]navigator.userProfile.method()
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

About this object

The `userProfile` object is an IE-specific (and Windows, at that) property that acts as the gateway to the user profile information that the client computer collects from the user. You can retrieve none of this information via JavaScript without permission from the user. Access to this information is performed in a strict sequence, part of which enables you to define how the request for this private information is worded when the user is presented with the request.

User profile data consists of nearly 30 fields of personal information about the user's contact information. Each of these fields has a name, which by and large conforms to the vCard standard. Your scripts can request one or more specific fields from the list, rather than having to deal with the entire set of fields.

The sequence for accessing this data entails four basic steps:

1. Put the request for each vCard field into a queue that is maintained in the browser's memory (via the `addReadRequest()` method).
2. Execute the batch request, which displays a detailed dialog box to the user (via the `doReadRequest()` method). If a user profile is in effect, the user sees which fields you are requesting plus the data in the vCard. The user then has the chance to deselect one or more of your choices — or disallow access completely.
3. Get each attribute by name (via the `getAttribute()` method). You invoke this method once for each vCard field.
4. Clear the queue of requests (via the `clearRequest()` method).

Returned values are strings. Thus, you can prefill the customer information for an order form or capture the information in hidden fields that are submitted with a visible form.

Listing 28-4 demonstrates the use of the four key methods of the `userProfile` object. After the page loads, it attempts to extract the data from every vCard field and displays both the attribute name and the value as associated with the current user profile in a table. Notice that the names of the attributes are hard-wired because the object does not provide a list of implemented attributes.

Listing 28-4: Accessing userProfile Data

```
<HTML>
<HEAD>
<TITLE>userProfile Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var attrs = ["Business.City","Business.Country","Business.Fax",
             "Business.Phone","Business.State","Business.StreetAddress",
             "Business.URL","Business.Zipcode","Cellular","Company",
             "Department","DisplayName","Email","FirstName",
             "Gender","Home.City","Home.Country","Home.Fax",
             "Home.Phone","Home.State","Home.StreetAddress",
             "Home.Zipcode","Homepage","JobTitle","LastName",
             "MiddleName","Notes","Office","Pager"]

function loadTable() {
    // make sure this executes only in IE4+ for Windows
    if ((navigator.userAgent.indexOf("Win") != -1) && navigator.userProfile) {
        var newRow, newCell, attrValue
        // queue up requests for every vCard attribute
        for (var i = 0; i < attrs.length; i++) {
            navigator.userProfile.addReadRequest("vCard." + attrs[i])
        }
        // dispatch the request to let user accept or deny access
        navigator.userProfile.doReadRequest(1, "JavaScript Bible")
        // append rows to the table with attribute/value pairs
        for (var j = 0; j < attrs.length; j++) {
            newRow = document.all.attrTable.insertRow(-1)
            newRow.bgColor = "#FFFF99"
            newCell = newRow.insertCell(0)
            newCell.innerText = "vCard." + attrs[j]
            newCell = newRow.insertCell(1)
            // get the actual value
            attrValue = navigator.userProfile.getAttribute("vCard." + attrs[j])
            newCell.innerHTML = (attrValue) ? attrValue : " "
        }
        // clean up after ourselves
        navigator.userProfile.clearRequest()
    } else {
        alert("This example requires IE4+ for Windows.")
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="loadTable()">
<H1>userProfile Object</H1>
<HR>
<TABLE ID="attrTable" BORDER=1 CELLPADDING=5>
```

Continued

Listing 28-4 *(continued)*

```
<TR BGCOLOR="#CCFFFF">
    <TH>vCard Property<TH>Value
</TR>

</TABLE>
</BODY>
</HTML>
```

It appears that the newer the version of Windows that the user runs, the more likely that user profile data is available. Even so, there may be little more than name and address data for those users who are careful not to fill out optional fields of Microsoft Web site forms requesting personal information.

Comparable information may be available from NN4+ users on any OS platform via signed scripts that access LDAP preferences. See the discussion earlier in this chapter about the `navigator.preference()` method.

Methods

addReadRequest("*attributeName*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Before the user is asked for permission to reveal any personal information, you must queue up requests — even if there is just one field in which you are interested. For each field, use the `addReadRequest()` method and specify as the parameter a string of the attribute name. Acceptable attribute names are as follows:

```
vCard.Business.City
vCard.Business.Country
vCard.Business.Fax
vCard.Business.Phone
vCard.Business.State
vCard.Business.StreetAddress
vCard.Business.URL
vCard.Business.Zipcode
vCard.Cellular
vCard.Company
vCard.Department
vCard.DisplayName
vCard.Email
vCard.FirstName
vCard.Gender
vCard.Home.City
```

```
vCard.Home.Country
vCard.Home.Fax
vCard.Home.Phone
vCard.Home.State
vCard.Home.StreetAddress
vCard.Home.Zipcode
vCard.Homepage
vCard.JobTitle
vCard.LastName
vCard.MiddleName
vCard.Notes
vCard.Office
vCard.Pager
```

All attribute values are case-insensitive.

This method returns a Boolean value of `true` if the addition to the queue succeeds. A returned value of `false` usually means that the attribute value is not valid or that a request for that attribute name is already in the queue. If you fail to clear the queue after compiling one list of attributes, attempts to read the attribute result in a return value of `false`.

On the CD-ROM

Example on the CD-ROM

Related Items: `clearRequest()`, `doReadRequest()`, and `getAttribute()` methods.

clearRequest()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

After retrieving the attributes whose names are stacked in the request queue, invoke the `clearRequest()` method to empty the queue. It is always good programming practice to clean up after yourself, especially when security concerns are involved.

On the CD-ROM

Example on the CD-ROM

Related Items: `addReadRequest()`, `doReadRequest()`, and `getAttribute()` methods.

doReadRequest(*reasonCode*, *identification*[, *domain*[, *path*[, *expiration*]]])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Once the names of the desired vCard attributes are stacked in the queue (via the `addReadRequest()` method), invoke the `doReadRequest()` method to prompt the user for the permission that your scripts need to gain access to the data. The user sees a detailed dialog box that lists the vCard fields you are requesting, as well as a description about your reason for wanting the data and who you are.

The first required parameter is an integer representing one of the standard descriptions as defined by the Internet Privacy Working Group. Associated text is displayed in the permission request dialog box that the user sees. The codes and their strings are as follows:

Code	*Description String*
0	Used for system administration.
1	Used for research and/or product development.
2	Used for completion and support of current transaction.
3	Used to customize the content and design of a site.
4	Used to improve the content of the site, including advertisements.
5	Used for notifying visitors about updates to the site.
6	Used for contacting visitors for marketing of services or products.
7	Used for linking other collected information.
8	Used by site for other purposes.
9	Disclosed to others for customization or improvement of the content and design of the site.
10	Disclosed to others, who may contact you, for marketing of services and/or products.
11	Disclosed to others, who may contact you, for marketing of services and/or products; you have the opportunity to ask a site not to do this.
12	Disclosed to others for any other purpose.

While these description strings are fixed, you do have an opportunity to include some customized information in the second parameter. The parameter is intended to enable you to identify the Web site or organization requesting the information.

Standards recommendations suggest you include a URL to the site, as well. In any case, the second parameter can be any string. But it is not treated like HTML, so do not attempt to include a clickable link here.

Two optional parameters enable you to specify a domain and path within that domain for which the user permissions are to apply. Both of these parameters closely mirror their usage in cookies, but they also depend on the capability to set an expiration date via the fifth parameter. Through IE5.5, however, the expiration date parameter is ignored. Therefore, permissions expire when the user quits the browser (just like temporary cookies do).

Example on the CD-ROM

Related Items: `addReadRequest()`, `clearRequest()`, and `getAttribute()` methods.

getAttribute("*attributeName*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `getAttribute()` method attempts to retrieve the vCard data based on the items queued via the `addReadRequest()` method. A permission dialog box provides the user an opportunity to choose which of the requested items to reveal or to deny all access to the information. Only one attribute name is permitted as a parameter to the `getAttribute()` method, requiring that you invoke the method for each attribute you want to fetch.

Example on the CD-ROM

Related Items: `addReadRequest()`, `clearRequest()`, and `doReadRequest()` methods.

✦ ✦ ✦

CHAPTER 29

Event Objects

✦ ✦ ✦ ✦

In This Chapter

The "life" of an event object

Event support in different browser generations

Retrieving information from an event

✦ ✦ ✦ ✦

Prior to NN4 and IE4, user and system actions — events — were captured predominantly by event handlers defined as attributes inside HTML tags. For instance, when a user clicked a button, the `click` event triggered the `onClick` event handler in the tag. That handler may invoke a separate function or perform some inline JavaScript script. Even so, the events themselves were rather dumb: Either an event occurred or it didn't. Where an event occurred (that is, the screen coordinates of the pointer at the moment the mouse button was clicked) and other pertinent event tidbits (for example, whether a keyboard modifier key was pressed at the same time) were not part of the equation. Until the Version 4 browsers, that is.

While remaining fully backward-compatible with the event handler mechanism of old, Version 4 browsers had the first event model that turned events into first-class objects whose properties automatically carry a lot of relevant information about the event when it occurs. These properties are fully exposed to scripts, allowing pages to respond more intelligently about what the user does with the page and its elements.

Another new aspect of Version 4 event models was the notion of "event propagation." It was possible to have an event processed by an object higher up the element containment hierarchy whenever it made sense to have multiple objects share one event handler. That the event being processed carried along with it information about the intended target, plus other golden information nuggets, made it possible for event handler functions to be smart about processing the event without requiring an event handler call to pass all kinds of target-specific information.

Unfortunately, the joy of this newly found power is tempered by the forces of object model incompatibility. No fewer than three event object models are in use today: The one initiated by NN4 (whose importance diminishes with each passing day as users migrate to other, newer browsers); the IE4+ model; and the model adopted by the W3C DOM Level 2 as implemented in NN6+. Many of these distinctions are addressed in the overviews of the object models in Chapter 15. In this chapter, you find out more about the actual event objects that contain all the "goodies." Where possible, cross-browser concerns are addressed.

Why "Events"?

Graphical user interfaces are more difficult to program than the "old-fashioned" command-line interface. With a command-line or menu-driven system, users were intentionally restricted in the types of actions they could take at any given moment. The world was very modal, primarily as a convenience to programmers who led users through rigid program structures.

That all changed in a graphical user interface, such as Windows, MacOS, X Window System, and all others derived from the pioneering work of the Xerox Star system. The challenge for programmers is that a good user interface in this realm must make it possible for users to perform all kinds of actions at any given moment: roll the mouse, click a button, type a key, select text, choose a pull-down menu item, and so on. To accommodate this, a program (or, better yet, the operating system) must be on the lookout for any possible activity coming from all input ports, whether it be the mouse, keyboard, or network connection.

A common methodology to accomplish this at the operating system level is to look for any kind of event, whether it comes from user action or some machine-generated activity. The operating system or program then looks up how it should process each kind of event. Such events, however, must have some smarts about them so that the program knows what and where on the screen the event is.

What an event knows (and when it knows it)

Although the way to reference an event object varies a bit among the three event models, the one concept they all share is that an event object is created the instant the event action occurs. For instance, if you click a button, an event object is created in the browser's memory. As the object is created, the browser assigns values to its properties — properties that reflect numerous characteristics of that specific event. For a `click` event, that information includes the coordinates of the click and which mouse button was used to generate the event. To be even more helpful, the browser does some quick calculations to determine that the coordinates of the `click` event coincide with the rectangular space of a button element on the screen. Therefore, the event object has as one of its properties a reference to the "screen thing" that you clicked on.

Most event object properties (all of them in some event models) are read-only, because an event object is like a snapshot of an event action. If the event model were to allow modification of event properties, performing both potentially useful and potentially unfriendly actions would be possible. For example, how frustrating would it be to a user to attempt to type into a text box only to have a keystroke modified between the actual key press and then have a totally different character appear in the text box? On the other hand, perhaps it may be useful in some situations to make sure that anything typed into a text box is converted to uppercase characters, no matter what is typed. Each event model brings its own philosophy to the table in this regard. For example, the IE4+ event model allows keyboard character events to be modified by script; the NN4 and W3C DOM event models do not.

Perhaps the most important aspect of an event object to keep in mind is that it exists only as long as scripts process the event. An event can trigger an event handler — usually a function. That function, of course, can invoke other functions. As long as statements are still executing in response to the event handler, the event object and all its properties are still "alive" and available to your scripts. But after the last script statement runs, the event object reverts to an empty object.

The reason an event object has such a brief life is that there can be only one event object at a time. In other words, no matter how complex your event handler functions are, they are executed serially (for experienced programmers: there is one execution thread). The operating system buffers events that start to bunch up on each other. Except in rare cases in which the buffer gets full and events are not recorded, event handlers are executed in the order in which the events occur.

The static Event object

Up to this point, the discussion has been about the event object (with a lowercase "e"), which is one instance of an event, with all the properties associated with that specific event action. In the NN4 and W3C DOM event models, there is also a static `Event` object (with an uppercase "E"). In the W3C DOM event model are additional subcategories of the `Event` object. These subcategories are all covered later in this chapter, but they are introduced here to draw the contrast between the event and `Event` objects. The former, as you've seen, is a transient object with details about a specific event action; the latter serves primarily as a holder of event-related constant values that scripts can use. The static `Event` object is always available to scripts inside any window or frame. If you want to see a list of all `Event` object properties in NN4 and NN6+, use The Evaluator (Chapter 13): enter `Event` into the bottom text box (also check out the `KeyEvent` object in NN6+).

The static `Event` object also turns out to be the object from which event objects are cloned. Thus, the static `Event` object has a number of properties and methods that apply to (are inherited by) the event objects created by event actions. These relationships are more important in the W3C DOM event model, which builds upon the DOM's object-oriented tendencies to implement the event model.

Event Propagation

Prior to the Version 4 browsers, an event fired on an object. If an event handler was defined for that event and that object, the handler executed; if there was no event handler, the event just disappeared into the ether. Newer browsers, however, send events on a longer ride, causing them to propagate through the document object models. As you know by now, three propagation models exist, one for each of the event models in use today: NN4, IE4+, and W3C DOM as implemented in NN6+. Conceptually, the NN4 and IE4+ propagation models are diametrically opposite each other. But the W3C DOM model manages to implement both models simultaneously, albeit with all new syntax so as not to step on the older models.

At the root of all three models is the notion that every event has a target. For user-initiated actions, this is fairly obvious. If you click a button or type in a text box, that button is the target of your mouse-related event; the text box is the target of your keyboard event. System-generated events are not so obvious, such as the `onLoad` event after a page finishes loading. In all event models, this event fires on the `window` object. What distinguishes the event propagation models is how an event reaches its target, and what, if anything, happens to the event after it finishes executing the event handler associated with the target.

NN4 event propagation

Although the installed base of NN4 continues to diminish, its propagation model initiated some concepts that are found in the modern W3C DOM event propagation model. The name for the model is *event capture*.

In NN4, all events propagate from the top of the document object hierarchy (starting with the `window` object) downward to the target object. For example, if you click a button in a form, the click event passes through the `window` and `document` (and, if available, layer) objects before reaching the button (the form object is not part of the propagation path). This propagation happens instantaneously, so that there is no performance penalty by this extra journey.

The event that passes through the `window`, `document`, and layer objects is a fully formed event object, complete with all properties relevant to that event action. Therefore, if the event were processed at the window level, one of the event object's properties is a reference to the target object, so that the event handler scripts at the window level can find out information, such as the name of the button and even get a reference to its enclosing form.

By default, event capture is turned off. To instruct the window, document, or layer object levels to process that passing click object requires turning on event capture for the `window`, `document`, and/or layer object.

Enabling NN4 event capture

All three objects just mentioned — `window`, `document`, and layer — have a `captureEvents()` method. You use this method to enable event capture at any of those object levels. The method requires one or more parameters, which are the event types (as supplied by `Event` object constants) that the object should capture, while letting all others pass untouched. For example, if you want the `window` object to capture all `keyPress` events, you include the following statement in a script that executes as the page loads:

```
window.captureEvents(Event.KEYPRESS)
```

Defining event handlers in the intended targets is also a good idea, even if they are empty (for example, `onKeyPress=""`) to help NN4 generate the event in the first place. If you want the window to capture multiple event types, string the event type constants together, separated by the pipe character:

```
window.captureEvents(Event.KEYPRESS | Event.CLICK)
```

Now you must assign an action to the event at the window's level for each event type. More than likely, you have defined functions to execute for the event. Assign a function reference to the event handler by setting the handler property of the `window` object:

```
window.onKeyPress = processKeyEvent
window.onClick = processClickEvent
```

Hereafter, if a user clicks a button or types into a field inside that window, the events are processed by their respective window-level event handler functions.

Turning off event capture

As soon as you enable event capture for a particular event type in a document, that capture remains in effect until the page unloads or you specifically disable the capture. You can turn off event capture for each event via the `window`, `document`, or layer `releaseEvents()` method. The `releaseEvents()` method takes the same kind of parameters — `Event` object type constants — as the `captureEvents()` method.

The act of releasing an event type simply means that events go directly to their intended targets without stopping elsewhere for processing, even if an event handler for the higher-level object is still defined. And because you can release individual event types based on parameters set for the `releaseEvents()` method, other events being captured are not affected by the release of others.

To demonstrate not only the `captureEvents()` and `releaseEvents()` methods, but other event model techniques, I present a series of several versions of the same document. Each successive version implements an added feature to help you experience the numerous interactions among events and event handling methods. The document merely contains a few buttons, plus some switches to enable and disable various methods being demonstrated in the section. A layer object is also thrown into the mixture because a lot of impetus for capturing and modifying event handling comes from application of layers in a document.

Listing 29-1 is the first example, which shows the basic event capture and release from the outermost document level. A checkbox lets you enable or disable the document-level capture of `click` events (all checkboxes in these examples use `onMouseUp` event handlers to avoid getting in the way of tracing `click` events). Because all `click` events are being captured by the outermost document, even clicks to the layer's buttons get trapped by the outermost document when `captureEvents()` is set.

Listing 29-1: **NN4 Event Capture and Release**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setDocCapture(enable) {
    if (!enable) {
        document.captureEvents(Event.CLICK)
    } else {
        document.releaseEvents(Event.CLICK)
    }
}
function doMainClick(e) {
    if (e.target.type == "button") {
        alert("Captured in top document")
    }
}
document.captureEvents(Event.CLICK)
document.onclick=doMainClick
</SCRIPT>
</HEAD>
<BODY>
<B>Basic document-level capture of Event.CLICK</B>
<HR>
<FORM>
<INPUT TYPE="checkbox" onMouseDown="setDocCapture(this.checked)" CHECKED>Enable
Document Capture
<HR>
```

Continued

Listing 29-1 *(continued)*

```
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"
    onClick="alert('Event finally reached Button:' + this.name)">

</FORM>

<LAYER ID="layer1" LEFT=200 TOP=150 BGCOLOR="coral">
<HEAD>
</HEAD>
<BODY>
<FORM>
<BR><P><INPUT TYPE="button" VALUE="Button 'layerButton1'"
    NAME="layerButton1"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
<P><INPUT TYPE="button" VALUE="Button 'layerButton2'"
    NAME="layerButton2"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
</FORM>
</BODY>
</LAYER>

</BODY>
</HTML>
```

With document-level event capture turned on (the default), all `click` events are trapped by the document's `onclick` event handler property, a function that alerts the user that the event was captured by the top document. Because all `click` events for buttons are trapped there, even `click` events of the layer's buttons are trapped at the top. But if you turn off event capture, the events reach their intended targets.

Note

If the logic of the `setDocCapture()` function seems backwards to you, recall that when the `onMouseDown` event fires on the checkbox, its state is the opposite of what it is being changed to.

In Listing 29-2, I add some code (shown in boldface) that lets the layer object capture `click` events whenever the outer document event capture is turned off. Inside the `<LAYER>` tag, a script sets the layer to capture `click` events. Therefore, if you disable the outer document capture, the `click` event goes straight to the `main1` button and to the layer event capture. Event capture in the layer object prevents the events from ever reaching the buttons in the layer, unless you disable event capture for both the document and the layer.

Listing 29-2: **Document and Layer Event Capture and Release**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
```

```
function setDocCapture(enable) {
    if (!enable) {
        document.captureEvents(Event.CLICK)
    } else {
        document.releaseEvents(Event.CLICK)
    }
}
function setLayerCapture(enable) {
    if (!enable) {
        document.layer1.captureEvents(Event.CLICK)
    } else {
        document.layer1.releaseEvents(Event.CLICK)
    }
}
function doMainClick(e) {
    if (e.target.type == "button") {
        alert("Captured in top document")
    }
}
document.captureEvents(Event.CLICK)
document.onclick=doMainClick
</SCRIPT>
</HEAD>
<BODY>
<B>Document-level and/or Layer-level capture of Event.CLICK</B>
<HR>
<FORM>
<INPUT TYPE="checkbox" onMouseDown="setDocCapture(this.checked)" CHECKED>Enable
Document Capture
<INPUT TYPE="checkbox" onMouseDown="setLayerCapture(this.checked)"
CHECKED>Enable Layer Capture
<HR>
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"
    onClick="alert('Event finally reached Button:' + this.name)">
</FORM>

<LAYER ID="layer1" LEFT=200 TOP=150 BGCOLOR="coral">
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function doLayerClick(e) {
    if (e.target.type == "button") {
        alert("Captured in layer1")
    }
}
layer1.captureEvents(Event.CLICK)
layer1.onclick=doLayerClick
</SCRIPT>
</HEAD>
<BODY>
<FORM>
 layer1<BR><P><INPUT TYPE="button" VALUE="Button 'layerButton1'"
    NAME="layerButton1"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
<P><INPUT TYPE="button" VALUE="Button 'layerButton2'"
```

Continued

Listing 29-2 *(continued)*

```
    NAME="layerButton2"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
</FORM>
</BODY>
</LAYER>

</BODY>
</HTML>
```

Passing events toward their targets

If you capture a particular event type, your script may need to perform some limited processing on that event before letting it reach its intended target. For example, perhaps you want to do something special if a user clicks an element with the Shift metakey pressed. In that case, the function that handles the event at the document level inspects the event's modifiers property to determine if the Shift key was pressed at the time of the event. If the Shift key was not pressed, you want the event to continue on its way to the element that the user clicked.

To let an event pass through the object hierarchy to its target, you use the `routeEvent()` method, passing as a parameter the event object being handled in the current function. A `routeEvent()` method does not guarantee that the event will reach its intended destination, because another object in between may have event capturing for that event type turned on and will intercept the event. That object, too, can let the event pass through with its own `routeEvent()` method.

Listing 29-3 demonstrates event routing by adding onto the document being built in previous examples. While the clickable button objects are the same, additional powers are added to the document and layer function handlers that process events that come their way. For each of these event-capturing objects, you have additional checkbox settings to allow or disallow events from passing through after each level has processed them.

The default settings for the checkboxes are like the ones in Listing 29-2, where event capture (for the `click` event) is set for both the `document` and `layer` objects. Clicking any button causes the `document` object's event handler to process and none other. But if you then enable the checkbox that lets the event continue, you find that click events on the layer buttons cause alerts to display from both the `document` and layer object event handler functions. If you then also let events continue from the layer object, a click on the button displays a third alert, showing that the event has reached the buttons. Because the `main1` button is not in the layer, none of the layer object event handling settings affect its behavior.

Listing 29-3: **NN4 Capture, Release, and Route Events**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setDocCapture(enable) {
    if (!enable) {
        document.captureEvents(Event.CLICK)
```

```
    } else {
        document.releaseEvents(Event.CLICK)
        document.forms[0].setDocRte.checked = false
        docRoute = false
    }

}
function setLayerCapture(enable) {
    if (!enable) {
        document.layer1.captureEvents(Event.CLICK)
    } else {
        document.layer1.releaseEvents(Event.CLICK)
        document.forms[0].setLyrRte.checked = false
        layerRoute = false
    }
}
var docRoute = false
var layerRoute = false
function setDocRoute(enable) {
    docRoute = !enable
}
function setLayerRoute(enable) {
    layerRoute = !enable
}
function doMainClick(e) {
    if (e.target.type == "button") {
        alert("Captured in top document")
        if (docRoute) {
            routeEvent(e)
        }
    }
}
document.captureEvents(Event.CLICK)
document.onclick=doMainClick
</SCRIPT>
</HEAD>
<BODY>
<B>Capture, Release, and Routing of Event.CLICK</B>
<HR>
<FORM>
<INPUT TYPE="checkbox" NAME="setDocCap"
onMouseDown="setDocCapture(this.checked)" CHECKED>Enable Document Capture 
<INPUT TYPE="checkbox" NAME="setDocRte"
onMouseDown ="setDocRoute(this.checked)">And let event continue<P>
<INPUT TYPE="checkbox" NAME="setLyrCap"
onMouseDown ="setLayerCapture(this.checked)" CHECKED>Enable Layer Capture 
<INPUT TYPE="checkbox" NAME="setLyrRte"
onMouseDown ="setLayerRoute(this.checked)">And let event continue
<HR>
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"
    onClick="alert('Event finally reached Button:' + this.name)">
</FORM>

<LAYER ID="layer1" LEFT=200 TOP=150 BGCOLOR="coral">
```

Continued

Listing 29-3 *(continued)*

```
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function doLayerClick(e) {
    if (e.target.type == "button") {
        alert("Captured in layer1")
        if (layerRoute) {
            routeEvent(e)
        }
    }
}
layer1.captureEvents(Event.CLICK)
layer1.onclick=doLayerClick
</SCRIPT>
</HEAD>
<BODY>
<FORM>
 layer1<BR><P><INPUT TYPE="button" VALUE="Button 'layerButton1'"
    NAME="layerButton1"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
<P><INPUT TYPE="button" VALUE="Button 'layerButton2'"
    NAME="layerButton2"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
</FORM>
</BODY>
</LAYER>

</BODY>
</HTML>
```

In some cases, your scripts need to know if an event that is passed onward by `routeEvent()` method activated a function that returns a value. This knowledge is especially valuable if your event must return a `true` or `false` value to let an object know if it should proceed with its default behavior (for example, whether a link should activate its `HREF` attribute URL or cancel after the event handler evaluates to `return true` or `return false`). When a function is invoked by the action of a `routeEvent()` method, the return value of the destination function is passed back to the `routeEvent()` method. That value, in turn, can be returned to the object that originally captured the event.

Event traffic cop

The last scenario is one in which a higher-level object captures an event and directs the event to a particular object elsewhere in the hierarchy. For example, you could have a document-level event handler function direct every click event whose `modifiers` property indicates that the Alt key was pressed to a Help button object whose own `onClick` event handler displays a help panel (perhaps shows an otherwise hidden layer).

You can redirect an event to any object via the `handleEvent()` method. This method works differently from the others described in this chapter, because the object reference of this method is the reference of the object to handle the event (with the event object being passed as a parameter, such as the other methods). As long as the target object has an event handler defined for that event, it will process the event as if it had received the event directly from the system (even though the event object's `target` property may be some other object entirely).

To demonstrate how this event redirection works, Listing 29-4 includes the final additions to the document being built so far in this chapter. The listing includes mechanisms that allow all `click` events to be sent directly to the second button in the layer (`layerButton2`). The previous interaction with document and layer event capture and routing is still intact, although you cannot have event routing and redirection on at the same time.

The best way to see event redirection at work is to enable both document and layer event capture (the default settings). When you click the `main1` button, the event reaches only as far as the document-level capture handler. But if you then turn on the "Send event to 'layerButton2'" checkbox associated with the document level, a click of the `main1` button reaches both the document-level event handler and `layerButton2`, even though the `main1` button is not anywhere near the layer button in the document object hierarchy. Click other checkboxes to work with the interaction of event capturing, routing, and redirection.

Listing 29-4: **NN4 Redirecting Events**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setDocCapture(enable) {
    if (!enable) {
        document.captureEvents(Event.CLICK)
    } else {
        document.releaseEvents(Event.CLICK)
        document.forms[0].setDocRte.checked = false
        docRoute = false
    }

}
function setLayerCapture(enable) {
    if (!enable) {
        document.layer1.captureEvents(Event.CLICK)
    } else {
        document.layer1.releaseEvents(Event.CLICK)
        document.forms[0].setLyrRte.checked = false
        layerRoute = false
    }
}
var docRoute = false
var layerRoute = false
function setDocRoute(enable) {
    docRoute = !enable
    document.forms[0].setDocShortCircuit.checked = false
    docShortCircuit = false
}
```

Continued

Listing 29-4 *(continued)*

```
function setLayerRoute(enable) {
    layerRoute = !enable
    document.forms[0].setLyrShortCircuit.checked = false
    layerShortCircuit = false
}

var docShortCircuit = false
var layerShortCircuit = false
function setDocShortcut(enable) {
    docShortCircuit = !enable
    if (docShortCircuit) {
        document.forms[0].setDocRte.checked = false
        docRoute = false
    }
}
function setLayerShortcut(enable) {
    layerShortCircuit = !enable
    if (layerShortCircuit) {
        document.forms[0].setLyrRte.checked = false
        layerRoute = false
    }
}

function doMainClick(e) {
    if (e.target.type == "button") {
        alert("Captured in top document")
        if (docRoute) {
            routeEvent(e)
        } else if (docShortCircuit) {
            document.layer1.document.forms[0].layerButton2.handleEvent(e)
        }
    }
}
document.captureEvents(Event.CLICK)
document.onclick=doMainClick
</SCRIPT>
</HEAD>
<BODY>
<B>Redirecting Event.CLICK</B>
<HR>
<FORM>
<INPUT TYPE="checkbox" NAME="setDocCap"
onMouseDown="setDocCapture(this.checked)" CHECKED>Enable Document Capture 
<INPUT TYPE="checkbox" NAME="setDocRte"
onMouseDown ="setDocRoute(this.checked)">And let event continue
<INPUT TYPE="checkbox" NAME="setDocShortCircuit"
onMouseDown ="setDocShortcut(this.checked)">Send event to 'layerButton2'<P>
<INPUT TYPE="checkbox" NAME="setLyrCap"
onMouseDown ="setLayerCapture(this.checked)" CHECKED>Enable Layer Capture 
<INPUT TYPE="checkbox" NAME="setLyrRte"
onMouseDown ="setLayerRoute(this.checked)">And let event continue
```

```
<INPUT TYPE="checkbox" NAME="setLyrShortCircuit"
onMouseDown ="setLayerShortcut(this.checked)">Send event to 'layerButton2'<P>
<HR>
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"
    onClick="alert('Event finally reached Button:' + this.name)">
</FORM>

<LAYER ID="layer1" LEFT=200 TOP=200 BGCOLOR="coral">
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function doLayerClick(e) {
    if (e.target.type == "button") {
        alert("Captured in layer1")
        if (layerRoute) {
            routeEvent(e)
        } else if (layerShortCircuit) {
            document.forms[0].layerButton2.handleEvent(e)
        }
    }
}
layer1.captureEvents(Event.CLICK)
layer1.onclick=doLayerClick
</SCRIPT>
</HEAD>
<BODY>
<FORM>
 layer1<BR><P><INPUT TYPE="button" VALUE="Button 'layerButton1'"
    NAME="layerButton1"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
<P><INPUT TYPE="button" VALUE="Button 'layerButton2'"
    NAME="layerButton2"
    onClick="alert('Event finally reached Button:' + this.name)"></P>
</FORM>
</BODY>
</LAYER>

</BODY>
</HTML>
```

IE4+ event propagation

Event propagation in IE4+ flows in the opposite direction of the NN4 event capture model. IE's model is called *event bubbling*, in which events "bubble" upward from the target object through the element containment hierarchy. It's important to distinguish between the old-fashioned document object hierarchy (followed in the NN4 event capture model) and the more modern notion of HTML element containment — a concept that carries to the W3C DOM as well.

A good way to demonstrate the effect of event bubbling — a behavior that is turned on by default — is to populate a simple document with lots of event handlers to see which ones fire and in what order. Listing 29-5 has `onClick` event handlers defined for a button inside a form, the form itself, and other elements and object all the way up the hierarchy out to the window.

Listing 29-5: Event Bubbling Demonstration

```
<HTML onClick="alert('Event is now at the HTML element.')">
<HEAD>
<TITLE>Event Bubbles</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function init() {
    window.onclick = winEvent
    document.onclick = docEvent
    document.body.onclick = docBodEvent
}
function winEvent() {
    alert("Event is now at the window object level.")
}
function docEvent() {
    alert("Event is now at the document object level.")
}
function docBodEvent() {
    alert("Event is now at the BODY element.")
}

</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>Event Bubbles</H1>
<HR>
<FORM onClick="alert('Event is now at the FORM element.')">
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"
    onClick="alert('Event started at Button: ' + this.name)">
</FORM>
</BODY>
</HTML>
```

You can try this listing in IE4+ and even NN6, because the latter observes event bubbling. But you will notice differences in the precise propagation among IE4+/Windows, IE4+/Macintosh, and NN6. But first, notice that after you click the button in Listing 29-5, the event first fires at the target: the button. Then the event bubbles upward through the HTML containment to fire at the enclosing FORM element; next to the enclosing BODY element; and so on. Where the differences occur are after the BODY element. Table 29-1 shows the objects for which event handlers are defined in Listing 29-5 and which objects have the `click` event bubble to them in the three classes of browsers.

Table 29-1 Event Bubbling Variations for Listing 29-5

Event Handler Location	*IE4+/Windows*	*IE4+/Macintosh*	*NN6*
BUTTON	yes	yes	yes
FORM	yes	yes	yes

Event Handler Location	*IE4+/Windows*	*IE4+/Macintosh*	*NN6*
BODY	yes	yes	yes
HTML	yes	no	yes
`document`	yes	yes	yes
`window`	no	no	yes

Despite the discrepancies in Table 29-1, events do bubble through the most likely HTML containers that come to mind. The object level with the most global scope and that works in all browser categories shown in the table is the `document` object.

Preventing IE event bubbling

Because bubbling occurs by default, there are times when you may prefer to prevent an event from bubbling up the hierarchy. For example, if you have one handler at the `document` level whose job is to deal with the `click` event from a related series of buttons, any other object that receives `click` events will allow those events to bubble upward to the `document` level unless the bubbling is cancelled. Having the event bubble up could conflict with the document-level event handler.

Each `event` object in IE has a property called `cancelBubble`. The default value of this property is `false`, which means that the event bubbles to the next outermost container that has an event handler for that event. But if, in the execution of an event handler, that property is set to `true`, the processing of that handler finishes its job, but the event does not bubble up any higher. Therefore, to stop an event from bubbling beyond the current event handler, include the following statement somewhere in the handler function:

```
event.cancelBubble = true
```

You can prove this to yourself by modifying the page in Listing 29-5 to cancel bubbling at any level. For example, if you change the event handler of the FORM element to include a statement that cancels bubbling, the event goes not further than the FORM in IE (the syntax is different for NN6, as discussed later):

```
<FORM
onClick="alert('Event is now at the FORM element.'); event.cancelBubble=true">
```

Redirecting events

Starting with IE5.5, you can redirect an event to another element, but with some limitations. The mechanism that makes this possible is the `fireEvent()` method of all HTML element objects (see Chapter 15). This method isn't so much redirecting an event as causing a brand-new event to be fired. But you can pass most of the properties of the original `event` object with the new event by specifying a reference to the old `event` object as the optional second parameter to the `fireEvent()` method.

The big limitation in this technique, however, is that the reference to the target element gets lost in this hand-off to the new event. The `srcElement` property of the old event gets overwritten with a reference to the object that is the target of the call to `fireEvent()`. For example, consider the following `onClick` event handler function for a button inside a FORM element:

```
function buttonEvent() {
    event.cancelBubble = true
    document.body.fireEvent("onclick", event)
}
```

By cancelling event bubbling, the event does not propagate upward to the enclosing FORM element. Instead, the event is explicitly redirected to the BODY element, passing the current `event` object as the second parameter. When the event handler function for the BODY element runs, its `event` object has information about the original event, such as the mouse button used for the click and the coordinates. But the `event.srcElement` property points to the `document.body` object. As the event bubbles upward from the BODY element, the `srcElement` property continues to point to the `document.body` object. You can see this at work in Listing 29-6 for IE5.5+.

Listing 29-6: **Cancelling and Redirecting Events in IE5.5+**

```
<HTML onClick="revealEvent('HTML', event)">
<HEAD>
<TITLE>Event Cancelling & Redirecting</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// display alert with event object info
function revealEvent(elem, evt) {
    var msg = "Event (from " + evt.srcElement.tagName + " at "
    msg += event.clientX + "," + event.clientY + ") is now at the "
    msg += elem + " element."
    alert(msg)
}
function init() {
    document.onclick = docEvent
    document.body.onclick = docBodEvent
}
function docEvent() {
    revealEvent("document", event)
}
function docBodEvent() {
    revealEvent("BODY", event)
}
function buttonEvent(form) {
    revealEvent("BUTTON", event)
    // cancel if checked (IE4+)
    event.cancelBubble = form.bubbleCancelState.checked
    // redirect if checked (IE5.5+)
    if (form.redirect.checked) {
        document.body.fireEvent("onclick", event)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>Event Cancelling & Redirecting</H1>
<HR>
<FORM onClick="revealEvent('FORM', event)">
```

```
<P><BUTTON NAME="main1" onClick="buttonEvent(this.form)">
Button 'main1'
</BUTTON></P>
<P><INPUT TYPE="checkbox" NAME="bubbleCancelState"
onClick="event.cancelBubble=true">Cancel Bubbling at BUTTON<BR>
<INPUT TYPE="checkbox" NAME="redirect" onClick="event.cancelBubble=true">
Redirect Event to BODY</P>
</FORM>
</BODY>
</HTML>
```

Listing 29-6 is a modified version of Listing 29-5. Major additions are enhanced event handlers at each level so that you can see the tag name of the event that is regarded as the `srcElement` of the event as well as the coordinates of the click event. With both checkboxes unchecked, events bubble upward from the button, and the BUTTON element is then shown to be the original target all the way up the bubble hierarchy. If you check the Cancel Bubbling checkbox, the event goes no further than the BUTTON element, because that's where event bubbling is turned off. If you then check the Redirect Event to BODY checkbox, the original event is cancelled at the BUTTON level, but a new event is fired at the BODY element. But notice that by passing the old `event` object as the second parameter, the click location properties of the old event are applied to the new event directed at the BODY. This event then continues to bubble upward from the BODY.

As a side note, if you uncheck the Cancel Bubbling checkbox but leave the Redirect Event box checked, you can see how the redirection is observed at the end of the BUTTON's event handler, and something special goes on. The original event is held aside by the browser while the redirected event bubbles upward. As soon as that event processing branch finishes, the original bubbling propagation carries on with the FORM. Notice, though that the `event` object still knows that it was targeted at the BUTTON element, and the other properties are intact. This means that for a time, two `event` objects were in the browser's memory, but only one is "active" at a time. While the redirected event is propagating, the `window.event` object refers to that `event` object only.

NN6+ event propagation

Yielding to arguments in favor of both event capture and event bubbling, the W3C DOM group managed to assemble an event model that employs both propagation systems. Although forced to use new syntax so as not to conflict with older browsers, the W3C DOM propagation model works like the NN4 one for capture and like IE4+ for bubbling. In other words, an event bubbles by default, but you can also turn on event capture if you want. Thus, an event first trickles down the element containment hierarchy to the target; then it bubbles up through the reverse path.

Event bubbling is on by default, just as in IE4+. To enable capture, you must apply a W3C DOM event listener to an object at some higher container. Use the `addEventListener()` method (see Chapter 15) for any visible HTML element or node. One of the parameters of the `addEventListener()` method determines whether the event listener function should be triggered while the event is bubbling or is captured.

Listing 29-7 is a simplified example that demonstrates how a click event aimed at a button can be both captured and allowed to bubble. Most event handling functions are assigned inside the init() function. Borrowing code from Listing 29-5, event handlers are assigned to the window, document, and BODY objects as property assignments. These are automatically treated as bubble-type event listeners. Next, two objects — the document and a form — are given capture-type event listeners for the click event. The document object event listener invokes the same function as the bubble-type event handler (the alert text includes some asterisks to remind you that it is the same alert being displayed in both the capture and bubble phases of the event). For the form object, however, the capture-type event listener is directed to one function, while a bubble-type listener for the same object is directed at a separate function. In other words, the form object invokes one function as the event trickles down to the target and another function when the event starts bubbling back up. Many of the event handler functions dynamically read the eventPhase property of the event object to reveal which phase of event propagation is in force at the instance the event handler is invoked.

Listing 29-7: NN6 Event Capture and Bubble

```
<HTML>
<HEAD>
<TITLE>W3C DOM Event Propagation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function init() {
    // using old syntax to assign bubble-type event handlers
    window.onclick = winEvent
    document.onclick = docEvent
    document.body.onclick = docBodEvent
    // turn on click event capture for two objects
    document.addEventListener("click", docEvent, true)
    document.forms[0].addEventListener("click", formCaptureEvent, true)
    // set event listener for bubble
    document.forms[0].addEventListener("click", formBubbleEvent, false)
}
function winEvent(evt) {
    alert("Event is now at the window object level (" + getPhase(evt) + ").")
}
function docEvent(evt) {
    alert("Event is now at the **document** object level (" + getPhase(evt) +
").")
}
function docBodEvent(evt) {
    alert("Event is now at the BODY level (" + getPhase(evt) + ").")
}
function formCaptureEvent(evt) {
    alert("This alert triggered by FORM only on CAPTURE.")
}
function formBubbleEvent(evt) {
    alert("This alert triggered by FORM only on BUBBLE.")
}
// reveal event phase of current event object
function getPhase(evt) {
    switch (evt.eventPhase) {
```

```
        case 1:
            return "CAPTURING"
            break
        case 2:
            return "AT TARGET"
            break
        case 3:
            return "BUBBLING"
            break
        default:
            return ""
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>W3C DOM Event Propagation</H1>
<HR>
<FORM>
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"  onClick=
    "alert('Event is now at the button object level (' + getPhase(event) +
').')">
</FORM>
</BODY>
</HTML>
```

If you want to remove event capture after it has been enabled, use the `removeEventListener()` method on the same object as the event listener that was originally added (see Chapter 15). And, because multiple event listeners can be attached to the same object, specify the exact same three parameters to the `removeEventListener()` method as applied to the `addEventListener()` method.

Preventing NN6 event bubbling or capture

Corresponding to the `cancelBubble` property of the IE4+ `event` object is an event object method in the W3C DOM. The method that prevents propagation in any event phase is the `stopPropagation()` method. Invoke this method anywhere within an event listener handler function. The current function executes to completion, but the event propagates no further.

Listing 29-8 extends the example of Listing 29-7 to include two checkboxes that let you stop propagation type at the FORM element in your choice of the capture or bubble phase.

Listing 29-8: **Preventing Bubble and Capture**

```
<HTML>
<HEAD>
<TITLE>W3C DOM Event Propagation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function init() {
    // using old syntax to assign bubble-type event handlers
    window.onclick = winEvent
```

Continued

Listing 29-8 *(continued)*

```
    document.onclick = docEvent
    document.body.onclick = docBodEvent
    // turn on click event capture for two objects
    document.addEventListener("click", docEvent, true)
    document.forms[0].addEventListener("click", formCaptureEvent, true)
    // set event listener for bubble
    document.forms[0].addEventListener("click", formBubbleEvent, false)
}
function winEvent(evt) {
    if (evt.target.type == "button") {
        alert("Event is now at the window object level (" +
getPhase(evt) + ").")
    }
}
function docEvent(evt) {
    if (evt.target.type == "button") {
        alert("Event is now at the **document** object level
(" + getPhase(evt) + ").")
    }
}
function docBodEvent(evt) {
    if (evt.target.type == "button") {
        alert("Event is now at the BODY level (" + getPhase(evt) + ").")
    }
}
function formCaptureEvent(evt) {
    if (evt.target.type == "button") {
        alert("This alert triggered by FORM only on CAPTURE.")
        if (document.forms[0].stopAllProp.checked) {
            evt.stopPropagation()
        }
    }
}
function formBubbleEvent(evt) {
    if (evt.target.type == "button") {
        alert("This alert triggered by FORM only on BUBBLE.")
        if (document.forms[0].stopDuringBubble.checked) {
            evt.preventBubble()
            }
    }
}
// reveal event phase of current event object
function getPhase(evt) {
    switch (evt.eventPhase) {
        case 1:
            return "CAPTURING"
            break
        case 2:
            return "AT TARGET"
            break
        case 3:
            return "BUBBLING"
```

```
            break
        default:
            return ""
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>W3C DOM Event Propagation</H1>
<HR>
<FORM>
<INPUT TYPE="checkbox" NAME="stopAllProp">Stop all propagation at FORM<BR>
<INPUT TYPE="checkbox" NAME="stopDuringBubble">Prevent bubbling past FORM
<HR>
<INPUT TYPE="button" VALUE="Button 'main1'" NAME="main1"  onClick=
    "alert('Event is now at the button object level (' + getPhase(event) +
').')">
</FORM>
</BODY>
</HTML>
```

Redirecting NN6 events

The mechanism for sending an event to an object outside the normal propagation pattern in NN6 is similar to that of IE4+, although with different syntax. In place of the IE4+ `fireEvent()` method, NN6 uses the W3C DOM `dispatchEvent()` method. The sole parameter of the method is an event object, such as the current event object. Listing 29-9 is the same as the IE4+ Listing 29-6, but with just a few modifications to run in the NN6 event model. Notice that the `dispatchEvent()` method passes the current event object as its sole parameter.

Listing 29-9: Cancelling and Redirecting Events in NN6+

```
<HTML onClick="revealEvent('HTML', event)">
<HEAD>
<TITLE>Event Cancelling & Redirecting</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// display alert with event object info
function revealEvent(elem, evt) {
    var msg = "Event (from " + evt.target.tagName + " at "
    msg += evt.clientX + "," + evt.clientY + ") is now at the "
    msg += elem + " element."
    alert(msg)
}
function init() {
    document.onclick = docEvent
    document.body.onclick = docBodEvent
}
function docEvent(evt) {
    revealEvent("document", evt)
}
```

Continued

Listing 29-9 *(continued)*

```
function docBodEvent(evt) {
    revealEvent("BODY", evt)
}
function buttonEvent(form, evt) {
    revealEvent("BUTTON", evt)
    // redirect if checked
    if (form.redirect.checked) {
        document.body.dispatchEvent(evt)
    }
    // cancel if checked
    if (form.bubbleCancelState.checked) {
        evt.stopPropagation()
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>Event Cancelling & Redirecting</H1>
<HR>
<FORM onClick="revealEvent('FORM', event)">
<P><BUTTON NAME="main1" onClick="buttonEvent(this.form, event)">
Button 'main1'
</BUTTON></P>
<P><INPUT TYPE="checkbox" NAME="bubbleCancelState"
onClick="event.stopPropagation()">Cancel Bubbling at BUTTON<BR>
<INPUT TYPE="checkbox" NAME="redirect" onClick="event.stopPropagation()">
Redirect Event to BODY</P>
</FORM>
</BODY>
</HTML>
```

Referencing the event object

While there may be essentially three different event object models in today's browsers, the way your scripts access those objects is divided into two camps: the IE way; and the NN (and W3C) way. I start with the simpler, IE way.

IE4+ event object references

In IE4+, the `event` object is accessible as a property of the `window` object:

```
window.event
```

But, as you are well aware, the `window` part of references is optional, so your scripts can treat the `event` object as if it were a global reference:

```
event.propertyName
```

Thus, any statement in an event handler function can access the `event` object without any special preparation or initializations.

NN4+ (W3C) event object references

The situation is a bit more complicated in the NN4+ event model. In some cases you must explicitly pass the event object as a parameter to an event handler function, while in other cases, the event object is delivered as a parameter automatically. The difference depends on how the event handler function is bound to the object.

Using the original way of binding event handlers to objects — via an attribute in the element's tag — you must specify the event object as a parameter by passing `event` as a parameter, as in

```
onClick="doSomething(event)"
```

This is the only time in the NN4+ model that you see an explicit reference to the `event` (lowercase "e") object as if it were a global reference. This reference does not work in any other context — only as a parameter to an event handler function. If you have multiple parameters, the `event` reference can go in any order, but I tend to put it last:

```
onClick="doSomething(this, event)"
```

The function definition that is bound to the element should therefore have a parameter variable in place to "catch" the event object parameter:

```
function doSomething(widget, evt) {...}
```

You have no restrictions on how you name this parameter variable. In some examples of this book, you may see the variable assigned as `event` or, more commonly, `evt`. When working with cross-browser scripts, avoid using `event` as a parameter variable name so as not to interfere with IE's `event` property.

Other ways of binding event handler functions to objects — via property assignments and the `addEventListener()` method in NN6+ — assign references of those handlers to the desired objects in the document, as in either of the following:

```
document.forms[0].someButton.onclick = doSomething
document.getElementById("myButton").addEventListener("click", doSomething, false)
```

Event binding through these approaches prevents explicit passage of your own parameters to the invoked functions. But the NN4+ browsers automatically pass as the sole parameter a reference to the event object created in response to the user or system action that triggered the event. This means that your functions should "receive" the passed event object in a parameter variable:

```
function doSomething(evt) {...}
```

Recall that the event object contains a reference to the object that was the target of the event. From that, you can access any properties of that object, such as the form object that contains a form control object.

You can see the way the event object is passed as a parameter in Listing 29-9. For all event handlers that are assigned by reference (both to an event handler property of an object and to an `addEventListener()` method call), the functions have a parameter variable in place to act as a reference to the event object for statements within the function. If you need to invoke other functions from there, you can pass the event object reference further along as needed. The event object retains its properties as long as the chain of execution triggered by the event action continues.

event Object Compatibility

Despite the incompatible ways that NN and IE event objects arrive at an event handler function, you can easily stuff the object into one variable that both browser types can use. For example, the following function fragment receives an event object from NN but also accommodates the IE `event` object:

```
function doSomething(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    if (evt) {
        // browser has an event to process
        ...
    }
}
```

If an event object arrives as a parameter, it continues to be available as `evt`; but if not, the function makes sure that a `window.event` object is available and assigns it to the `evt` variable; finally, if the browser doesn't know about an `event` object, the `evt` variable is made an empty string. Processing continues only if `evt` contains an event object.

That's the easy part. The madness comes in the details: reading properties of the event object when the property names can vary widely across the three event object models. Sections later in this chapter provide details of each property and method of all three event object models, but seeing an overview of the property terminology on a comparative basis is helpful. Table 29-2 lists the common information bits and actions you are likely to want from an event object and the property or method names used in the three event object models.

Table 29-2 Common event Object Properties and Methods

Property/Action	***NN4***	***IE4+***	***NN6***
Target element	`target`	`srcElement`	`target`
Event type	`type`	`type`	`type`
X coordinate in element	n/a†	`offsetX`	n/a†
Y coordinate in element	n/a†	`offsetY`	n/a†
X coordinate in positioned element	`layerX`	`x`	`layerX`
Y coordinate in positioned element	`layerY`	`y`	`layerY`
X coordinate on page	`pageX`	n/a†	`pageX`
Y coordinate on page	`pageY`	n/a†	`pageY`
X coordinate in window	n/a	`clientX`	`clientX`
Y coordinate in window	n/a	`clientY`	`clientY`
X coordinate on screen	`screenX`	`screenX`	`screenX`

Property/Action	NN4	IE4+	NN6
Y coordinate on screen	`screenY`	`screenY`	`screenY`
Mouse button	`which`	`button`	`button`
Keyboard key	`which`	`keyCode`	`keyCode`
Shift key pressed	`modifiers`	`shiftKey`	`shiftKey`
Alt key pressed	`modifiers`	`altKey`	`altKey`
Ctrl key pressed	`modifiers`	`ctrlKey`	`ctrlKey`
Previous Element	n/a	`fromElement`	`relatedTarget`
Next Element	n/a	`toElement`	`relatedTarget`
Cancel bubbling	n/a	`cancelBubble`	`preventBubble()`
Prevent default action	`return false`	`returnValue`	`preventDefault()`

†Value can be derived through calculations with other properties.

As you can see in Table 29-2, properties for the IE4+ and NN6 event objects have a lot in common. This is good news, especially as the installed base of NN4 users diminishes over time. The primary incompatibility is how to reference the element that is the intended target of the event. This, too, can be branched in your code to achieve a common variable that references the element. For example, embedded within the previous function fragment can be a statement, such as the following:

```
var elem = (evt.target) ? evt.target : evt.srcElement
```

Each event model has additional properties that are not shared by the other. Details about these are covered in the rest of this chapter.

Dueling Event Models

Despite the sometimes widely divergent ways event object models treat their properties, accommodating a wide range of browsers for event manipulation is not difficult. In this section, you see two scripts that examine important event properties. The first script reveals which, if any, modifier keys are held down during an event; the second script extracts the codes for both mouse buttons and keyboard keys. Both scripts work with all browsers that have event objects, including NN4. If your audience no longer uses NN4, you can eliminate the code branches that support it.

Cross-platform modifier key check

Listing 29-10 demonstrates branching techniques for examining the modifier key(s) being held down while an event fires. Details of the event object properties, such as `modifiers` and `altKey`, can be found later in this chapter. To see the page in action, click a link, type into a text box, and click a button while holding down any combination of modifier keys. A series of four checkboxes representing the four modifier keys is at the bottom. As you click or type, the checkbox(es) of the pressed modifier key(s) become checked.

Listing 29-10: **Checking Events for Modifier Keys**

```
<HTML>
<HEAD>
<TITLE>Event Modifiers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkMods(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    if (evt) {
        var elem = (evt.target) ? evt.target : evt.srcElement
        var form = document.output
        if (evt.modifiers) {
            form.modifier[0].checked = evt.modifiers & Event.ALT_MASK
            form.modifier[1].checked = evt.modifiers & Event.CONTROL_MASK
            form.modifier[2].checked = evt.modifiers & Event.SHIFT_MASK
            form.modifier[3].checked = evt.modifiers & Event.META_MASK
        } else {
            form.modifier[0].checked = evt.altKey
            form.modifier[1].checked = evt.ctrlKey
            form.modifier[2].checked = evt.shiftKey
            form.modifier[3].checked = false
        }
    }
    return false
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Event Modifiers</H1>
<HR>
<P>Hold one or more modifier keys and click on
<A HREF="javascript:void(0)" onMouseDown="return checkMods(event)">
this link</A> to see which keys you are holding.</P>
<FORM NAME="output">
<P>Enter some text with uppercase and lowercase letters:
<INPUT TYPE="text" SIZE=40 onKeyUp="checkMods(event)"></P>
<P><INPUT TYPE="button" VALUE="Click Here With Modifier Keys"
onClick="checkMods(event)"></P>
<P>
<INPUT TYPE="checkbox" NAME="modifier">Alt
<INPUT TYPE="checkbox" NAME="modifier">Control
<INPUT TYPE="checkbox" NAME="modifier">Shift
<INPUT TYPE="checkbox" NAME="modifier">Meta
</P>
</FORM>
</BODY>
</HTML>
```

Because all three event handlers call the same `checkMods()` function, branching is needed only in this function. Notice, though, that branching is done by object detection, rather than `navigator.userAgent` detection. This method makes the most sense for this example, because the scripts rely on the existence of particular objects and properties for their proper execution. For NN4, the event object is passed as a parameter (evt) whose modifiers property is Bitwise ANDed with an Event object constant for each modifier key. For IE4+ and NN6, the script checks the event object property for each of three modifiers.

Cross-platform key capture

To demonstrate keyboard events in both browsers, Listing 29-11 captures the key character being typed into a text box, as well as the mouse button used to click a button. As with Listing 29-10, NN4 has a very different way of getting this information compared to IE4+ and NN6. In this arena, however, NN6 continues to support the NN4 syntax as well, so you can use the old or new syntax as you like. Whereas NN4 combines the features of key character code and mouse button into one event object property (depending upon the event type), newer browsers have entirely separate properties for these values. Listing 29-11 is written such that NN6 follows the NN4 syntax path, but even if the NN4 syntax should disappear in a future NN version, the browser would follow the new syntax path without blinking an eye.

Listing 29-11: Checking Events for Key and Mouse Button Pressed

```
<HTML>
<HEAD>
<TITLE>Button and Key Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkWhich(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    if (evt) {
        var thingPressed = ""
        var elem = (evt.target) ? evt.target : evt.srcElement
        if (evt.which) {
            thingPressed = evt.which
        } else {
            if (elem.type == "textarea") {
                thingPressed = evt.keyCode
            } else if (elem.type == "button") {
                thingPressed = evt.button
            }
        }
        status = thingPressed
    }
    return false
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Button and Key Properties</H1> (results in the status bar)
<HR>
<FORM>
<P>Mouse down atop this
<INPUT TYPE="button" VALUE="Button" onMouseDown="checkWhich(event)">
this link</A> or this
<INPUT TYPE="button" VALUE="Button" onMouseDown="checkWhich(event)">
```

Continued

Listing 29-11 *(continued)*

```
with either mouse button (if you have more than one).</P>
<P>Enter some text with uppercase and lowercase letters:
<TEXTAREA COLS=40 ROWS=4 onKeyPress="checkWhich(event)" WRAP="virtual">
</TEXTAREA></P>
</FORM>
</BODY>
</HTML>
```

The codes displayed for the keyboard event are equivalent to the ASCII values of character keys. If you need the codes of other keys, the `onKeyDown` and `onKeyUp` event handlers provide Unicode values for any key that you press on the keyboard. See the `keyCode` property listings for event objects later in this chapter for more details.

Event Types

Although browsers prior to Version 4 did not have an accessible event object, this is a good time to summarize the evolution of what in today's browsers is known as the `type` property. The `type` property reveals the kind of event that generates an event object (the event handler name minus the "on"). Object models in IE4+ and NN6+ provide event handlers for virtually every HTML element, so that it's possible, for example, to define an `onClick` event handler for not only a clickable button, but also a P or even an arbitrary SPAN element. We'll come back to the current crop of browsers in a moment. But first, in case you must write scripts that work on older browsers, you need to know which elements in those browsers support which event handlers. This knowledge will help you determine a common denominator of event handlers to implement in your pages, based on the browsers you anticipate will be accessing the pages.

Older browsers

Earlier browsers tended to limit the number of event handlers for any particular element to just those that made sense for the kind of element it was. Even so, many scripters wanted more event handlers on more objects. But until that became a reality in IE4+ and NN6+, authors had to know the limits of the object models. Table 29-3 shows the event handlers available for objects within three generations of early browsers. Each column represents the version in which the event type was introduced. For example, the `window` object started out with four event types and gained three more when NN4 was released. In contrast, the area object was exposed as an object for the first time in NN3, which is where the first event types for that object are listed.

Table 29-3 Event Types through the Early Ages

Object	*NN2/IE3*	*NN3*	*NN4*
`window`	`blur`		`dragdrop`
	`focus`		`move`
	`load`		`resize`
	`unload`		
layer			`blur`
			`focus`
			`load`
			`mouseout`
			`mouseover`
			`mouseup`
link	`click`	`mouseout`	`dblclick`
	`mouseover`		`mousedown`
			`onmouseup`
area		`mouseout`	`click`
		`mouseover`	
image		`abort`	
		`error`	
		`load`	
form	`submit`	`reset`	
text, textarea, password	`blur`		`keydown`
	`change`		`keypress`
	`focus`		`keyup`
	`select`		
all buttons	`click`		`mousedown`
			`mouseup`
select	`blur`		
	`change`		
	`focus`		
fileUpload		`blur`	
		`focus`	
		`select`	

With the exception of the NN4 layer object, all objects shown in Table 29-3 have survived into the newer browsers, so that you can use these event handlers with confidence. Again, keep in mind that of the browsers listed in Table 29-3, only NN4 has an event object of any kind exposed to scripts.

Event types in IE4+ and NN6

By now you should have at least scanned the list of event handlers defined for elements in common, as shown in Chapter 15. This list of event types is enormous. A sizable number of the event types are unique to IE4, IE5, and IE5.5, and in some cases, just the Windows version at that.

If you compose pages for both IE4+ and NN6+, however, you need to know which event types these browser families and generations have in common. Event types for NN6 are based primarily on the W3C DOM Level 2 specification, although they also include keyboard events, which are not formally part of the Level 2 specification. Table 29-4 lists a common denominator of event types for modern browsers and the objects that support them. As you can see, many of these event types and corresponding objects go way back to the beginning. The biggest change is that mouse events are available for any visible element. While not as long as the IE event list, the event types in Table 29-4 are the basic set you should get to know for all browsers.

Table 29-4 IE4+ and NN6+ Event Types in Common

Event type	*Applicable Elements*
`abort`	OBJECT
`blur`	`window`, BUTTON, text, password, LABEL, SELECT, TEXTAREA
`change`	text, password, TEXTAREA, SELECT
`click`	All elements
`error`	`window`, FRAMESET, OBJECT
`focus`	`window`, BUTTON, text, password, LABEL, SELECT, TEXTAREA
`keydown`	text, password, TEXTAREA
`keypress`	text, password, TEXTAREA
`keyup`	text, password, TEXTAREA
`load`	`window`, FRAMESET, OBJECT
`mousedown`	All elements
`mousemove`	All elements
`mouseout`	All elements
`mouseover`	All elements
`mouseup`	All elements
`reset`	FORM
`resize`	`window`

Event type	Applicable Elements
scroll	window
select	text, password, TEXTAREA
submit	FORM
unload	window, FRAMESET

NN4 event Object

Properties	Methods	Event Handlers
data		
layerX		
layerY		
modifiers		
pageX		
pageY		
screenX		
screenY		
target		
type		
which		

Syntax

Accessing NN4 event object properties:

eventObject.property

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

About this object

Most of the details about this object were covered in the comparative event object discussions earlier in this chapter. As the NN4 browser dissipates from the user-installed base, this object and its details will become less important.

Properties

data

Value: Array of Strings Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

A `DragDrop` event contains information about the URL string being dragged to the browser window. Because dragging multiple items to a window is possible (for example, many icons representing URLs on some operating systems), the value of the property is an array of strings, with each string containing a single URL (including `file://` URLs for computer files).

URL information such as this is deemed to be private data, so it is exposed only to signed scripts after the user has granted permission to read browser data. If you want your signed script to capture this information without loading the URL into the window, the event handler must evaluate to return `false`.

On the CD-ROM

Example (with Listing 29-12) on the CD-ROM

layerX
layerY
pageX
pageY
screenX
screenY

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

For many (but not all) mouse-related events, the NN4 event object contains a lot of information about the coordinates of the pointer when the event occurred. In the most complex case, a click in a layer object has three distinct pairs of horizontal and vertical (`x` and `y`) coordinate values relative to the layer, the page, and the entire screen. If no layers are specified for a document, the layer and page coordinate systems are identical. Note that these values are merely geographical in nature and do not, by themselves, contain any information about the object being clicked (information held by the *`eventObject`*`.target` property).

These mouse coordinate properties are set only with specific events. In the case of a link object, the `click` and all four mouse events pack these values into the event object. For buttons, however, only the mouse events (`mouseDown` and `mouseUp`) receive these coordinates.

Each of the two window event types (`move` and `resize`) uses one of these property pairs to convey the results of the user action involved. For example, when the user resizes a window, the `resize` event stuffs the *eventObject*`.layerX` and *eventObject*`.layerY` properties with the inner width and height (that is, the content area) of the browser window (you can also use the optional *eventObject*`.width` and *eventObject*`.height` property names if you prefer). When the user moves the window, the *eventObject*`.screenX` and *eventObject*`.screenY` properties contain the screen coordinates of the top-left corner of the entire browser application window.

On the CD-ROM

Example (with Listing 29-13) on the CD-ROM

Related Items: `window` and layer object move and resize methods.

modifiers

Value: Constant Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The `modifiers` property of the NN4 event object refers to the modifier keys that can be pressed while clicking or typing. Modifier keys are Alt (also the Option key on the Macintosh keyboard), Ctrl, Shift, and what is known as a meta key (for example, the Command key, ⌘, on the Macintosh keyboard). You can use this property to find out if one or more modifier keys were pressed at the time the event occurred.

Values for these keys are integer values designed in such a way that any combination of keys generates a unique value. Fortunately, you don't have to know anything about these values, because the event model supplies some plain-language constants (properties of a global `Event` object always available behind the scenes) that a script can apply to the property value passed with the object. The constant names consist of the key name (all uppercase), followed by an underscore and the uppercase word `MASK`. For example, if the Alt key is pressed by itself or in concert with other modifier keys, you can use the bitwise AND operator (`&`) and the `Event.ALT_MASK` constant to test for the presence of the Alt key in the property value:

```
function handleMyEvent(evt) {
    if (evt.modifiers & Event.ALT_MASK) {
        //statements for Alt key handling
    }
}
```

Modifiers are not available with every event. You can capture them with `mouseDown` and `mouseUp` events in buttons and links. The only `click` event offering modifiers is with button objects. Keyboard events in text objects also include these modifiers. But be aware that accelerated keyboard combinations (for example, Ctrl+Q/⌘-Q for Quit) are not trappable by JavaScript event mechanisms because they are reserved for the browser's own menu shortcuts.

Example

See Listing 29-10 earlier in this chapter to see (in a cross-browser way) how the modifier keys are read for NN4.

`target`

Value: Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Every event has a property containing a reference to the object that was clicked, typed into, or otherwise acted upon. Most commonly, this property is examined when you set up a page to trap for events at the window, document, or layer level, as described earlier in this chapter. The `target` property lets you better identify the intended destination of the event while handling all processing for that type of event in one place. With a reference to the target object at hand in this property, your scripts can extract and/or set properties of the object directly.

`type`

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

An event object's type is the name of the event that generated the event object. An event name is the same as the event handler's name, less the "on" prefix. Therefore, if a button's `onClick` event handler is triggered by a user's click, then the event type is `click` (all lowercase). If you create a multipurpose function for handling events, you can extract the *`eventObject`*`.type` property to help the function decide how to handle the current event. This sounds like a good job for the `switch` control structure (see Chapter 39).

which

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The value of the `which` property depends on the event type: a mouse button indicator for mouse events and a character key code for keyboard events.

For a mouse-related event, the *`eventObject`*`.which` property contains either a 1 for the left (primary) mouse button or a 3 for the right (secondary) mouse button. Most Macintosh computers have only a one-button mouse, so exercise care in designing pages that rely on the second mouse button. Even on Windows and other platforms, you must program an object's `onMouseDown` event handler to `return false` for the secondary button to be registered instead of a browser pop-up menu appearing on-screen.

Keyboard events generate the ISO-Latin character code for the key that has been pressed. This value is an integer between 0 and 255. If your script needs to look at the actual character being typed, rather than the key code, use the `String.fromCharCode()` method (see Chapter 34) to make the conversion. If you have difficulty obtaining character codes from keyboard events, try using the `onKeyDown` and `onKeyUp` events rather than `onKeyPress`. In either case, the function keys do not present character codes.

Example

See Listing 29-10 for an example of using the *`eventObject`*`.which` property.

IE4+ event Object

Properties	*Methods*	*Event Handlers*
`altKey`		
`altLeft`		
`behaviorCookie`		
`behaviorPart`		
`bookmarks`		
`boundElements`		
`button`		
`cancelBubble`		
`clientX`		

Continued

Properties	Methods	Event Handlers
clientY		
contentOverflow		
ctrlKey		
ctrlLeft		
dataFld		
dataTransfer		
fromElement		
keyCode		
nextPage		
offsetX		
offsetY		
propertyName		
qualifier		
reason		
recordset		
repeat		
returnValue		
saveType		
screenX		
screenY		
shiftKey		
shiftLeft		
srcElement		
srcFilter		
srcUrn		
toElement		
type		
x		
y		

Syntax

Accessing IE4+ `event` object properties:

```
[window.]event.property
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

About this object

The IE4+ `event` object is a property of the `window` object. Its basic operation is covered earlier in this chapter.

You can see a little of what the `event` object is about with the help of The Evaluator (see Chapter 13). If you type `event` into the bottom text box, you can examine the properties of the `event` object for the event that triggers the function that displays the `event` object properties. If you press the Enter key in the text box, you see properties of the `keypress` event that caused the internal script to run; click the List Properties button to see the properties of the `click` event fired at the button. Hold down some of the modifier keys while clicking to see how this affects some of the properties.

As you review the properties for the `event` object, make special note of the compatibility table for each property. The list of properties for this object has grown over the evolution of the IE4+ event object model. Also, most properties are listed here as being read-only, which they were in IE4. But for IE5+, these properties are also Read/Write if the event is created artificially via methods, such as IE5.5's `document.createEventObject()` method. Event objects that are created by user or system action have very few properties that can be modified on the fly (to prevent your scripts from altering user actions).

Properties

altKey
ctrlKey
shiftKey

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

When an `event` object is created in response to a user or system action, these three properties are set based on whether their corresponding keys were being held down at the time — a Shift-click, for example. If the key was held down, the property is assigned a value of `true`; otherwise the value is `false`.

Most commonly, you use expressions consisting of this property as `if` construction condition statements. Because these are Boolean values, you can combine multiple properties in a single condition. For example, if you have a branch of a function that is to execute only if the event occurred with both the Shift and Control keys held down, the condition looks as the following:

```
if (event.shiftKey && event.ctrlKey) {
    // statements to execute
}
```

Conversely, you can take a more user-friendly approach to provide special processing if the user holds down any one of the three modifier keys:

```
if (event.shiftKey || event.ctrlKey || event.altKey) {

    // statements to execute
}
```

The rationale behind this approach is to offer perhaps some shortcut operation for users, but not force them to memorize a specific modifier key combination.

Example

See Listing 29-10, where the values of these three properties are used to set the `checked` properties of corresponding checkboxes for a variety of event types.

Related Items: `altLeft`, `ctrlLeft`, `shiftLeft` properties.

altLeft
ctrlLeft
shiftLeft

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Some versions of Windows (notably Windows NT and Windows 2000) allow events to be modified by only the left-hand Alt, Ctrl, and Shift keys when using IE5.5+. For these modifiers to be recorded by the `event` object, focus must be on the document (body), and not in any form control. If the left-key version is `false` and the regular version is `true`, then your script knows that the right-hand key had been held down during the event.

Related Items: `altKey`, `ctrlKey`, `shiftKey` properties.

behaviorCookie
behaviorPart

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

These two properties are related to a Windows technology that Microsoft calls *rendering behaviors*. Unlike the behaviors discussed under the `addBehavior()` method in Chapter 15, rendering behaviors are written in C++ and provide services for custom drawing on your Web page. For more details, consult the document "Implementing Rendering Behaviors" at `http://msdn.microsoft.com/workshop/browser/editing/imprendbehav.asp`.

bookmarks
boundElements
dataFld
qualifier
reason
recordset

Value: See Text Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

This group of `event` object properties is tied to using Data Binding in Windows versions of IE4+. Extensive details of Data Binding lie outside the scope of this book, but Table 29-5 provides a summary of these `event` object properties within that context (much of the terminology is used in Data Binding, but doesn't affect other scripting). For more details, search for ActiveX Data Objects (ADO) at `http://msdn.microsoft.com/workshop/`.

Table 29-5 ADO-Related event Object Properties

Property	*Value*	*First Implemented*	*Description*
`bookmarks`	Array	IE4	Array of ADO bookmarks (saved positions) for records within a recordset associated with the object that received the event.

Continued

Table 29-5 *(continued)*

Property	***Value***	***First Implemented***	***Description***
`boundElements`	Array	IE5	Array of element references for all elements bound to the same data set that was touched by the current event.
`dataFld`	String	IE5	Name of the data source column that is bound to a table cell that receives a `cellchange` event.
`qualifier`	String	IE5	Name of the data member associated with a data source that receives a data-related event. Available only if the data source object (DSO) allows multiple-named data members or a qualifier has been explicitly set via the `DATASRC` attribute of the bound element. Read-write in IE5+.
`reason`	Integer	IE4	Set only from `onDataSetComplete` event, provides the result code of the data set loading (0=successful; 1=transfer aborted; 2=other error).
`recordset`	Object	IE4	Reference to the current recordset in a data source object.

button

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `button` property reveals which button or buttons were pressed to activate a mouse event. If no mouse button is pressed to generate an event, this property is zero. But integers 1 through 7 reveal single and multiple button presses, including three-button mice when they are recognized by the operating system. Integer values correspond to buttons according to the following scheme:

Value	*Description*
0	No button
1	Left (primary) button
2	Right button
3	Left and right buttons together
4	Middle button
5	Left and middle buttons together
6	Right and middle buttons together
7	Left, middle, and right buttons together

Mouse buttons other than the primary one are easier to look for in `mousedown` or `mouseup` events, rather than `onclick` events. Be aware that as the user works toward pressing multiple buttons, each press fires a `mousedown` event. Therefore, if the user presses the left button first, the `mousedown` event fires, with the `event.button` property bearing the `1` value; as soon as the right button is pressed, the `mousedown` event fires again, but this time with an `event.button` value of `3`. If your script intends to perform special action with both buttons pressed, it should ignore and not perform any action for a single mouse button, because that one-button event will very likely fire in the process, disturbing the intended action.

Exercise caution when scripting the `event.button` property for both IE4+ and NN6+. The W3C DOM event model defines different button values for mouse buttons (`0`, `1`, and `2` for left, middle, and right) and no values for multiple buttons.

Example

See Listing 29-11, where the `event.button` property is revealed in the statusbar. Try pressing individual mouse buttons on, for example, the screen button. Then try combinations, watching the results very closely in the statusbar.

Related Items: None.

cancelBubble

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `cancelBubble` property (which sounds more as if it should be a method name) determines whether the current `event` object bubbles up any higher in the element containment hierarchy of the document. By default, this property is `false`, meaning that if the event is supposed to bubble, then it will do so automatically.

To prevent event bubbling for the current event, set the property to `true` anywhere within the event handler function. As an alternative, you can cancel bubbling directly in an element's event handler attribute, as in the following:

```
onClick="doButtonClick(this); event.cancelBubble = true"
```

Cancelling event bubbling works only for the current event. The very next event to fire will have bubbling enabled (provided the event bubbles).

Example

See Listing 29-6 to see the `cancelBubble` property in action. Even though that listing has some features that apply to IE5.5+, the bubble cancelling demonstration works all the way back to IE4.

Related Items: `returnValue` property.

clientX
clientY
offsetX
offsetY
screenX
screenY
x
y

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

An IE `event` object provides coordinates for an event in as many as four coordinate spaces: the element itself, the parent element of the event's target, the viewable area of the browser window, and the entire video screen. Unfortunately, misleading values can be returned by some of the properties that correspond to these coordinate spaces, as discussed in this section. Note that no properties provide the explicit position of an event relative to the entire page, in case the user has scrolled the window.

Starting with the innermost space — that of the element that is the target of the event — the `offsetX` and `offsetY` properties should provide pixel coordinates within the target element. This is how, for example, you could determine the click point on an image, regardless of whether the image is embedded in the BODY or floating around in a positioned DIV. Windows versions through (at least) IE5.5 produce the correct values in most cases. But for some elements that are child elements of the BODY element, the vertical (`y`) value may be relative to the viewable window, rather than just the element itself. You can see an example of this when you work with Listing 29-14 and click the H1 or P elements near the top of the page. This problem does not affect IE for the Mac, but there is another problem on Mac versions: If the page is scrolled away from its normal original position, the scrolled values are subtracted from the `clientX` and `clientY` values. This is an incompatibility bug, and you must take this error into account if you need click coordinates inside an element for a potentially scrolled page. This error correction must be done only for the Mac, because Windows works OK.

Extending scope to the offset parent element of the event's target, the `x` and `y` properties in IE5+ for Windows should return the coordinates for the event relative to the target's offset parent element (the element that can be found via the `offsetParent` property). For most non-positioned elements, these values are the same as the `clientX` and `clientY` properties because, as discussed in a moment, the offset parent element has a zero offset with *its* parent, the BODY. Observe an important caution about the `x` and `y` properties: In IE4/Windows and through IE5/Macintosh, the properties do not take into account any offset parent locations other than the BODY. Even in IE5+ for Windows, this property can give false readings in some circumstances. By and large, these two properties should not be used.

The next set of coordinates, `clientX` and `clientY`, are relative to the visible document area of the browser window. When the document is scrolled all the way to the top (or the document doesn't scroll at all), these coordinates are the same as the coordinates on the entire page. But because the page can scroll "underneath" the viewable window, the coordinates on the page can change if the page scrolls. Also, in the Windows versions of IE, you can actually register mouse events that are up to two pixels outside of the BODY element, which seems weird, but true. Therefore, in IE/Windows, if you click the background of the BODY, the event fires on the BODY element, but the `clientX`/`clientY` values will be two pixels greater then `offsetX`/`offsetY` (they're equal in IE/Mac). Despite this slight discrepancy, you should rely on the `clientX` and `clientY` properties if you are trying to get the coordinates of an event that may be in a positioned element, but have those coordinates relative to the entire viewable window, rather than just the positioning context.

Taking the page's scrolling into account for an event coordinate is often important. After all, unless you generate a fixed-size window for a user, you don't know how the browser window will be oriented. If you're looking for a click within a specific region of the page, you must take page scrolling into account. The scrolling factor can be retrieved from the `document.body.scrollLeft` and `document.body.scrollTop` properties. When reading the `clientX` and `clientY` properties, be sure to add the corresponding scroll properties to get the position on the page:

```
var coordX = event.clientX + document.body.scrollLeft
var coordY = event.clientY + document.body.scrollTop
```

Do this in your production work without fail.

Finally, the `screenX` and `screenY` properties return the pixel coordinates of the event on the entire video screen. These properties may be more useful if IE provided more window dimension properties. In any case, because mouse events fire only when the cursor is somewhere in the content region of the browser window, don't expect to get screen values of anywhere outside this region.

If these descriptions seem confusing to you, you are not alone. Throw in a few bugs, and it may seem like quite a mess. But think how you may use event coordinates in scripts. By and large, you want to know one of two types of mouse event coordinates: within the element itself and within the page. Use the `offsetX`/`offsetY` properties for the former; use `clientX`/`clientY` (plus the scroll property values) for the latter.

While the coordinate properties are used primarily for mouse events, there is a little quirk that may let you determine if the user has resized the window via the maximize icon in the title bar (on the Mac, this is called the zoom box) or the resize handle at the bottom-right corner of the screen. Mouse event coordinates are recorded in the `event` object for a `resize` event. In the case of the maximize icon, the `clientY` coordinate is a negative value (above the client space) and the `clientX` coordinate is within about 45 pixels of the previous width of the window (`document.body.clientWidth`). This, of course, happens after the window has resized, so it is not a way to prevent window resizing.

On the CD-ROM

Example (with Listing 29-14) on the CD-ROM

Related Items: `fromElement`, `toElement` properties.

dataTransfer

Value: Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `dataTransfer` property is a reference to an IE/Windows-only object called the `dataTransfer` object. Use this object in drag-and-drop operations (that is, with drag-and- drop-related events) to control not only the data that gets transferred from the source to the target but also to control the look of the cursor along the way.

Table 29-6 lists the properties and methods of the `dataTransfer` object.

Table 29-6 dataTransfer object Properties and Methods

Property/Method	*Returns*	*Description*
`dropEffect`	String	An element that is a potential recipient of a drop action can use the `onDragEnter`, `onDragOver`, or `onDrop` event handler to set the cursor style to be displayed when the cursor is atop the element. Before this can work, the source element's `onDragStart` event handler must assign a value to the `event.effectAllowed` property. Possible string values for both properties are `copy`, `link`, `move`, or `none`. These properties correspond to the Windows system cursors for the operations users typically do with files and in other documents. You must also cancel the default action (meaning set `event.returnValue` to `false`) for all of these drop element event handlers: `onDragEnter`, `onDragOver`, and `onDrop`.
`effectAllowed`	String	Set in response to an `onDragStart` event of the source element, this property determines which kind of drag-and-drop action will be taking place. Possible string values are `copy`, `link`, `move`, or `none`. This property value must match the `dropEffect` property value for the target element's `event` object. Also, cancel the default action (meaning, set `event.returnValue` to `false`) in the `onDragStart` event handler.
`clearData([`*format*`])`	Nothing	Removes data in the clipboard. If no format parameters are supplied, all data are cleared. Data formats can be one or more of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`.
`getData(`*format*`)`	String	Retrieves data of the specified format from the clipboard. The format is one of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`. The clipboard is not emptied after you get the data, so that it can be retrieved in several sequential operations.

Continued

Table 29-6 *(continued)*

Property/Method	***Returns***	***Description***
`setData(`*`format`*`, `*`data`*`)`	Boolean	Stores string data in the clipboard. The format is one of the following strings: `Text`, `URL`, `File`, `HTML`, `Image`. For non-text data formats, the data must be a string that specifies the path or URL to the content. Returns `true` if the transfer to the clipboard is successful.

The `dataTransfer` object acts as a conduit and controller of data that your scripts need to transfer from one element to another in response to a user's drag-and-drop action. You need to adhere to a well-defined sequence of actions triggered by a handful of event handlers. This means that the object is invoked on different instances of the `event` object as different events fire in the process of dragging and dropping.

The sequence begins at the source element, where an `onDragStart` event handler typically assigns a value to the `dropEffect` property and uses the `getData()` method to explicitly capture whatever data it is about the source object that gets transferred to the eventual target. For example, if you drag an image, the information being transferred may simply be the URL of the image — data that is extractable from the `event.srcElement.src` property of that event (the `src` property of the image, that is).

At the target element(s), three event handlers must be defined: `onDragEnter`, `onDragOver`, and `onDrop`. Most commonly, the first two event handlers do nothing more than mark the element for a particular `dropEffect` (which must match the `effectAllowed` set at the source during the drag's start) and set `event.returnValue` to false so that the cursor displays the desired cursor. These actions are also carried out in the `onDrop` event handler, but that is also the handler that does the processing of the destination action at the target element. This is when the `dataTransfer` object's `getData()` method is invoked to pick up the data that has been "stored" away by `getData()` at the start of the drag. If you also want to make sure that the data is not picked up accidentally by another event, invoke the `clearData()` method to remove that data from memory.

Note that the style of dragging being discussed here is not the kind in which you see the source element actually moving on the screen (although you could script it that way). The intention is to treat drag-and-drop operations just as Windows does in, say, the Windows Explorer window or on the Desktop. To the user, the draggable component becomes encapsulated in the cursor. That's why the properties of the `dataTransfer` object control the appearance of the cursor at the drop point as a way of conveying to the user the type of action that will occur with the impending drop.

Example

An extensive example of the `dataTransfer` property in action can be found in Listing 15-37 in the section for the `onDrag` event handler.

Related Items: `onDragEnd`, `onDragEnter`, `onDragLeave`, `onDragOver`, `onDragStart`, `onDrop` event handlers.

fromElement
toElement

Value: Element Object   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `fromElement` and `toElement` properties allow an element to uncover where the cursor rolled in from or has rolled out to. These properties extend the power of the `onMouseOver` and `onMouseOut` event handlers by expanding their scope to outside the current element (usually to an adjacent element).

When the `onMouseOver` event fires on an element, the cursor had to be over some other element just beforehand. The `fromElement` property holds a reference to that element. Conversely, when the `onMouseOut` event fires, the cursor is already over some other element. The `toElement` property holds a reference to that element.

On the CD-ROM

Example (with Listing 29-15) on the CD-ROM

Related Items: `srcElement` property.

keyCode

Value: Integer   Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

For keyboard events, the `keyCode` property returns an integer corresponding to the Unicode value of the character (for `onKeyPress` events) or the keyboard character key (for `onKeyDown` and `onKeyUp` events). There is a significant distinction between these numbering code systems.

If you want the Unicode values (the same as ASCII values for the Latin character set) for the key that a user pressed, get the `keyCode` property from the `onKeyPress` event handler. For example, a lowercase “a” returns 97, while an uppercase “A” returns 65. Non-character keys, such as arrows, page navigation, and function keys, return a `null` value for the `keyCode` property during `onKeyPress` events. In other words, the `keyCode` property for `onKeyPress` events is more like a character code than a key code.

To capture the exact keyboard key that the user presses, use either the `onKeyDown` or `onKeyUp` event handler. For these events, the `event` object captures a numeric code associated with a particular key on the keyboard. For the character keys, this varies with the language assigned as the system language. Importantly, there is no distinction between uppercase or lowercase: The “A” key on the Latin keyboard returns a value of 65, regardless of the state of the Shift key. At the same time, however, the press of the Shift key fired its own `onKeyDown` and `onKeyUp` events, setting the `keyCode` value to 16. Other non-character keys — arrows, page navigation, function, and similar — have their own codes as well. This gets very detailed, including special key codes for the numeric keyboard keys that are different from their corresponding numbers along the top row of the alphanumeric keyboard.

Be sure to see the extensive section on keyboard events in Chapter 15 for examples of how to apply the `keyCode` property in applications.

On the CD-ROM

Example (with Listing 29-16) on the CD-ROM

Related Items: `onKeyDown`, `onKeyPress`, `onKeyUp` event handlers.

nextPage

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `nextPage` property is applicable only if your IE5.5/Windows page uses a TemplatePrinter behavior. Values of this property are one of the following strings: `left`, `right`, or an empty string. For more information about the TemplatePrinter behavior for Windows-only versions of IE5.5+, see

```
http://msdn.microsoft.com/workshop/browser/hosting/printpreview/reference/
behaviors/TemplatePrinter.asp
```

propertyName

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `propertyName` property is filled only after an `onPropertyChange` event fires. This property is not available through Version 5 of IE/Macintosh.

If a script modifies a property, the `onPropertyChange` event handler fires, and the string name of the property is stuffed into the `event.propertyName` property. If the property happens to be a property of the `style` object associated with the element, the `propertyName` is the full property reference, as in `style.backgroundColor`.

Example

See Listing 15-46 in the section about the `onPropertyChange` event handler for an example of the values returned by this property.

Related Items: `onPropertyChange` event handler (Chapter 15).

repeat

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `repeat` property reveals for `onKeyDown` events only whether the key is in repeat mode (as determined by the Keyboard control panel settings in the system). With this information, you can prevent the automatic triggering of repeat mode from causing multiple characters from being recognized by the browser. This property can come in handy if users may be physically challenged and may occasionally and accidentally hold down a key too long. The following script fragment in an `onKeyDown` event handler for a text box or TEXTAREA prevents multiple characters from appearing even if the system goes into repeat mode:

```
if (event.repeat) {
    event.returnValue = false
}
```

By disabling the default action while in repeat mode, no further characters reach the text box until repeat mode goes away (meaning, with the press of another key). This property is not available in IE/Mac through Version 5.

Related Items: `onKeyDown` event handler.

returnValue

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

While IE4+ continues to honor the original way of preventing default action for an event handler (that is, having the last statement of the event handler evaluate to `return false`), the IE4+ event model provides a property that lets the cancellation of default action take place entirely within a function invoked by an event handler. By default, the `returnValue` property of the `event` object is `true`, meaning that the element processes the event after the scripted handler completes its job, just as if the script weren't there. Normal processing, for example, is displaying a typed character, navigating to a link's HREF URL upon being clicked, or submitting a form after the Submit button is clicked.

But you don't always want the default action to occur. For example, consider a text box that is supposed to allow only numbers be typed in it. The `onKeyPress` event handler can invoke a function that inspects each typed character. If the character is not a numeric character, then it should not reach the text box for display. The following validation function may be invoked from the `onKeyPress` event handler of just such a text box:

```
function checkIt() {
    var charCode = event.keyCode
    if (charCode < 48 || charCode > 57) {
        alert("Please make sure entries are numerals only.")
        event.returnValue = false
    }
}
```

By using this event handler, the errant character won't appear in the text box.

Note that this property is not a substitute for the `return` statement of a function. If you need a value to be returned to the invoking statement, you can use a `return` statement in addition to setting the `event.returnValue` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `return` statement (Chapter 41).

saveType

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

The `saveType` property is assigned a value only when an `oncontentsave` event is bound to an IE/Windows DHTML behavior (.htc). For more information about behaviors, see

```
http://msdn.microsoft.com/workshop/author/behaviors/overview.asp
```

Related Items: `addBehavior()` method.

srcElement

Value: Element Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `srcElement` property is a reference to the HTML element object that is the original target of the event. Because an event may bubble up through the element containment hierarchy and be processed at any level along the way, having a property that points back to the element from which the event originated is comforting. After you have a reference to that element, you can read or write any properties that belong to that element or invoke any of its methods.

On the CD-ROM

Example (with Listing 29-17) on the CD-ROM

Related Items: `fromElement`, `toElement` properties.

srcFilter

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

According to Microsoft, the `srcFilter` property should return a string of the name of the filter that was applied to trigger an `onFilterChange` event handler. While the property exists in the `event` object, its value is always `null`, at least through IE5.5. This property, because it is filter related, is a Windows-only property.

Related Items: `onFilterChange` event handler; `style.filter` object.

srcUrn

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

If an event is fired in an IE/Windows behavior attached to an element, and the behavior has a URN identifier defined for it, the `srcUrn` property returns the string from the URN identifier. For more information about behaviors, see

`http://msdn.microsoft.com/workshop/author/behaviors/overview.asp`

Related Items: `addBehavior()` method.

toElement

See `fromElement`.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

You can find out what kind of event fired to create the current `event` object by way of the `type` property. The value is a string version of the event name — just the name of the event without the "on" prefix that is normally associated with event names in IE. This property can be helpful when you designate one event handler function to process different kinds of events. For example, both the `onMouseDown` and `onClick` event handlers for an object can invoke one function. Inside the function, a branch is written for whether the type comes in as `mousedown` or `click`, with different processing for each event type. That is not to endorse such event handler function sharing, but for you to be aware of this power should your script constructions find the property helpful.

This property and its values are fully compatible with the NN4 and NN6 event models.

On the CD-ROM

Example on the CD-ROM

Related Items: All event handlers (Chapter 15).

NN6+ event Object

Properties	*Methods*	*Event Handlers*
`altKey`	`preventDefault()`	
`bubbles`	`stopPropagation()`	
`button`		

Properties	***Methods***	***Event Handlers***
`cancelBubble`		
`cancelable`		
`charCode`		
`clientX`		
`clientY`		
`ctrlKey`		
`currentTarget`		
`detail`		
`eventPhase`		
`isChar`		
`keyCode`		
`layerX`		
`layerY`		
`metaKey`		
`pageX`		
`pageY`		
`relatedTarget`		
`screenX`		
`screenY`		
`shiftKey`		
`target`		
`timeStamp`		
`type`		
`view`		

Syntax

Accessing NN6+ event object properties and methods:

eventObject.property | *method*([*parameters*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

About this object

Although it is based largely on the event object as defined by the W3C DOM Level 2, the NN6+ event object also carries forward several characteristics from the NN4 event object. A few properties are continued primarily for backward compatibility. But because development for NN6 will likely forego the peculiarities of the NN4 DOM and event models, you should ignore these items (as highlighted below). Wherever possible, look forward and embrace the W3C DOM aspects of the event model.

While the NN6 event model provides a bubbling event propagation model just as IE4+, the incompatibility of referencing event objects between the event models is still there. In NN6 (as in NN4), an event object is explicitly passed as a parameter to event handler (or, rather, event listener) functions. But after you have a browser-specific event object assigned to a variable inside a function, a few important properties have the same names between the IE4+ and NN6+ event models. If Microsoft adopts more of the W3C DOM event model in future versions of IE, the compatibility situation should improve.

The event object discussed in this section is the instance of an event that is created as the result of a user or system event action. The NN6 DOM includes an additional static `Event` object. Many of the properties of the static `Event` object are inherited by the event instances, so the detailed coverage of those shared properties is in this section because it is the event object you'll be scripting for the most part.

In many code fragments in the following detail sections, you will see references that begin with the `evt` reference. This assumes that the statement(s) resides inside a function that has assigned the incoming event object to the `evt` parameter variable:

```
function myFunction(evt) {...}
```

As shown earlier in this chapter, you can equalize NN6 and IE4+ event object references when it is practical to do so because the scripts work on identical (or similar) event object properties.

Properties

altKey
ctrlKey
metaKey
shiftKey

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

When an event object is created in response to a user or system action, these four properties are set based on whether their corresponding keys were being held down at the time — a Shift-click, for example. If the key was held down, the property is assigned a value of `true`; otherwise the value is `false`. The `metaKey` property corresponds to the Command key on the Macintosh keyboard but does not register for the Windows key on Wintel computers.

Most commonly, you use expressions consisting of this property as `if` construction condition statements. Because these are Boolean values, you can combine multiple properties in a single condition. For example, if you have a branch of a function that is to execute only if the event occurred with both the Shift and Control keys held down, the condition looks as the following:

```
if (evt.shiftKey && evt.ctrlKey) {
    // statements to execute
}
```

Conversely, you can take a more user-friendly approach to provide special processing if the user holds down any one of the four modifier keys:

```
if (evt.shiftKey || evt.ctrlKey || evt.metaKey || evt.altKey) {
    // statements to execute
}
```

The rationale behind this approach is to offer perhaps some shortcut operation for users, but not force them to memorize a specific modifier key combination.

Example

See Listing 29-10, where the values of these properties are used to set the `checked` properties of corresponding checkboxes for a variety of event types.

Related Items: None.

bubbles

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Not every event bubbles. For example, an `onsubmit` event propagates no further than the form object with which the event is associated. Events that do not bubble have their event object's `bubbles` property set to `false`; all others have the property set to `true`. You use this property in the rare circumstances of a single event handler function processing a wide variety of events. You may want to perform special operations only on events that can bubble and handle the others without special treatment. For this branch, you can use the property in an `if` condition statement:

```
if (evt.bubbles) {
    // special processing for bubble-able events
}
```

You do not have to branch, however, just to cancel bubbling. A non-propagating event doesn't mind if you tell it not to propagate.

Related Items: cancelBubble property.

button

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The button property reveals the button that was pressed to activate the mouse event. The left (primary) button returns a value of 1. If the mouse is a three-button mouse, the middle button returns 2. The right button (on any multi-button mouse) returns a value of 3. Note that these values differ from those stated in the W3C DOM (0, 1, and 2, respectively), but these values are backward-compatible with the NN4 which property.

Mouse buttons other than the primary one are easier to look for in mousedown or mouseup events, rather than onclick events. In the case of a user pressing multiple buttons, only the most recent button is registered.

Exercise caution when scripting the button property for both IE4+ and NN6+. The respective event models define different button values for mouse buttons.

Example

See Listing 29-11, where the button property is revealed in the statusbar. Try pressing individual mouse buttons on, say, the screen button.

Related Items: None.

cancelBubble

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The cancelBubble property is a rare instance of an IE4+ event property being implemented in NN6 even though the property is not defined in the W3C DOM. The property operates the same as in IE4+ in that it determines whether the current event object bubbles up any higher in the element containment hierarchy of the document. By default, this property is false, meaning that if the event is supposed to bubble, then it will do so automatically.

To prevent event bubbling for the current event, set the property to true anywhere within the event handler function. As an alternative, you can cancel bubbling directly in an element's event handler attribute, as in the following:

```
onClick="doButtonClick(this); event.cancelBubble = true"
```

Cancelling event bubbling works only for the current event. The very next event to fire will have bubbling enabled (provided the event bubbles).

If you are trying to migrate your code as much as possible to the W3C DOM, then use the `stopPropagation()` method instead of `cancelBubble`. For cross-browser compatibility, however, `cancelBubble` is a safe bet.

Example

See Listing 29-6 to see the `cancelBubble` property in action in an IE environment. Even though that listing has some features that apply to IE5.5+, the bubble cancelling demonstration works all the way back to IE4.

Related Items: `stopPropagation()` method.

cancelable

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

If an event is cancelable, then its default action can be prevented from occurring with the help of a script. While most events are cancelable, some are not. The cancelable property lets you inquire about a particular event object to see if its event type is `cancelable`. Values for the property are Booleans. You may want to perform special operations only on events that are cancelable, and handle the others without special treatment. For this branch, you can use the property in an `if` condition statement:

```
if (evt.cancelable) {
    // special processing for cancelable events
}
```

You do not have to branch, however, just to prevent an event's default action. A non-cancelable event doesn't mind if you tell it to prevent the default action.

Related Items: `preventDefault()` method.

charCode
keyCode

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 event object model clearly distinguishes between the Unicode character attached to the alphanumeric keys of the keyboard and the code attached to each of the keyboard (regardless of its character). To inspect the character of a key, use the `onKeyPress` event to create the `event` object, and then look at the `event` object's `charCode` property. This is the property that returns 97 for "a" and 65 for "A" because it's concerned with the character associated with the key action. This property's value is zero for `onKeyDown` and `onKeyUp` events.

In contrast, the `keyCode` property is filled with a non-zero value only from `onKeyDown` and `onKeyUp` events (`onKeyPress` sets the property to zero) when alphanumeric keys are pressed; for most other non-character keys, all three events fill the `keyCode` property. Through this property you can look for non-character keys, such as arrows, page navigation, and function keys. For the character keys, there is no distinction between uppercase or lowercase: The "A" key on the Latin keyboard returns a value of 65, regardless of the state of the Shift key. At the same time, however, the press of the Shift key fires its own `onKeyDown` and `onKeyUp` events, setting the `keyCode` value to 16. Other non-character keys — arrows, page navigation, function, and similar — have their own codes as well. This gets very detailed, including special key codes for the numeric keyboard keys that are different from their corresponding numbers along the top row of the alphanumeric keyboard.

Be sure to see the extensive section on keyboard events in Chapter 15 for examples of how to apply the `keyCode` property in applications.

On the CD-ROM

Example (with Listing 29-18) on the CD-ROM

Related Items: `onKeyDown`, `onKeyPress`, `onKeyUp` event handlers.

clientX
clientY
layerX
layerY
pageX
pageY
screenX
screenY

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 event object borrows mouse coordinate properties from both the NN4 and IE4+ event models. If you have worked with event coordinates in these other browsers, then you have nothing new to learn for NN6.

Like the IE4+ event object, the NN6 event object's `clientX` and `clientY` properties are the coordinates within the viewable content region of the window. These values are relative to the window space, not the document. But unlike IE4+, you don't have to calculate the position of the coordinates within the document because another pair of properties, `pageX` and `pageY`, provide that information automatically. If the page has not scrolled, then the values of the client and page coordinates are the same. Because it is usually more important to know an event's coordinates with respect to the document than the window, the `pageX` and `pageY` properties are used most often.

Another property pair, `layerX` and `layerY`, borrow terminology from the now defunct layer schemes of NN4, but the properties can still be quite valuable nonetheless. These coordinates are measured relative to the positioning context of the element that received the event. For regular, unpositioned elements in the BODY part of a document, that positioning context is the BODY element. Thus, for those elements, the values of the page and layer coordinates will be the same. But if you create a positioned element, the coordinate space is measured from the top-left corner of that space. Thus, if you are using the coordinates to assist in scripted dragging of positioned elements, you can confine your scope to just the positioned element.

One coordinate system missing from the NN6 repertoire is that of the target element itself (comparable to the `offsetX` and `offsetY` properties of IE4+). These values, however, can be calculated by subtracting from the page coordinate properties the `offsetLeft` and `offsetTop` properties of both the target element and its positioning context. For example, if you want to get the coordinates of a mouse event inside an image, the event handler can calculate those values as follows:

```
var clickOffsetX = evt.pageX - evt.target.offsetLeft - document.body.offsetLeft
var clickOffsetY = evt.pageY - evt.target.offsetTop - document.body.offsetTop
```

The last set of coordinate properties, `screenX` and `screenY`, provide values relative to the entire video display. Of all these properties, only the client and screen coordinates are defined in the W3C DOM Level 2 standard.

Keep in mind that in NN6, event targets include text nodes inside elements. Because nodes do not have all the properties of elements (for example, they have no offset properties signifying their location in the document), you may sometimes have to go to the target node's parent node to get an element object whose offset properties provide the necessary page geography. This matters, of course, only if your scripts need concern themselves with mouse events on text.

On the CD-ROM

Example (with Listing 29-19) on the CD-ROM

Related Items: `target` property.

currentTarget

Value: Element Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

As an event courses its way through its propagation paths, an event listener may process that event along the way. While the event knows what the target is, it can also be helpful for the event listener function to know which element's event listener is now processing the event. The `currentTarget` property provides a reference to the element object whose event listener is processing the event. This allows one listener function to potentially process the event from different levels, branching the code to accommodate different element levels that process the event.

A valuable companion piece of information about the event is the `eventPhase` property, which helps your event listener function determine if the event is in capture mode, bubble mode, or is at the target. This property is demonstrated in the next section.

On the CD-ROM

Example (with Listing 29-20) on the CD-ROM

Related Items: `eventPhase` property.

detail

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `detail` property is included in the W3C DOM specification as an extra property whose purpose can be determined by the browser maker. In theory, this integer property value can convey additional information about the event. While the property is present in the NN6 event object (and returns values for some events), it contains no additional data about events, but may in the future.

Related Items: None.

eventPhase

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

An event fires in one of three possible event phases: event capture, at the target, or bubbling. Because the same event listener function may be processing an event in multiple phases, it can inspect the value of the `eventPhase` property of the event object to see in which phase the event was when the function was invoked. Values for this property are integers `1` (capture), `2` (at target), or `3` (bubbling).

On the CD-ROM

Example on the CD-ROM

Related Items: `currentTarget` property.

isChar

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

You can find out from each keyboard event whether the key being pressed is a character key by examining the `isChar` property. Most typically, however, you are already filtering for character or non-character keys by virtue of the event handlers used to capture keyboard actions: `onKeyPress` for character keys; `onKeyDown` or `onKeyUp` for non-character keys. Be aware that the `isChar` property returns inconsistent values (even for the same key) in the first release of NN6.

Related Items: `charCode`, `keyCode` properties.

relatedTarget

Value: Element Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `relatedTarget` property allows an element to uncover where the cursor rolled in from or has rolled out to. This property extends the power of the `onMouseOver` and `onMouseOut` event handlers by expanding their scope to outside the current element (usually to an adjacent element). This one property in NN6 does the same duty as the `fromElement` and `toElement` properties of the IE4+ `event` object.

When the `onMouseOver` event fires on an element, the cursor had to be over some other element just beforehand. The `relatedTarget` property holds a reference to that element. Conversely, when the `onMouseOut` event fires, the cursor is already over some other element. The `relatedTarget` property holds a reference to that element.

Example (with Listing 29-21) on the CD-ROM

Related Items: `target` property.

target

Value: Element Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `target` property is a reference to the HTML element object that is the original target of the event. Because an event may trickle down and bubble up through the element containment hierarchy and be processed at any level along the way, having a property that points back to the element from which the event originated is comforting. As soon as you have a reference to that element, you can read or write any properties that belong to that element or invoke any of its methods.

Example (with Listing 29-22) on the CD-ROM

Related Items: `relatedTarget` property.

timeStamp

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Each event receives a time stamp in milliseconds, based on the same date epoch as the Date object (1 January 1970). Just as with the `Date` object, accuracy is wholly dependent on the accuracy of the system clock of the client computer.

While the precise time of an event may be of value in only some situations, the time between events can be useful for applications, such as timed exercises or action games. You can preserve the time of the most recent event in a global variable, and compare the time of the current time stamp against the stored value to determine the elapsed time between events.

On the CD-ROM

Example (with Listing 29-23) on the CD-ROM

Related Items: `Date` object.

`type`

Value: String — Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

You can find out what kind of event fired to create the current event object by way of the `type` property. The value is a string version of the event name — just the name of the event without the "on" prefix that is normally associated with event listener names in NN6. This property can be helpful when you designate one event handler function to process different kinds of events. For example, both the `onMouseDown` and `onClick` event listeners for an object can invoke one function. Inside the function, a branch is written for whether the type comes in as `mousedown` or `click`, with different processing for each event type. That is not to endorse such event handler function sharing, but be aware of this power should your script constructions find the property helpful.

This property and its values are fully compatible with the NN4 and IE4+ event models.

Related Items: All event handlers (Chapter 15).

`view`

Value: Window Object Reference — Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The closest that the W3C DOM Level 2 specification comes to acknowledging the browser window is an abstract object called an *abstract view* (AbstractView class). The object's only property is a reference to the document that it contains — the root document node that you've come to know and love. User events always occur within the confines of one of these views, and this is reflected in the `event` object's view property. NN6 returns a reference to the window object (which can be a frame) in which the event occurs. This reference allows an event object to be passed to scripts in other frames and those scripts can then gain access to the document object of the target element's window.

Related Items: window object.

Methods

preventDefault()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

While NN6+ continues to honor the original way of preventing default action for an event handler (that is, having the last statement of the event handler evaluate to return false), the NN6+ event model provides a method that lets the cancellation of default action take place entirely within a function invoked by an event handler. For example, consider a text box that is supposed to allow only numbers be typed in it. The onKeyPress event handler can invoke a function that inspects each typed character. If the character is not a numeric character, then it does not reach the text box for display. The following validation function may be invoked from the onKeyPress event handler of just such a text box:

```
function checkIt(evt) {
    var charCode = evt.charCode
    if (charCode < 48 || charCode > 57) {
        alert("Please make sure entries are numbers only.")
        evt.preventDefault()
    }
}
```

This way, the errant character won't appear in the text box.

Invoking the preventDefault() method in NN6 is the equivalent of assigning true to event.returnValue in IE5+.

Related Items: cancelable property.

stopPropagation()

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Use the `stopPropagation()` method to stop events from trickling down or bubbling up further through the element containment hierarchy. A statement in the event listener function that invokes

```
evt.stopPropagation()
```

is all that is needed. As an alternative, you can cancel bubbling directly in an element's event handler attribute, as in the following:

```
onClick="doButtonClick(this); event.stopPropagation()"
```

If you are writing cross-browser scripts, you also have the option of using the `cancelBubble` property, which is compatible with IE4+.

Related Items: `bubbles`, `cancelBubble` properties.

✦ ✦ ✦

30 CHAPTER

Style Sheet and Style Objects

✦ ✦ ✦ ✦

In This Chapter

Managing style sheets by script

Changing element styles on the fly

Distinguishing among STYLE, styleSheet, and style objects

✦ ✦ ✦ ✦

Version 4 browsers were the first to offer full-scale support for the concept of style sheets (although IE3 offered limited style sheet support). Style sheets promote a concept that makes excellent sense in the fast-paced, high-volume content creation environment that is today's World Wide Web: separating content from the rendering details of the content. Textual content may come from any number of electronic sources, but it may need to be dropped into different contexts — just like an online news feed that becomes amalgamated into dozens of Web portal sites, each with its own look and feel. All the content cares about is the text and its meaning; the Web page designer then decides how that content should be rendered on the page.

The concept has other advantages. Consider the large corporate Web site that wants to promote its identity through a distinct style. A family of style sheets can dictate the font face, font size, the look of emphasized text, and the margin width of all body text. To apply these styles on an element-by-element basis would not only be a tedious page authoring task, it is fraught with peril. If the style is omitted from the tags of one page, the uniformity of the look is destroyed. Worse yet, if the corporate design changes to use a different font face, the task of changing every style in every tag — even with a highly powered search-and-replace operation — is risky. But if a single external style sheet file dictates the styles, then the designer need make only one change in that one file to cause the new look to ripple ("cascade") through the entire Web site.

Learning how to create and apply style sheets is beyond the scope of this book, and this chapter assumes you already are familiar with style sheet terminology, such as a style sheet rule and a selector. If these terms are not in your vocabulary, you can find numerous tutorials on the subject both online and in books. Although IE and NN browsers adhere fairly closely to W3C standards for style sheets (called Cascading Style Sheets, or CSS for short), you should learn from an independent source. Microsoft, in particular, includes some extras in the style sheet vocabulary that work only on IE4+ for Windows. Unless that is your single target browser brand and client operating system, learning the common denominator of style sheet features is the right way to go. Details in this chapter cover all versions, so pay close attention to compatibility listings for each item.

One last compatibility note: While NN4 implements a fair amount of CSS, it does not expose style sheets or style rules to the object model. Part of this is linked to the static nature of an NN4 page. Because modifying a style may alter the physical layout of body elements, and because that browser does not reflow the page in response to such changes, altering styles of content that is already loaded is simply not possible. In NN6, however, the page reflows, and everything relating to styles is exposed to the scriptable object model.

Making Sense of the Object Names

The first task in this chapter is to clarify the seemingly overlapping terminology for the style sheet-related objects that you will be scripting. Some objects are more abstract than others, but they are all important. The objects in question are

- STYLE element object
- styleSheet object (a member of the `styleSheets` array)
- rule or cssRule object (a member of the `rules` or `cssRules` array)
- `style` object

A STYLE element object is the object that represents the `<STYLE>` tag in your document. Most of its properties are inherited from the basic HTML element objects you see detailed in Chapter 15. While the STYLE element object has a `disabled` property, by and large, you won't be accessing style sheets via the STYLE element object.

A style sheet can be embedded in a document via the `<STYLE>` tag or it may be linked in via a `<LINK>` tag. One property of the `document` object, the `styleSheets` property, returns an array (collection) of all styleSheet objects that are currently "visible" to the document, whether or not they are disabled. Even though the `<STYLE>` tag, for example, contains lines of code that make up the rules for a style sheet, the STYLE element object is not the path to reach the individual rules. The styleSheet object is. It is through the styleSheet object that you can enable or disable an entire sheet, access individual rules (via the `rules` or `cssRules` property array), and add or delete rules for that style sheet.

The meat of any style sheet is the rules that define how elements are to be rendered. At this object level, the terminology forks for IE4+ and NN6. The IE4+ object model calls each style sheet rule a rule object; NN6, adhering to the W3C DOM Level 2 standard, calls each rule a cssRule object. IE5 for the Macintosh supports both references to the same object. Despite the incompatible object names, the two objects share key property names. Assembling a reference to a rule requires array references. For example, the reference to the first rule of the first styleSheet object in the document is as follows for the two browsers:

```
var oneRule = document.styleSheets[0].rules[0]       // IE4+
var oneRule = document.styleSheets[0].cssRules[0]    // IE5/Mac, NN6+
```

The last object of this quartet of style-related objects is the `style` object. This object is the motherlode, where actual style definitions take place. In earlier chapters, you have seen countless examples of modifying one or more `style` properties of an element. Most typically, this modification is accomplished through the `style` property of the HTML element. For example, you would set the font color of a SPAN element whose ID is "hot" as follows:

```
document.all.hot.style.color = "red"                    // IE4+
document.getElementById("hot").style.color = "red"    // IE5+, NN6+
```

The `style` object is also a property of a `rule/cssRule` object. Thus, if you need to modify the style of elements affected by an existing style sheet rule, you approach the `style` object through a different reference path, but the `style` object is treated just as it is for elements:

```
document.styleSheets[0].rules[0].style.color = "red"       // IE4+
document.styleSheets[0].cssRules[0].style.color = "red"    // IE5/Mac, NN6+
```

Many scripters concern themselves solely with the `style` object, and at that, a `style` object associated with a particular element object. Rare are instances that require manipulation of styleSheet objects beyond perhaps enabling and disabling them under script control. Therefore, if you are learning about these objects for the first time, pay closest attention to the `style` object details rather than to the other related objects.

Imported Style Sheets

Style sheets embedded in a document via the STYLE element can import additional style sheets via the `@import` selector:

```
<STYLE TYPE="text/css">
@import url(externalStyle.css);
P {font-size:16pt}
</STYLE>
```

In this example scenario, the document sees just one `styleSheet` object. But that object has a style sheet nested inside — the style sheet defined by the external file. IE4+ calls one of these imported styles sheets an `import` object. An `import` object has all the properties of any styleSheet object, but its `parentStyle` property is a reference to the styleSheet that "owns" the `@import` rule. In fact, the `@import` statement does not even appear among the rules collection of the IE styleSheet object. Therefore, to access the first rule of the imported style sheet, the reference is as the following:

```
document.styleSheets[0].imports[0].rules[0]
```

The W3C DOM and NN6 treat `import` rule objects differently from the IE model. To the W3C DOM, even an at-rule is considered one of the `cssRules` collection of a styleSheet object. One of the properties of a cssRule object is `type`, which conveys an integer code value revealing whether the rule is a plain CSS rule or one of several other types, including an `import` rule. Of course, an imported rule object then has as one of its properties the styleSheet object that, in turn, contains the rules defined in the external style sheet file. The parent-child relationship exists here, as well, whereby the styleSheet that contains the `@import` rule is referenced by the imported styleSheet object's `parentStyle` property (just as in IE4+).

Reading Style Properties

Both the IE4+ and NN6 (W3C) object models exhibit a behavior that at first glance may seem disconcerting. On the one hand, the W3C and good HTML practice encourage defining styles remotely (that is, embedded via `<STYLE>` or `<LINK>` tags) rather than as values assigned to the `STYLE` attribute of individual element tags throughout the document. This more closely adheres to the notion of separating style from content.

On the other hand, object models can be very literal beasts. Strictly speaking, if an element object presents a scriptable property that reflects an attribute for that element's tag, the first time a script tries to read that property, a value will be associated with that property *only* if the attribute is explicitly assigned in the HTML code. But if you assign style sheet settings via remote style sheets, the values are not explicitly set in the tag. Therefore, the `style` property of such an element comes up empty, even though the element is under the stylistic control of the remote style sheet. If all you want to do is assign a new value to a `style` property, that's not a problem, because your assignment to the element object's `style` property overrides whatever style is assigned to that property in the remote style sheet (and then that new value is subsequently readable from the `style` property). But if you want to see what the current setting is, the initial value won't be in the element's `style` object.

To the rescue, in IE5+ anyway, comes an extra, read-only property—`currentStyle`—that reveals the style sheet values that are currently being applied to the element, regardless of where the style sheet definitions are. The `currentStyle` property returns an object that is in the same format and has the same properties as the regular `style` property. If your audience runs browsers no earlier than IE5, then you should make a habit of reading styles for an element via its `currentStyle` property. If you want a change to a `style` object's property to apply to only one element, then use the element's `style` property to set that value; but if the change is to apply to all elements covered by the same remote style sheet rule, then modify the `style` property of the rule object.

STYLE Element Object

See Chapter 15 for items shared by all HTML elements.

Properties	Methods	Event Handlers
`media`		
`type`		

Syntax

Accessing STYLE element object properties and methods:

```
(IE4+)        document.all.objectID.property | method([parameters])
(IE5+/NN6)    document.getElementById(objectID).property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

The STYLE element is among the classification of HTML directive elements (see Chapter 20) in that it goes in the HEAD portion of a document and does not have any of its own content rendered in the page. But the contents obviously have a great amount of control over the rendering of other elements. Most of the properties, methods, and event handlers that the STYLE element inherits from all HTML elements are irrelevant.

One exception is the Boolean `disabled` property. Although there are additional ways to disable a style sheet (the `disabled` property of the styleSheet object), it may be easier to disable or enable a style sheet by way of the STYLE element object. Because you can assign an ID to this element and reference it explicitly, doing so may be more convenient than trying to identify which styleSheet object among the document's `styleSheets` collection you intend to enable or disable.

Properties

media

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `media` property represents the `MEDIA` attribute of a STYLE element. This attribute can define what kind of output device is governed by the style sheet. The HTML 4.0 specification has lofty goals for this attribute, but at best, computer browsers are limited to the following values: `screen`, `print`, and `all`. Thus, you can design one set of styles to apply when the page is viewed on the computer screen and a different set for when it's printed.

type

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The type property represents the TYPE attribute of the STYLE element. For CSS style sheets, this property is always set to text/css. If your scripts assign some other value to this property and the browser does not support that style sheet type, the style sheet no longer functions as a CSS style sheet, and any styles it controls revert to their default styles.

styleSheet Object

Properties	Methods	Event Handlers
cssRules	addImport()	
cssText	addRule()	
disabled	deleteRule()	
href	insertRule()	
id	removeRule()	
imports		
media		
ownerNode		
ownerRule		
owningElement		
pages		
parentStyleSheet		
readOnly		
rules		
title		
type		

Syntax

Accessing styleSheet object properties and methods:

(IE4+/NN6) document.styleSheets[*index*].*property* | *method*([*parameters*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

About this object

If the STYLE element object is the concrete incarnation of a style sheet, then the styleSheet object is its abstract equivalent. A styleSheet object exists by virtue of a style sheet definition being embedded in the current document either by way of the `<STYLE>` tag or linked in from an external file via the `<LINK>` tag. Each element that introduces a style sheet into a document creates a separate styleSheet object. Access to a styleSheet object is via the `document.styleSheets` array. If the document contains no style sheet definitions, then the array has a length of zero. Styles that are introduced into a document by way of an element's `STYLE` attribute are not considered styleSheet objects.

Although both IE4+ and NN6+ present styleSheet objects—and the object represents the same "thing" in both browser families—the set of properties and methods diverges widely between browsers. In many cases, the object provides the same information but through differently named properties in the two families. Interestingly, on some important properties, such as the ones that return the array of style rules and a reference to the HTML element that is responsible for the style sheet's being in the document, IE5+/Mac provides both the Microsoft and W3C terminology. Methods for this object focus on adding rules to and deleting rules from the style sheet. For the most part, however, your use of the styleSheet object will be as a reference gateway to individual rules (via the `rules` or `cssRules` array).

Properties

cssRules

Value: Array of rule objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				(✓)	(✓)

The `cssRules` property returns an array of style sheet rule objects. Strictly speaking, the objects are called cssRule objects in the W3C DOM terminology. This property is implemented in the Mac version of IE5+, but not in the Windows version as of IE5.5. The list of rule objects is in source code order. The corresponding IE4+/Windows property is `rules`.

On the CD-ROM

Example on the CD-ROM

Related Items: `rules` property; `cssRule, rule` objects.

cssText

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `cssText` property contains a string of the style sheet rules contained by the styleSheet object. Parsing this text in search of particular strings is not wise because the text returned by this property can have carriage returns and other formatting that is not obvious from the text that is assigned to the rules in the style sheet. But you can use this property as a way to completely rewrite the rules of a style sheet in a rather brute-force manner: Assemble a string consisting of all the new rules and assign that string to the `cssText` property. The more formal way of modifying rules (adding and removing them) is perhaps better form, but there is no penalty for using the `cssText` property if your audience is strictly IE5+.

Example on the CD-ROM

Related Items: `addRule()`, `deleteRule()`, `insertRule()`, `removeRule()` methods.

disabled

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

While the `disabled` property of the STYLE element object works with that element only, the styleSheet object's `disabled` property works with a styleSheet object that comes into the document by a LINK element as well.

Enabling and disabling style sheets is one way to swap different appearance styles for a page, allowing the user to select the preferred style. The page can contain multiple style sheets that control the same selectors, but your script can enable one and disable another to change the overall style. You can even perform this action via the `onLoad` event handler. For example, if you have separate style sheets for Windows and Mac browsers, you can put both of them in the document, initially both disabled. An `onLoad` event handler determines the operating system and enables the style sheet tailored for that OS. Unless your style sheets are very extensive, there is little download performance penalty for having both style sheets in the document.

Example on the CD-ROM

Related Items: `disabled` property of the STYLE element object.

href

Value: String Read/Write (See Text)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

When a style sheet is linked into a document via a LINK element, the `href` property of the styleSheet object contains a string with the URL to that file. Essentially, the `href` property of the LINK element is passed along to the styleSheet object that loads as a result. In IE4+ for Windows only, this property is read/write, allowing you to dynamically link in an external style sheet file after the page has loaded. In IE/Mac and NN6, this property is read-only.

Related Items: LINK element object.

id

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `id` property of a styleSheet object inherits the `id` property of its containing element (STYLE or LINK element). This can get confusing, because it may appear as though two objects in the document have the same ID. The `id` string, however, can be used as an index to the `document.styleSheets` array in IE4+ (for example, `document.styleSheets["winLINK"]`). NN6 does not provide a comparable identifier associated with a styleSheet object.

Related Items: `id` property of all element objects.

imports

Value: Array of styleSheet Objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

A style sheet can contain one or more `@import` rules to import an external style sheet file into the document. Each imported styleSheet object is treated as an `import` object. The `imports` property is a collection of all imported styleSheet objects that belong to the current styleSheet object. Imported style sheets are not added to the `document.styleSheets` collection, so that references to an imported styleSheet object must be through the `document.styleSheets[i].imports[i]` array.

An `import` object is, itself, a styleSheet object. All properties and methods applicable to a styleSheet object also apply to an `import` object. Therefore, if you want to load a different external style sheet into the page, you can assign the new URL to the imported styleSheet object's `href` property:

```
document.styleSheets[0].imports[0].href = "alternate.css"
```

Modifications of this nature work in IE for Windows, but not in IE/Mac as of Version 5.

Related Items: styleSheet object.

media

Value: See Text Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

CSS style sheets can be defined to apply to specific output media, such as the video display screen, printer, and, in the future, devices such as speech synthesizers or Braille generators. A style sheet gets this direction from the `MEDIA` attribute of a STYLE or LINK element. That value is represented in the `media` property of the styleSheet object.

In IE4+, the `media` property value is a string with one of three possible values: `screen`, `printer`, `all`. The W3C DOM and NN6 take this one step further by allowing for potentially multiple values being assigned to the `MEDIA` attribute. The NN6 value is an array of string media names.

Related Items: None.

ownerNode

Value: Node Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `ownerNode` property is a reference to the document node in which the styleSheet object is defined. For styleSheet objects defined inside STYLE and LINK elements, the `ownerNode` property is a reference to that element. The corresponding property in IE4+ is `owningElement`. Oddly, IE5/Mac has an additional, misnamed property called `owningNode`, whose value equals that of the `owningElement` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `ownerRule, owningElement` property.

ownerRule

Value: cssRule Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `ownerRule` property applies to a styleSheet object that has been imported into a document via the `@import` rule. The property returns a reference to the `@import` rule responsible for loading the external style sheet. There is an interaction between the `ownerRule` and `ownerNode` properties in that an imported rule has an `ownerRule` but its `ownerNode` property is `null`; conversely, a regular styleSheet has an `ownerNode`, but its `ownerRule` property is `null`. Note that NN6 does not expose imported style sheets as objects, so this property is not yet applicable to NN.

Related Items: `ownerNode` property.

owningElement

Value: Element Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `owningElement` property is a reference to the element object in which the styleSheet object is defined. For styleSheet objects defined inside STYLE and LINK elements, the `owningElement` property is a reference to that element. The corresponding property in NN6+ is `ownerNode`. Oddly, IE5/Mac has an additional, misnamed property called `owningNode`, whose value equals that of the `owningElement` property.

On the CD-ROM

Example on the CD-ROM

Related Items: `ownerNode` property.

pages

Value: Array of @page Rules Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

An @page style rule defines the dimensions and margins for printed versions of a Web page. The pages property returns a collection of @page rules contained by the current styleSheet object. If no @page rules are defined in the style sheet, the array has a length of zero.

While an @page rule has the same properties as any rule object, it has one more read-only property, the pseudoClass property, which returns any pseudo-class definitions in the rule. For example, the following @page rules define different rectangle specifications for the left and right printed pages:

```
@page :left {margin-left:4cm; margin-right:3cm;}
@page :right {margin-left:3cm; margin-right:4cm;}
```

Values for the pseudoClass property of these two page rules are :left and :right, respectively.

To the W3C DOM, an @page rule is just another rule object, but one whose type property returns page.

For more information about the paged media specification, see http://www.w3.org/TR/REC-CSS2/page.html.

Related Items: None.

parentStyleSheet

Value: styleSheet Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

An imported style sheet is present thanks to the hosting of a styleSheet object created by a STYLE or LINK element. That host styleSheet object is referenced by the parentStyleSheet property. For most styleSheet objects (that is, those not imported via the @import rule), the parentStyleSheet property is null. Take note of the distinction between the parentStyleSheet property, which points to a styleSheet object, and the various properties that refer to the HTML element that "owns" the styleSheet object.

Related Items: None.

readOnly

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `readOnly` property's name is a bit misleading. Its Boolean value lets your script know whether the current `style sheet` was embedded in the document by way of the STYLE element or brought in from an external file via the LINK element or `@import` rule. When embedded by a STYLE element, the `readOnly` property is `false`; for style sheets defined outside the page, the property is `true`. But a value of `true` doesn't mean that your scripts cannot modify the style properties. Style properties can still be modified on the fly, but of course the changes will not be reflected in the external file from which the initial settings came.

Related Items: `owningElement` property.

rules

Value: Array of `rule` Objects Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `rules` property returns an array of all rule objects (other than `@` rules) defined in the current style sheet. The order of rule objects in the array is based on source code order of the rules defined in the STYLE element or in the external file.

Use the `rules` array as the primary way to reference an individual rule inside a style sheet. If you use a `for` loop to iterate through all rules in search of a particular rule, you will most likely be looking for a match of the rule object's `selectorText` property. This assumes, of course, that each selector is unique within the style sheet. Using unique selectors is good practice, but no restrictions prevent you from reusing a selector name in a style sheet for additional style information applied to the same selector elements.

The corresponding property name for NN6 is `cssRules`. IE5/Mac responds to both the `rules` and `cssRules` properties.

On the CD-ROM

Example on the CD-ROM

Related Items: `rule` object; `cssRules` property.

title

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

If you assign a value to the `TITLE` attribute of a STYLE element or a LINK element that loads a style sheet, that string value filters down to the `title` property of the styleSheet object. You can use the string value as a kind of identifier, but it is not usable as a true identifier that you can use as an index to the `styleSheets` array. In visible HTML elements, the TITLE attribute usually sets the text that displays with the tooltip over the element. But for the unseen STYLE and LINK elements, the attribute has no impact on the rendered display of the page. Therefore, you can use this attribute and corresponding property to convey any string value you want.

Related Items: `title` property of all HTML elements.

type

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `type` property of a styleSheet object picks up the `TYPE` attribute of the STYLE or LINK element that embeds a style sheet into the page. Unless you are experimenting with some new types of style sheet language (assuming it is even supported in the browser), the value of the type property is `text/css`.

Related Items: None.

Methods

addImport("*URL*"[, *index*])

Returns: Integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `addImport()` method lets you add an `@import` rule to a styleSheet object. A required first parameter is the URL of the external `.css` file that contains one or more style sheet rules. If you omit the second parameter, the `@import` rule is appended to the end of rules in the styleSheet object. Or you can specify an integer as the index of the position within the rules collection where the rule should be inserted. The order of rules in a styleSheet object can influence the cascading order of overlapping style sheet rules (that is, multiple rules that apply to the same elements).

The value returned by the method is an integer representing the index position of the new rule within the rules collection of the styleSheet. If you need subsequent access to the new rule, you can preserve the value returned by the `addImport()` method and use it as the index to the `rules` collection.

Related Items: `addRule()` method.

addRule("*selector*", "*styleSpec*"[, *index*])
removeRule(*index*)

Returns: Integer (for `addRule()`).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `addRule()` method appends or inserts a style sheet rule into the current styleSheet object. The first two parameters are strings for the two components of every rule: the selector and the style specification. Any valid selector, including multiple, space-delimited selectors, is permitted. For the style specification, the string should contain the semicolon-delimited list of style *`attribute`*`:`*`value`* pairs, but without the curly braces that surround the specification in a regular style sheet rule.

If you omit the last parameter, the rule is appended to the end of the `rules` collection for the style sheet. Or, you can specify an integer index value signifying the position within the `rules` collection where the new rule should go. The order of rules in a styleSheet object can influence the cascading order of overlapping style sheet rules (meaning multiple rules that apply to the same elements).

The return value conveys no meaningful information.

To remove a rule from a styleSheet object's `rules` collection, invoke the `removeRule()` method. Exercise some care here, because you must have the correct index value for the rule that you want to remove. Your script can use a `for` loop to iterate through the rules collection, looking for a match of the `selectorText` property (assuming that you have unique selectors). The index for the matching rule can then be used as the parameter to `removeRule()`. This method returns no value.

For NN6, the corresponding methods are called `insertRule()` and `deleteRule()`.

On the CD-ROM

Example on the CD-ROM

Related Items: `deleteRule()`, `insertRule()` methods.

deleteRule(*index*)
insertRule("*rule*", *index*)

Returns: Integer (for `insertRule()`).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `insertRule()` method appends or inserts a style sheet rule into the current styleSheet object. The first parameter is a string containing the style rule as it would normally appear in a style sheet, including the selector and curly braces surrounding the semicolon-delimited list of style *`attribute`*`:`*`value`* pairs.

You must supply an index location within the `cssRules` array where the new rule is to be inserted. If you want to append the rule to the end of the list, use the `length` property of the `cssRules` collection for the parameter. The order of rules in a styleSheet object can influence the cascading order of overlapping style sheet rules (meaning multiple rules that apply to the same elements).

The return value is an index for the position of the inserted rule.

To remove a rule from a styleSheet object's `cssRules` collection, invoke the `deleteRule()` method. Exercise some care here, because you must have the correct index value for the rule that you want to remove. Your script could use a `for` loop to iterate through the `cssRules` collection, looking for a match of the `selectorText` property (assuming that you have unique selectors). The index for the matching rule can then be used as the parameter to `deleteRule()`. This method returns no value.

For IE4+, the corresponding methods are called `addRule()` and `removeRule()`.

On the CD-ROM

Example on the CD-ROM

Related Items: `addRule()`, `removeRule()` methods.

cssRule and rule Objects

Properties	***Methods***	***Event Handlers***
`cssText`		
`parentStyleSheet`		
`readOnly`		
`selectorText`		
`style`		
`type`		

Syntax

Accessing rule or cssRule object properties:

```
(IE4+)          document.styleSheets[index].rules[index].property
(IE5-Mac/NN6+)  document.styleSheets[index].cssRules[index].property
```

About these objects

The rule and cssRule objects are different object model names for the same objects. For IE4+, the object is known as a *rule* (and a collection of them the `rules` collection); for NN6 (and IE5/Mac), the object follows the W3C DOM recommendation, calling the object a *cssRule* (and a collection of them the `cssRules` collection). For the remainder of this section, they will be referred to generically as the rule object.

A rule object has two major components. The first is the selector text, which governs which element(s) are to be influenced by the style rule. The second component is the style definition, with its set of semicolon-delimited *`attribute`*:*`value`* pairs. In both the IE4+ and NN6 object models, the style definition is treated as an object: the `style` object, which has tons of properties representing the style attributes available in the browser. The `style` object that belongs to a rule object is precisely the same `style` object that is associated with every HTML element object. Accessing `style` properties of a style sheet rule requires a fairly long reference, as in

```
document.styleSheets[0].rules[0].style.color = "red"
```

but the format follows the logic of JavaScript's dot-syntax to the letter.

Properties

cssText

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				(✓)	

The `cssText` property returns the full text of the current cssRule object. This property is available in NN6 and IE5/Macintosh. While the text returned from this property can be parsed to locate particular strings, it is easier and more reliable to access individual style properties and their values via the `style` property of a cssRule object.

Related Items: `style` property.

parentStyleSheet

Value: styleSheet Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				(✓)	

The `parentStyleSheet` property is a reference to the styleSheet object that contains the current cssRule object. This property is available in NN6 and IE5/Macintosh. The return value is a reference to a styleSheet object, from which scripts can read and write properties related to the entire style sheet.

Related Items: `parentRule` property.

readOnly

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `readOnly` property's name is a bit misleading. Its Boolean value lets your script know whether the current rule's styleSheet was embedded in the document by way of the STYLE element or brought in from an external file via the LINK element or `@import` rule. When embedded by a STYLE element, the `readOnly` property is false; for style sheets defined outside the page, the property is `true`. But a value of `true` doesn't mean that your scripts cannot modify the style properties. Style properties can still be modified on the fly, but of course the changes are not reflected in the external file from which the initial settings came.

Related Items: `styleSheet.readOnly` property.

selectorText

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `selectorText` property returns only the selector portion of a style sheet rule. The value is a string, and if the selector contains multiple, space-delimited items, the `selectorText` value returns the same space-delimited string. For selectors that are applied to classes (preceded by a period) or ids (preceded by a crosshatch), those leading characters are returned as part of the string as well.

If you want to change the selector for a rule, removing the original rule and adding a new one in its place is better. You can always preserve the `style` property of the original rule and assign the style to the new rule.

On the CD-ROM

Example on the CD-ROM

Related Items: `style` property.

style

Value: `style` Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `style` property of a rule (or cssRule) is, itself, an object whose properties consist of the CSS style attributes supported by the browser. Modifying a property of the `style` object requires a fairly long reference, as in

```
document.styleSheets[0].rules[0].style.color = "red"
```

Any change you make to the rule's `style` properties is reflected in the rendered style of whatever elements are denoted by the rule's selector. If you want to change the style of just one element, then access the `style` property of just that element. Style values applied directly to an element override whatever style sheet style values are associated with the element.

On the CD-ROM

Example on the CD-ROM

Related Items: `style` object.

type

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The W3C DOM defines several classes of style sheet rules. To make it easier for a script to identify the kind of cssRule it is working with, the `type` property returns an integer whose value is associated with one of the known cssRule types. While not all of these rule types may be implemented in NN6, the complete W3C DOM list is as follows:

Type	Description
0	Unknown type
1	Regular style rule
2	@charset rule
3	@import rule
4	@media rule
5	@font-face rule
6	@page rule

Most of the style sheet rules you work with are type 1. To learn more about these rule types, consult the W3C specification for CSS at `http://www.w3.org/TR/REC-CSS2`.

Related Items: None.

currentStyle, runtimeStyle, and style Objects

Properties	Methods	Event Handlers
(See below)		

Syntax

Accessing `currentStyle`, `runtimeStyle`, or `style` object properties:

```
(IE4+/NN6)        elementReference.style.property
(IE4+/NN6)        document.styleSheets[index].style.property
(IE5+)            elementReference.currentStyle.property
(IE5.5)           elementReference.runtimeStyle.property
```

About these objects

All three of these objects — `currentStyle`, `runtimeStyle`, and `style` — return an object that contains dozens of properties related to style sheet specifications associated either with a styleSheet object (for the `style` object only) or any rendered HTML element object. With the browser page reflow facilities of IE4+ and NN6+, changes made to the properties of the `style` and IE-specific `runtimeStyle` objects are reflected immediately by the rendered content on the page.

The primary object, the `style` object, is accessed as a property of either a styleSheet object or an HTML element object. It is vital to remember that style properties of an HTML element are reflected by the `style` object only if the specifications are made via the STYLE attribute inside the element's tag. If your coding style requires that style sheets be applied via STYLE or LINK tags, and if your scripts need to access the `style` property values as set by those style sheets, then you must read the properties through the read-only `currentStyle` property (available in IE5+). The `currentStyle` object returns the effective style sheet being applied to an HTML element object.

IE's `currentStyle` object does not have precisely the same properties as its `style` object. Missing from the `currentStyle` object are the properties that contain combination values, such as `border` or `borderBottom`. On the other hand, `currentStyle` provides separate properties for each of the sides of a clipping rectangle (`clipTop`, `clipRight`, `clipBottom`, and `clipLeft`), which the `clip` property does not provide.

Microsoft introduced one more flavor of style object — the `runtimeStyle` object — in IE5.5. This object lets scripts override any style property that is set in a style sheet or via the `STYLE` attribute. In other words, the `runtimeStyle` object is like a read/write version of `currentStyle` except that assigning a new value to one of its properties does not modify the style sheet definition or the value assigned in a STYLE attribute. By and large, however, your scripts will modify the `style` property of an element to make changes, unless you modify styles by enabling and disabling style sheets (or changing the `className` property of an element so that it is under the control of a different selector).

Style properties

If you add up all the `style` object properties available in browsers starting with IE4 and NN6, you have a list approximately 180 properties long. A sizable percentage are in common among all browsers and are scriptable versions of W3C CSS style sheet attributes. The actual CSS attribute names are frequently script-unfriendly in that multiple-worded attributes have hyphens in them, such as `font-size`. JavaScript identifiers do not allow hyphens, so multiple-worded attributes are converted to interCap versions, such as `fontSize`.

Not all style properties are supported by all browsers that have the `style` object in their object models. Microsoft, in particular, has added many properties that are sometimes unique to IE and sometimes unique to just IE for Windows (or even just to Windows 2000). On the Netscape side, you find some properties that appear to be supported by the `style` object, but the browser doesn't genuinely support the attributes. For example, the CSS specification defines several attributes that enhance the delivery of content that is rendered through a speech synthesizer. While NN6 does not qualify, the Gecko browser engine at the core of NN6 could be adapted to such a browser. Therefore, if you see a property in the following listings that doesn't make sense to you, test it out in the compatible browsers to verify that it works as you need it.

Some browsers also expose advanced `style` object properties to scripters, when, in fact, they are not genuinely supported in the browser. For example, an inspection of the `style` object for IE5/Mac and NN6 shows a `quotes` property, which matches the `quotes` style attribute in the W3C CSS2 specification. But in truth, the `quotes` style property cannot be set by script in these browsers. When you see that a property is supported by IE5/Mac and NN6 but none others, testing out the `style` property (and the style sheet attribute as well) in The Evaluator is a good idea before attempting to employ the property in your application.

With so many properties associated with an object, it may be difficult to locate the specific property you need for a particular style effect. To help you locate properties, the listings that follow are divided into functional categories, ordered by popularity:

Category	*Description*
Text & Fonts	Font specifications, text rendering, text alignment
Inline Display & Layout	Element flow, alignment, and display
Positioning	Explicit positioning of "layers"
Background	Background images and colors
Borders & Edges	Borders, padding, and margins around elements
Lists	Details for UL and OL elements
Scrollbars	Scrollbar colors (IE5.5/Windows only)
Tables	Details for TABLE elements and components
Printing	Page breaks and alignment for printed pages
Miscellaneous	Odds and ends
Aural	For rendering via speech-synthesis

Property values

All `style` object property values are strings. Moreover, many groups of style properties share the same format for their values. Knowing the formats for the frequently used values is helpful. The purpose of this chapter is not to teach you about style sheets but to show you how to script them. Therefore, if you see unfamiliar terminology here, consult online or print instructional material about CSS style sheets.

Length

Values for length cover a wide range, but they all define an amount of physical space in the document. Because content can be displayed on a video monitor or printed on a sheet of paper, any kind of length value should include a unit of measure as well as the quantity. One group of units (`px`, `em`, `ex`) are considered *relative* units, because the precise size depends on factors beyond the control of the style sheet (for example, the pixel density of the display) or units set by elements with more global scope (for example, a P element's margin em length dependent upon the BODY element's font-size setting). *Absolute* units (`in`, `cm`, `mm`, `pi`, `pt`) are more appropriate for printed output. Length units are referred in script according to the following table:

Unit	*Script Version*	*Example*
pixel	`px`	`14px`
em	`em`	`1.5em`
ex	`ex`	`1.5ex`
inch	`in`	`3.0in`
centimeter	`cm`	`4.0cm`
millimeter	`mm`	`40mm`
pica	`pi`	`72pi`
point	`pt`	`14pt`

A length value can also be represented by a percentage as a string. For example, the `lineHeight` style for a paragraph would be set to `120%` of the font size established for the paragraph by the following statement:

```
document.getElementById("myP").style.lineHeight = "120%"
```

Style inheritance — an important CSS concept — often has significant impact on style properties whose values are lengths.

Color

Values for colors can be one of three types:

✦ RGB values (in a few different formats)

✦ plain-language versions of the color names

✦ plain-language names of system user interface items

RGB values can be expressed as hexadecimal values. The most common way is with a crosshatch character followed by six hex numbers, as in `#ff00ff` (letters can be uppercase or lowercase). A special shortcut is also available to let you specify three numbers with the assumption that they will be expanded to pairs of numbers. For example, a color of `#f0f` is expanded internally to be `#ff00ff`.

An alternative RGB expression is with the `rgb()` prefix and three numbers (from 0 to 255) or percentages corresponding to the red, green, and blue components of the color. Here are a couple of examples:

```
document.styleSheets[0].rules[0].style.color = "rgb(0, 255, 0)"
document.styleSheets[0].rules[0].style.color = "rgb(0%, 100%, 0%)"
```

Browsers also respond to a long list of plain-language color names originally devised by Netscape. You can see the list with sample colors at `http://developer.netscape.com/docs/manuals/htmlguid/colortab.htm`. Not all of those colors are necessarily part of what are known as "Web safe" colors. For a demonstration of Web safe colors, visit `http://www.lynda.com/hexh.html`.

The last category of color values references user interface pieces, many of which are determined by the user's control panel for video display. The string values correspond to recognizable UI components (also called system colors), as follows:

activeborder	graytext	menutext
activecaption	highlight	scrollbar
appworkspace	highlighttext	threeddarkshadow
background	inactiveborder	threedface
buttonface	inactivecaption	threedhighlight
buttonhighlight	inactivecaptiontext	threedlightshadow
buttonshadow	infobackground	threedshadow
buttontext	infotext	window
captiontext	menu	windowframe
windowtext		

Using these color settings may be risky for public sites, because you are at the mercy of the color settings the user has chosen. For a corporate environment where system installations and preferences are strictly controlled, these values could help define a safe color scheme for your pages.

Rectangle sides

Many style properties control the look of sides of rectangles (for example, thickness of a border around a block element). In most cases, the style values can be applied to individual sides or combinations of sides, depending on the number of values supplied to the property. The number of values affects the four sides of the rectangle according to the following matrix:

Number of Values	*Impact*
1	All four sides set to the one value
2	Top and bottom sides set to first value; left and right sides set to second value
3	Top side set to first value; left and right sides set to second value; bottom side set to third value
4	Top, right, bottom, and left sides set to individual values in that order

For example, to set the border color of an element so that all sides are red, the syntax is

```
elementRef.style.borderColor = "red"
```

To set the top and bottom to red but the left and right to green, the syntax is

```
elementRef.style.borderColor = "red green"
```

Properties that accept these multiple values cover a wide range of styles. Values may be colors, lengths, or selections from a fixed list of possible values.

Combination values

Another category of style values includes properties that act as shortcuts for several related properties. For example, the `border` property encompasses the `borderWidth`, `borderStyle`, and `borderColor` properties. This is possible because very different classes of values represent the three component properties: `borderWidth` is a length; `borderStyle` is based on a fixed list of values; and `borderColor` is a color value. Therefore, you can specify one or more of these property values (in any order), and the browser knows how to apply the values to the detailed sub-property. Only one value is permitted for any one of these sub-properties, which means that if the property is one of the four-sided styles described in the previous section, the value is applied to all four sides equally.

For example, setting the `border` property to a single value, as in

```
elementRef.style.border = "blue"
```

is the same as setting

```
elementRef.style.borderColor = "blue"
```

But if you set multiple items, as in

```
elementRef.style.border = "groove blue 3px"
```

then you have set the equivalent of the following three statements:

```
elementRef.style.borderStyle = "groove"
elementRef.style.borderColor = "blue"
elementRef.style.borderWidth = "3px"
```

In the property descriptions that follow, these combination values are denoted by their scripted property names and the OR (||) operator, as in

```
border = "borderStyle || borderColor || borderWidth"
```

URLs

Unlike other property values containing URLs, a `style` property requires a slightly different format. This format includes the `url()` prefix, with the actual URL (relative or absolute) located inside the parentheses. The URL itself is not quoted, but the entire property value is, as in

```
elementRef.style.backgroundImage = "url(chainlink.jpg)"
```

URLs should not have any spaces in them, but if they do, then use the URL-encoded version for the file specification: convert spaces to %20. This format distinguishes a URL value from some other string value for shortcut properties.

Text and font properties

color

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Foreground color of an element, primarily used to assign color to text. May also affect edges and highlights of other elements in some browsers.

Value: Color specification.

Example: `elementRef.style.color = "rgb(#22FF00)"`

font

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Up to six font-related style properties.

Value: Combination values: `fontStyle || fontVariant || fontWeight || fontSize || lineHeight || fontFamily`. See individual properties for their value formats.

Example: `elementRef.style.font = "bold sans-serif 16px"`

fontFamily

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Font family to be applied to an element in order of priority.

Value: Comma-delimited list of font families to be applied to element, starting with the most preferred font family name. You can also use one of several generic family names that rely on the browser to choose the optimal font to match the class: `serif | sans-serif | cursive | fantasy | monospace`. Not all browsers support all constants, but `serif`, `sans-serif`, and `monospace` are commonly implemented.

Example: `elementRef.style.fontFamily = "Bauhaus 93, Arial, monospace"`

fontSize

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Size of the characters of the current font family.

Value: Lengths (generally px or pt values); relative size constants: larger | smaller; absolute size constants: `xx-small | x-small | small | medium | large | x-large | xx-large`

Examples: *`elementRef`*`.style.fontSize = "16px"`
`elementRef``.style.fontSize = "small"`

fontSizeAdjust

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Aspect value of a secondary font family so that it maintains a similar character height as the primary font family.

Value: Number (including floating-point value) or `none`.

Example: *`elementRef`*`.style.fontSizeAdjust = "1.05"`

fontStretch

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Rendered width of a font's characters.

Value: Constant `ultra-condensed | extra-condensed | condensed | semi-condensed | semi-expanded | expanded | extra-expanded | ultra-expanded` or `wider | narrower | inherit | normal`

Example: *`elementRef`*`.style.fontStretch = "expanded"`

fontStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Italic style of characters.

Value: Constant `normal | italic | oblique | inherit`

Example: *`elementRef`*`.style.fontStyle = "italic"`

fontVariant

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Rendering characters as small caps.

Value: Constant `normal | small-caps | inherit`

Example: `elementRef.style.fontVariant = "small-caps"`

fontWeight

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Rendering characters in bold or light weights. Fonts that support numbered gradations can be controlled by those numbers. Normal = 400; Bold = 700.

Value: Constant `bold | bolder | lighter | normal | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | inherit`

Example: `elementRef.style.fontWeight = "bold"`

letterSpacing

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Spacing between characters. Used to override a font family's own characteristics.

Value: Length (usually em units, relative to current font size); Constant `normal | inherit`

Example: `elementRef.style.letterSpacing = "1.2em"`

lineBreak

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Line break rules for Japanese text content.

Value: Constant `normal | strict`

Example: `*elementRef*.style.lineBreak = "strict"`

lineHeight

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Height of the rectangular space that holds a line of text characters.

Value: Length (usually em units, relative to current font size); number (a multiplier on the inherited line height); percentage (relative to inherited line height); constant `normal |inherit`

Example: `*elementRef*.style.lineHeight = "1.1"`

quotes

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Characters to be used for quotation marks.

Value: Space-delimited pairs of open and close quotation symbols; Constant `none |inherit`

Example: `*elementRef*.style.quotes = "« »"`

rubyAlign

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	–	No

Controls: Alignment of ruby text within a RUBY element.

Value: Constant `auto | left | center | right | distribute-letter | distribute-space | line-edge`

Example: `*RUBYelementRef*.style.rubyAlign = "distribute=letter"`

rubyOverhang

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	–	No

Controls: Overhang of ruby text within a RUBY element.

Value: Constant `auto | whitespace | none`

Example: `*RUBYelementRef*.style.rubyOverhang = "whitespace"`

rubyPosition

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	–	No

Controls: Placement of ruby text with respect to the RUBY element's base text.

Value: Constant `above | inline`

Example: `*RUBYelementRef*.style.rubyPosition = "inline"`

textAlign

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Horizontal alignment of text with respect to its containing element.

Value: Constant `center | justify | left | right`

Example: `*elementRef*.style.textAlign = "center"`

textAlignLast

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Horizontal alignment of last line of text in a paragraph.

Value: Constant `auto | center | justify | left | right`

Example: `elementRef.style.textAlignLast = "justify"`

textAutospace

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Extra spacing between ideographic and non-ideographic text.

Value: Constant `none | ideograph-alpha | ideograph-numeric | ideograph-parenthesis | ideograph-space`

Example: `elementRef.style.textAutospace = "ideograph-alpha"`

textDecoration

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Display of underline, overline, or line-through with text.

Value: Constant `none | blink | line-through | overline | underline`

Example: `elementRef.style.textDecoration = "underline"`

textDecorationBlink
textDecorationLineThrough
textDecorationNone
textDecorationOverline
textDecorationUnderline

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	–	No

Controls: Individual text decoration characteristics for text, allowing for multiple decorations to be applied to the same text.

Value: Boolean (not strings) `true | false`

Example: *`elementRef`*`.style.textDecorationUnderline = true`

textIndent

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Amount of indentation for the first line of a block text element (e.g., P).

Value: Length (negative values for outdenting); percentage (relative to inherited value)

Example: *`elementRef`*`.style.textIndent = "2.5em"`

textJustify

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	–	No

Controls: Additional detailed specifications for an element whose `textAlign` property is set to `justify`.

Value: Constant `auto | distribute | distribute-all-lines | distribute-center-last | inter-cluster | inter-ideograph | inter-word | kashida | newspaper`

Example: *`elementRef`*`.style.textJustify = "distribute"`

textJustifyTrim

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	–	No

Reserved for future use.

textKashidaSpace

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Ratio of kashida expansion to white space expansion for Arabic writing systems.

Value: Percentage

Example: `elementRef.style.textKashidaSpace = "90%"`

textShadow

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Shadow rendering around text characters. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: Each shadow specification consists of an optional color and three space-delimited length values (horizontal shadow offset, vertical shadow offset, blur radius length). Multiple shadow specifications are comma-delimited.

textTransform

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Case rendering of the text (meaning without altering the case of the original text).

Value: Constant `none | capitalize | lowercase | uppercase`

Example: *`elementRef`*`.style.textTransform = "uppercase"`

textUnderlinePosition

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Whether an underline text decoration is displayed above or below the text. Seems redundant with `textDecorationUnderline` and `textDecorationOverline`.

Value: Constant `above | below`

Example: *`elementRef`*`.style.textUnderlinePosition = "above"`

unicodeBidi

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	6	Yes

Controls: Within bi-directional text (for example, English and Arabic), to what extent an alternate direction text block is embedded within the outer element.

Value: Constant `normal | embed | bidi-override`

Example: *`elementRef`*`.style.unicodeBidi = "embed"`

whiteSpace

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Treatment of white space characters within an element's source code.

Value: Constant `normal | nowrap | pre`

Example: *`elementRef`*`.style.whiteSpace = "nowrap"`

wordBreak

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Word breaking characteristics, primarily for Asian-language text or text containing a mixture of Asian and Latin characters.

Value: Constant `normal | break-all | keep-all`

Example: *`elementRef`*`.style.wordBreak = "break-all"`

wordSpacing

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Spacing between words.

Value: Length (usually in em units); Constant `normal`

Example: *`elementRef`*`.style.wordSpacing = "1em"`

wordWrap

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Word wrapping characteristics of text in a block element, explicitly sized inline element, or positioned element.

Value: Constant `normal | break-word`

Example: *`elementRef`*`.style.wordWrap = "break-word"`

writingMode

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Direction of content flow (left-to-right/top-to-bottom or top-to-bottom/right-to-left, as in some Asian languages).

Value: Constant `lr-tb | tb-rl`

Example: `elementRef.style.writingMode = "tb-rl"`

Inline display and layout properties

clear

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Layout orientation of an element with respect to a neighboring floating element.

Value: Constant `both | left | none | right`

Example: `elementRef.style.clear = "right"`

clip

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The clipping rectangle of an element (that is, the position of the rectangle through which the user sees an element's content).

Value: `rect(topLength, rightLength, bottomLength, leftLength) | auto`

Example: `elementRef.style.clip = "rect(10px, 300px, 200px, 0px)"`

clipBottom
clipLeft
clipRight
clipTop

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	—	—	No

Controls: Individual edges of the clipping rectangle of an element. These properties are read-only properties of the `currentStyle` object.

Value: Length | `auto`

Example: `var leftEdge = elementRef.currentStyle.clipLeft`

content

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: The content rendered by an element. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: See `http://www.w3.org/TR/REC-CSS2/generate.html#propdef-content`.

counterIncrement

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: The jumps in counter values to be displayed via the `content` style property. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: One or more pairs of counter identifier and integers.

counterReset

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Resets a named counter for content to be displayed via the `content` style property. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: One or more pairs of counter identifier and integers.

cssFloat

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Horizontal alignment of an element that allows other content to wrap around the element (usually text wrapping around an image). Corresponds to the CSS `float` style attribute. See also the `floatStyle` property, below. Floating (non-positioned) elements follow a long sequence of rules for their behavior, detailed at `http://www.w3.org/TR/REC-CSS2/visuren.html#propdef-float.`

Value: Constant `left | right | none`

Example: *elementRef*`.style.cssFloat = "right"`

cursor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The icon used for the cursor on the screen from a library of system-generated cursors. The CSS2 specification defines syntax for downloadable cursors, but this feature is not implemented as of IE5.5 or NN6.

Value: Constant `auto | crosshair | default | e-resize | help | move | n-resize | ne-resize | nw-resize | pointer | s-resize | se-resize | sw-resize | text | w-resize | wait`

Example: *elementRef*`.style.cursor = "hand"`

direction

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	6	Yes

Controls: Layout direction (left-to-right or right-to-left) of inline text (same as `DIR` attribute of an element).

Value: Constant `ltr | rtl`

Example: *elementRef*`.style.direction = "rtl"`

display

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Whether an element is displayed on the page. Content surrounding an undisplayed element cinches up to occupy the undisplayed element's space — as if the element didn't exist for rendering purposes (see the `visibility` property for a different approach). Commonly used to hide or show segments of a graphical tree structure. Also used to direct the browser to display an element as inline or block-level element. Some special-purpose values are associated with specific element types (for example, lists, table cells, and so on).

Value: Constant `block | compact | inline | inline-table | list-item | none | run-in | table | table-caption | table-cell | table-column-group | table-footer-group | table-header-group | table-row | table-row-group`

Example: `*elementRef*.style.display = "none"`
`// removes element from page`

filter

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	—	No

Controls: Rendering effects on static content and on transitions between hiding and showing elements. Microsoft made a massive overhaul of the `filter` style sheet syntax for IE5.5/Windows (using the DXImageTransform ActiveX control). A handy online utility lets you preview the filter results and provides copy-and-paste code you can use to start adding filters and scripted control of filters to your pages. See `http://msdn.microsoft.com/workshop/samples/author/dhtml/DXTidemo/DXTidemo.htm`. Scripting transitions require several steps to load the transition and actions before playing the transition. Use `style.filter` to read or write the entire filter specification string; use the `elem.styles[i]` object to access individual filter properties. See discussion of the `filter` object later in this chapter.

Value: Filter specification as string.

Example: `var filterSpec = *elementRef*.style.filter ="alpha(opacity=50) flipH()"`

floatStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	4	–	Yes

Controls: Horizontal alignment of an element that allows other content to wrap around the element (usually text wrapping around an image). Corresponds to the CSS `float` style attribute. See also the `cssFloat` property, above. Floating (non-positioned) elements follow a long sequence of rules for their behavior, detailed at `http://www.w3.org/TR/REC-CSS2/visuren.html#propdef-float`.

Value: Constant `left | right | none`

Example: *`elementRef`*`.style.floatStyle = "right"`

layoutGrid

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Page grid properties (primarily for Asian-language pages).

Value: Combination values: *`layoutGridMode`* `||` *`layoutGridType`* `||` *`layoutGridLine`* `||` *`layoutGridChar`*. See individual properties for their value formats.

Example: *`elementRef`*`.style.layoutGrid = "2em strict"`

layoutGridChar

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Size of the character grid (Asian languages).

Value: Length; Percentage; Constant `none | auto`

Example: *`elementRef`*`.style.layoutGridChar = "2em"`

layoutGridLine

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Line height of the grid (Asian languages).

Value: Value: Length; Percentage; Constant `none | auto`

Example: `*elementRef*.style.layoutGridLine = "110%"`

layoutGridMode

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: One- or two-dimensional grid (Asian languages).

Value: Constant `both | none | line | char`

Example: `*elementRef*.style.layoutGridMode = "both"`

layoutGridType

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: Type of grid for text content (Asian languages).

Value: Constant `loose | strict | fixed`

Example: `*elementRef*.style.layoutGridType = "strict"`

markerOffset

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Distance between the edges of a marker box (content whose display is of a marker type) and a block-level element's box. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: Length; Constant `auto`

Example: `elementRef.style.markerOffset = "2em"`

marks

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Rendering of crop marks and the like on the printed page. Note: The style attribute for this property is not implemented in IE5/Mac or NN6, but the property is listed as valid for a `style` object.

Value: Constant `crop || cross | none`

Example: `elementRef.style.marks = "crop"`

maxHeight
maxWidth
minHeight
minWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Maximum or minimum height or width of an element. The corresponding style attribute is implemented in NN6.

Value: Length; Percentage; Constant (for max properties only) `none`

Example: `elementRef.style.maxWidth = "300px"`

overflow

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The rendering of a block-level element's content when its native rectangle exceeds that of its next outermost rectangular space. A `hidden` overflow clips the block-level content; a `scrolled` overflow forces the outermost rectangle to display scrollbars so that users can scroll around the block-level element's content; a `visible` overflow causes the block-level element to extend beyond the outermost container's rectangle (indeed, "overflowing" the container).

Value: Constant `auto | hidden | scroll | visible`

Example: `*elementRef*.style.overflow = "scroll"`

overflowX
overflowY

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	–	–	No

Controls: The rendering of a block-level element's content when its native rectangle exceeds the width (`overflowX`) or height (`overflowY`) of its next outermost rectangular space. A hidden overflow clips the block-level content; a scrolled overflow forces the outermost rectangle to display scrollbars so that users can scroll around the block-level element's content; a visible overflow causes the block-level element to extend beyond the outermost container's rectangle (indeed, "overflowing" the container).

Value: Constant `auto | hidden | scroll | visible`

Example: `*elementRef*.style.overflowX = "scroll"`

styleFloat

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	–	Yes

Controls: Horizontal alignment of an element that allows other content to wrap around the element (usually text wrapping around an image). Corresponds to the CSS `float` style attribute. See also the `cssFloat` property, above. Floating (non-positioned) elements follow a long sequence of rules for their behavior, detailed at `http://www.w3.org/TR/REC-CSS2/visuren.html#propdef-float`.

Value: Constant `left | right | none`

Example: `*elementRef*.style.styleFloat = "right"`

verticalAlign

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: How inline and table cell content aligns vertically with surrounding content. Not all constant values are supported by all browsers.

Value: Constant `baseline` | `bottom` | `middle` | `sub` | `super` | `text-bottom` | `text-top` | `top`; Length; Percentage.

Example: `elementRef.style.verticalAlign = "baseline"`

visibility

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Whether an element is displayed on the page. The element's space is preserved as empty space when the element is hidden. To cinch up surrounding content, see the `display` property. This property is used frequently for hiding and showing positioned element under script control.

Value: Constant `collapse` | `hidden` | `visible`

Example: `elementRef.style.visibility = "hidden"`

width

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Horizontal dimension of a block-level element. Earlier browsers exhibit unexpected behavior when nesting elements that have their `width` style properties set.

Value: Length; Percentage; Constant `auto`

Example: `elementRef.style.width = "200px"`

zoom

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Magnification factor of a rendered element.

Value: Constant `normal`; Percentage (where `100%` is normal); floating-point number (scale multiplier, where 1.0 is normal)

Example: *`elementRef`*`.style.zoom = ".9"`

Positioning properties

(See Chapter 31 for coding examples of positioned elements and their `style` properties.)

bottom
right

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	6	Yes

Controls: The offset measure of a positioned element from its containing rectangle's bottom and right edges, respectively. In practice, you should adjust the size of a positioned element via the style's `height` and `width` properties.

Value: Length; Percentage; Constant `auto`

Example: *`elementRef`*`.style.bottom = "20px"`

left
top

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The offset measure of a positioned element from its containing rectangle's left and top edges, respectively. In practice, use these properties to position an element under script control. To position an absolute-positioned element atop an inline element, calculate the position of the inline element via the `offsetTop` and `offsetLeft` properties with some browser-specific adjustments, as shown in Chapter 31.

Value: Length; Percentage; Constant `auto`

Example: `elementRef.style.top = "250px"`

height
width

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Height and width of a block-level element's box. Used most commonly to adjust the dimensions of a positioned element (Chapter 31).

Value: Length; Percentage; Constant `auto`

Example: `elementRef.style.height = "300px"`

pixelBottom
pixelHeight
pixelLeft
pixelRight
pixelTop
pixelWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	(4)	–	No

Controls: Integer pixel values for (primarily positioned) elements. Because the non-pixel versions of these properties return strings that also contain the unit measure (for example, `30px`), these properties let you work exclusively in integers for pixel units. The same can be done cross-platform by using `parseInt()` on the non-pixel versions of these properties. The `pixelBottom` and `pixelRight` properties are not in IE4/Mac.

Value: Integer

Example: `elementRef.style.pixelTop = elementRef.style.pixelTop + 20`

posBottom
posHeight
posLeft
posRight
posTop
posWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	(4)	–	No

Controls: Numeric values for (primarily positioned) elements in whatever unit was specified by the corresponding style attribute. Because the non-pos versions of these properties return strings that also contain the unit measure (for example, `1.2em`), these properties let you work exclusively in numbers in the same units as the style was originally defined. The same can be done cross-platform by using `parseFloat()` on the non-pixel versions of these properties.

Value: Integer

Example: *elementRef*`.style.posTop = `*elementRef*`.style.posTop + 0.5`

position

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The type of positioning to be applied to the element. An element that is not explicitly positioned is said to be *static*. A relative-positioned element appears in its normal page flow location but can be explicitly positioned relative to that location. An absolute-positioned element must have its `top` and `left` style attributes set to give the element a set of coordinates for its location. IE5/Mac and NN6 also allow for a fixed positioned element, which remains at its designated position in the browser window, even if the page scrolls (for example, for a watermark effect). See Chapter 31 for more information on positioned elements.

Value: Constant `absolute | fixed | relative | static`

Example: *elementRef*`.style.position = "absolute"`

zIndex

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Front-to-back layering of positioned elements. Multiple items with the same `zIndex` value are layered in source code order (earliest item at the bottom). The higher the value, the closer to the user's eye the element is.

Value: Integer number; Constant `auto`

Example: *`elementRef`*`.style.zIndex = "3"`

Background properties

background

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Up to five background style properties for an element.

Value: Combination values: *`backgroundAttachment`* `||` *`backgroundColor`* `||` *`backgroundImage`* `||` *`backgroundPosition`* `||` *`backgroundRepeat`*

Example: *`elementRef`*`.style.background = "scroll url(bricks.jpg) repeat-x"`

backgroundAttachment

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Whether the background image remains fixed or scrolls with the content. Default is `scroll`.

Value: Constant `fixed | scroll`

Example: *`elementRef`*`.style.backgroundAttachment = "fixed"`

backgroundColor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Solid, opaque color for the background, or completely transparent. If you assign a background image, the color is layered behind the image so that any transparent spots of the image show the background color.

Value: Color value; Constant `transparent`

Example: `*elementRef*.style.backgroundColor = "salmon"`

backgroundImage

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The URL (if any) of an image to be used for the background for the element.

Value: URL value; Constant `none`

Example: `*elementRef*.style.backgroundImage = "url(bricks.jpg)"`

backgroundPosition

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: The left-top location of the background image. Any offset from the left-top corner (default value "0% 0%") allows background color to show through along left and top edges of the element.

Value: Length values; Percentages; Constant `left | center | right || top | center | bottom`. While single values are accepted, their behavior may not be as expected. Providing space-delimited pairs of values is more reliable.

Example: `*elementRef*.style.backgroundPosition = "left top"`

backgroundPositionX
backgroundPositionY

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	–	No

Controls: The left (`backgroundPositionX`) and top (`backgroundPositionY`) locations of the background image. Any offset from the left-top corner (default value "0%") allows background color to show through along left and top edges of the element.

Value: Length value; Percentage; Constant `left | center | right` (for `backgroundPositionX`); Constant `top | center | bottom` (for `backgroundPositionY`).

Example: `elementRef.style.backgroundPositionX = "5px"`

backgroundRepeat

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Image repetition characteristics of a background image. You can force the image to repeat along a single axis, if you want.

Value: Constant `repeat | repeat-x | repeat-y | no-repeat`

Example: `elementRef.style.backgroundRepeat = "repeat-y"`

Border and edge properties

border

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Up to three border characteristics (color, style, and width) for all four edges of an element.

Value: Combination values *`borderColor`* `||` *`borderStyle`* `||` *`borderWidth`*

Example: `elementRef.style.border = "green groove 2px"`

borderBottom
borderLeft
borderRight
borderTop

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Up to three border characteristics (color, style, and width) for a single edge of an element.

Value: Combination values

(for `borderBottom`)
`borderBottomColor` || *`borderBottomStyle`* ||*`borderBottomWidth`*

(for `borderLeft`)
`borderLeftColor` || *`borderLeftStyle`* || *`borderLeftWidth`*

(for `borderRight`)
`borderRightColor` || *`borderRightStyle`* || *`borderRightWidth`*

(for `borderTop`)
`borderTopColor` || *`borderTopStyle`* || *`borderTopWidth`*

Example: *`elementRef`*`.style.borderLeft = "#3300ff solid 2px"`

borderBottomColor
borderLeftColor
borderRightColor
borderTopColor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Color for a single border edge of an element.

Value: Color values; Constant `transparent`

Example: *elementRef*`.style.borderTopColor = "rgb(30%, 50%, 0%)"`

borderBottomStyle
borderLeftStyle
borderRightStyle
borderTopStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Rendered style for a border edge of an element.

Value: Constant `none | hidden | dotted | dashed | solid | double | groove | ridge | inset | outset`. IE versions for Windows prior to IE5.5 do not respond to the `dotted` or `dashed` types; IE/Mac does not respond to the `hidden` type.

Example: *elementRef*`.style.borderRightStyle = "double"`

borderBottomWidth
borderLeftWidth
borderRightWidth
borderTopWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of a border edge of an element.

Value: Length value; Constant `thin | medium | thick` (precise measure is at browser's discretion).

Example: *elementRef*`.style.borderBottomWidth = "5px"`

borderColor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Rendered color for one to four sides of an element.

Value: Color values for one to four rectangle sides.

Example: `elementRef.style.borderColor = "green black"`

borderStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Rendered style for one to four sides of an element.

Value: One to four rectangle side constants `none | hidden | dotted | dashed | solid | double | groove | ridge | inset | outset`. IE versions for Windows prior to IE5.5 do not respond to the `dotted` or `dashed` types; IE/Mac does not respond to the `hidden` type.

Example: `elementRef.style.borderStyle = "ridge"`

borderWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of border for one to four sides of an element.

Value: One to four rectangle side length value or constants `thin | medium | thick` (precise dimension is at browser's discretion).

Example: `elementRef.style.borderWidth = "5px 4px 5px 3px"`

margin

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of transparent margin space outside the element's borders for one to four edges.

Value: One to four rectangle side length values.

Example: `elementRef.style.margin = "10px 5px"`

marginBottom
marginLeft
marginRight
marginTop

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of transparent margin space outside the element's borders for a single border edge.

Value: Length value

Example: `elementRef.style.marginBottom = "50px"`

outline

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Up to three characteristics of an outline surrounding an element (such as a border, but not shifting the location of internal content). This style is not fully supported in the above browsers, even though the properties are reflected in the `style` object.

Value: Combination values: *outlineColor* || *outlineStyle* || *outlineWidth*

Example: `elementRef.style.outline = "red groove 2px"`

outlineColor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Color of all four edges of an outline. This style is not fully supported in the above browsers, even though the properties are reflected in the `style` object.

Value: Color values; Constant `invert`

Example: `elementRef.style.outlineColor = "cornflowerblue"`

outlineStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Rendered style for all four sides of an element outline. This style is not fully supported in the above browsers, even though the properties are reflected in the `style` object.

Value: Constant `none | hidden | dotted | dashed | solid | double | groove | ridge | inset | outset`

Example: `elementRef.style.outlineStyle = "ridge"`

outlineWidth

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Thickness of all four sides of an element outline. This style is not fully supported in the above browsers, even though the properties are reflected in the `style` object.

Value: Length value or constant `thin | medium | thick` (precise dimension is at browser's discretion)

Example: `elementRef.style.outlineWidth = "4px"`

padding

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of space between an element's content and its borders for one to four edges.

Value: One to four rectangle side length values.

Example: `elementRef.style.padding = "5px"`

paddingBottom
paddingLeft
paddingRight
paddingTop

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Thickness of space between an element's content and its borders for a single edge.

Value: Length value

Example: `elementRef.style.paddingBottom = "20px"`

List Properties

listStyle

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Up to three characteristics of a list (OL or UL) presentation. Also applies to DD, DT, and LI elements.

Value: Combination values *listStyleImage* || *listStylePosition* || *listStyleType*

Example: `elementRef.style.listStyle = "none inside lower-alpha"`

listStyleImage

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: URL of the image to be used as a marker for a list item.

Value: URL value; Constant `none`

Example: `elementRef.style.listStyleImage = "url(custombullet.jpg)"`

listStylePosition

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	**4**	**4**	**6**	**Yes**

Controls: Whether the marker should be formatted inside the wrapped text of its content or dangle outside the wrapped text (default).

Value: Constant `inside | outside`

Example: `elementRef.style.listStylePosition = "inside"`

listStyleType

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	**4**	**4**	**6**	**Yes**

Controls: Which of the standard marker sets should be used for items in the list. A change to this property for a single LI element causes succeeding items to be in the same style.

Value: For UL elements, constant `circle | disc | square`

For OL elements, constant `decimal | lower-alpha | lower-roman | upper-alpha | upper-roman`

Example: `elementRef.style.listStyleType = "upper-roman"`

Scrollbar properties

scrollbar3dLightColor
scrollbarArrowColor
scrollbarBaseColor
scrollbarDarkShadowColor
scrollbarFaceColor
scrollbarHighlightColor
scrollbarShadowColor
scrollbarTrackColor

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5.5	–	–	No

Controls: Colors of individual components of scrollbars when they are displayed for APPLET, BODY, DIV, EMBED, OBJECT, or TEXTAREA elements. To experiment with how different colors can affect the individual components, visit `http://msdn.microsoft.com/workshop/samples/author/dhtml/refs/scrollbarColor.htm`.

Value: Color values; Constant `none`

Example: `elementRef.style.scrollbarTrackColor = "hotpink"`

Table properties

borderCollapse

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	5	6	Yes

Controls: Whether a TABLE element adheres to the CSS2 separated borders model or the collapsed borders model. Style is not fully supported in IE5/Mac.

Value: Constant `collapse | separate`

Example: `elementRef.style.borderCollapse = "separate"`

borderSpacing

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: For a table following the separated borders model, the thickness of the spacing between cell rectangles (akin to the `CELLSPACING` attribute of TABLE elements). Style is not fully supported in IE5/Mac.

Value: One length value (for horizontal and vertical spacing) or comma-delimited list of two length values (the first for horizontal; the second for vertical).

Example: `elementRef.style.borderSpacing = "10px"`

captionSide

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Position of the CAPTION element inside a TABLE element. Style is not implemented in IE5/Mac and is only partially implemented in NN6.

Value: Constant `top | right | bottom | left`

Example: `elementRef.style.captionSide = "bottom"`

emptyCells

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Rendering of cells and their borders when the cells have no content. Default behavior is to not render borders around empty cells. Style is not implemented in IE5/Mac and is only partially implemented in NN6.

Value: Constant `show | hide`

Example: `elementRef.style.emptyCells = "show"`

tableLayout

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	5	6	Yes

Controls: Whether table is rendered progressively based on fixed width settings of the first row of cells or is rendered after the widths of all row content can be determined. Modifying this property after a table loads has no effect on the table.

Value: Constant `auto | fixed`

Example: *`elementRef`*`.style.tableLayout = "auto"`

Page and printing properties

orphans
widows

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: The minimum number of lines of a paragraph to be displayed at the bottom of a page (orphans) or top of a page (widows) when a page break occurs.

Value: Integer

Example: *`elementRef`*`.style.orphans = "4"`

page

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: The page (defined in an `@page` rule) with which the current element should be associated for printing.

Value: Identifier assigned to an existing `@page` rule

Example: *`elementRef`*`.style.page = "landscape"`

pageBreakAfter
pageBreakBefore

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	Yes

Controls: Whether a printed page break should be before or after the current element and the page break type. Style is not fully implemented in the IE4 browsers.

Value: Constant `auto | always | avoid | left | right`

Example: `elementRef.style.pageBreakBefore = "always"`

pageBreakInside

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	5	6	Yes

Controls: Whether a printed page break is allowed inside an element.

Value: Constant `auto | avoid`

Example: `elementRef.style.pageBreakInside = "avoid"`

size

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	—	—	6	Yes

Controls: The size or orientation of the page box (linked to the style rule via the page property) used to determine printed pages.

Value: One (same value for width and height) or two space-delimited (width and height) length values; constant `auto | portrait | landscape`

Example: `elementRef.style.size = "portrait"`

Miscellaneous properties

accelerator

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	—	—	No

Controls: Whether an accelerator key is defined for an element.

Value: Boolean

Example: `elementRef.style.accelerator = "true"`

behavior

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	—	—	No

Controls: The external behavior to be applied to the current element.

Value: Space-delimited list of URL values. URLs can be a file location, an OBJECT element id, or one of the built-in (default) behaviors.

Example: `elementRef.style.behavior = "url(#default#anchorClick)"`

cssText

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	4	4	6	No

Controls: Actual CSS rule text (read-only). This property exists by virtue of the browser's object model and is not part of the CSS specification. There is no corresponding CSS attribute.

Value: String

Example: var cssRuleText = `elementRef.style.cssText`

imeMode

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	5	—	—	No

Controls: Whether text is entered into a text INPUT or TEXTAREA element through the Input Method Editor (for languages, such as Chinese, Japanese, or Korean).

Value: Constant `auto | active | inactive | disabled`

Example: `elementRef.style.imeMode = "active"`

Aural properties

Although these properties are defined in the CSS2 specification and placeholders exist for them in NN6, the styles are not implemented in NN6. The script equivalent properties are listed here for the sake of completeness only.

azimuth
cue
cueAfter
cueBefore
elevation
pause
pauseAfter
pauseBefore
pitch
pitchRange
playDuring
richness
speak
speakHeader
speakNumeral
speakPunctuation
speechRate
stress
voiceFamily
volume

	IE/Windows	IE/Mac	NN	W3C CSS2
Compatibility	–	–	6	Yes

Controls: A variety of styles primarily for browsers that support speech synthesis output.

Value: Consult `http://www.w3.org/TR/REC-CSS2/aural.html` for details on aural style sheets.

filter Object

Properties	*Methods*	*Event Handlers*
(See text)		

Syntax

Accessing `filter` object properties and methods:

```
(IE4+)    document.all.objectID.style.filters[i].property |
          method([parameters])
(IE5.5+)  document.all.objectID.style.filters[filterName].property |
          method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

About this object

Earlier in this chapter, the `style.filter` property was shown to allow reading and writing of the string value that is assigned to an element's `style.filter` property. Filters are available in IE for Windows only, and not for the Mac as of IE5/Mac, even though IE5/Mac returns the `style.filter` property value. The purpose of this section is to teach you not how to use filters but rather, how to script them.

Multiple filters are merely part of the space-delimited list of filters. Some filter types have additional specifications. For example, the `glow()` filter has three properties that more clearly define how the element should be rendered with a glow effect. The style sheet rule for an element whose ID is `glower` looks like the following:

```
#glower {filter:glow(color=yellow, strength=5, enabled=true)}
```

Accessing the `currentStyle.filter` property for that element yields the string value:

```
glow(color=yellow, strength=5, enabled=true)
```

Attempting to modify a single sub-property of the `glow()` filter by way of string parsing would be cumbersome and hazardous at best. For example, imagine trying to increment the glow filter's `strength` property by 5.

Reading and writing sub-properties

A cleaner way to work with individual properties of a filter is to access the filter as an object belonging to the element affected by the filter. Each type of filter object has as its properties the individual sub-properties that you set in the style sheet. Continuing with the `glow()` filter example, you could access just the `color` property of the filter as follows:

```
var currColor = document.all.glower.currentStyle.filters["glow"].color
```

The reference is through the `currentStyle` property for reading the value, because in this case, the filter is applied in a style sheet definition, and only the `currentStyle` property reveals the effective style properties acting on an element. To modify the color, assign a new value to the `filter` object's property, but do so through the element's `style` property:

```
document.all.glower.style.filters["glow"].color = "green"
```

To increment a numeric value, such as increasing the `glow()` filter's `strength` property by 5, use a construction such as the following (long-winded though it may be):

```
document.all.glower.style.filters["glow"].strength =
document.all.glower.currentStyle.filters["glow"].strength + 5
```

Table 30-1 lists the filter object names that work all the way back to IE4 and the properties associated with each filter type.

Table 30-1 IE4-Compatible Static Filter Types

Filter Name	Description and Properties		
`alpha()`	Transparency level		
	Properties:	`opacity`	(0 to 100)
		`finishopacity`	(0 to 100)
		`style`	(gradient shape 0 to 3)
		`startX`	(coordinate integer)
		`startY`	(coordinate integer)
		`finishX`	(coordinate integer)
		`finishY`	(coordinate integer)
`blur()`	Simulating blurred motion		
	Properties:	`add`	(1 or 0)

Continued

Table 30-1 (continued)

Filter Name	*Description and Properties*		
		`direction`	(0, 45, 90, 135, 180, 225, 270, 315)
		`strength`	(pixel count)
`chroma()`	Color transparency		
	Properties:	`color`	(color value)
`dropShadow()`	Shadow effect		
	Properties:	`color`	(color value)
		`offx`	(horizontal offset pixels)
		`offy`	(vertical offset pixels)
		`positive`	(1 or 0)
`flipH()`	Horizontally mirrored image		
	Properties:	None	
`flipV()`	Vertically mirrored image		
	Properties:	None	
`glow()`	Outer edge radiance		
	Properties:	`color`	(color value)
		`strength`	(intensity 1 to 255)
`gray()`	Eliminate color		
	Properties:	None	
`invert()`	Opposite hue, saturation, brightness levels		
	Properties:	None	
`light()`	Add light source (controlled by methods)		
	Properties:	None	
`mask()`	Overlay transparent mask		
	Properties:	`color`	(color value)
`shadow()`	Render as silhouette		

Filter Name	Description and Properties		
	Properties:	`color`	(color value)
		`direction`	(0, 45, 90, 135, 180, 225, 270, 315)
`wave()`	Add sine-wave distortion		
	Properties:	`add`	(1 or 0)
		`freq`	(integer number of waves)
		`light`	(strength 0 to 100)
		`phase`	(percentage offset 0 to 100)
		`strength`	(intensity 0 to 255)
`xRay()`	Render edges only		
	Properties:	None	

In addition to the static filter types, which are applied to content and sit there unless modified by script, the IE4+ `filter` object also provides types for blends and reveals for transitions between visible and invisible elements. Scripting transitions to act when a script hides or shows an element requires a few lines of code, including calls to some of the `filter` object's methods. First, Table 30-2 shows the IE4+ syntax for transition filters.

Table 30-2 **IE4+ Transition Filters**

Filter Name	Description and Properties		
`blendTrans()`	Fades out old element, fades in new element		
	Properties:	`duration`	(floating point number of seconds)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)

Continued

Table 30-2 *(continued)*

Filter Name	*Description and Properties*		
`revealTrans()`	Reveals element to be shown through an effect		
	Properties:	`duration`	(floating-point number of seconds)
		`transition`	(code number for effect)
			0 Box in
			1 Box out
			2 Circle in
			3 Circle out
			4 Wipe up
			5 Wipe down
			6 Wipe right
			7 Wipe left
			8 Vertical blinds
			9 Horizontal blinds
			10 Checkerboard across
			11 Checkerboard down
			12 Random dissolve
			13 Split vertical in
			14 Split vertical out
			15 Split horizontal in
			16 Split horizontal out
			17 Strips left down
			18 Strips left up
			19 Strips right down
			20 Strips right up
			21 Random bars horizontally
			22 Random bars vertically

Filter Name	Description and Properties		
			23 Random effect
	Methods:	apply()	(freezes current display)
		play()	(plays the transition)
		stop()	(stops transition mid-stream)

To make a transition work under script control, a filter must be applied to the element that you want the transition to work on. That can be done by script or by assigning a filter style to the element. As for the scripting, you begin by invoking the `apply()` method of the desired `filter` object. Next, script the change, such as assigning a new URL to the `src` property of an IMG element. While you do this, the `apply()` method freezes the image until you invoke the `play()` method on the filter. Listing 30-1 effects a checkerboard transition between two images after you click the image.

Listing 30-1: **A Reveal Transition Between Images**

```
<HTML>
<HEAD>
<TITLE>IE4+ Transition</TITLE>
<STYLE TYPE="text/css">
IMG {filter:revealTrans(transition=10)}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function doReveal() {
    document.all.myIMG.filters["revealTrans"].apply()
    if (document.all.myIMG.src.indexOf("desk1") != -1) {
        document.all.myIMG.src = "desk3.gif"
    } else {
        document.all.myIMG.src = "desk1.gif"
    }
    document.all.myIMG.filters["revealTrans"].play()
}
</SCRIPT>
</HEAD>
<BODY>
<H1>IE4+ Transition</H1>
<HR>
<P>Click on the image to cause a reveal transition.</P>
<IMG ID="myIMG" SRC="desk1.gif" HEIGHT=90 WIDTH=120 onClick="doReveal()">
</BODY>
</HTML>
```

Building on the example in Listing 30-1, the next example in Listing 30-2 demonstrates how a script can also modify a `filter` object's property, including a transition filter. Before the transition filter has its `apply()` method invoked, the script sets the transition type based on a user choice in a SELECT list.

Listing 30-2: **Choosing Reveal Transitions Between Images**

```
<HTML>
<HEAD>
<TITLE>IE4+ Transition and Choices</TITLE>
<STYLE TYPE="text/css">
IMG {filter:revealTrans(transition=10)}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function doReveal() {
    document.all.myIMG.filters["revealTrans"].transition =
document.forms[0].transChoice.value
    document.all.myIMG.filters["revealTrans"].apply()
    if (document.all.myIMG.src.indexOf("desk1") != -1) {
        document.all.myIMG.src = "desk3.gif"
    } else {
        document.all.myIMG.src = "desk1.gif"
    }
    document.all.myIMG.filters["revealTrans"].play()
}
</SCRIPT>
</HEAD>
<BODY>
<H1>IE4+ Transition and Choices</H1>
<HR>
<FORM>
<P>Choose the desired transition type:
<SELECT NAME="transChoice">
    <OPTION VALUE=0>Box in
    <OPTION VALUE=1>Box out
    <OPTION VALUE=2>Circle in
    <OPTION VALUE=3>Circle out
    <OPTION VALUE=4>Wipe up
    <OPTION VALUE=5>Wipe down
    <OPTION VALUE=6>Wipe right
    <OPTION VALUE=7>Wipe left
    <OPTION VALUE=8>Vertical blinds
    <OPTION VALUE=9>Horizontal blinds
    <OPTION VALUE=10>Checkerboard across
    <OPTION VALUE=11>Checkerboard down
    <OPTION VALUE=12>Random dissolve
    <OPTION VALUE=13>Split vertical in
    <OPTION VALUE=14>Split vertical out
    <OPTION VALUE=15>Split horizontal in
    <OPTION VALUE=16>Split horizontal out
    <OPTION VALUE=17>Strips left down
```

```
    <OPTION VALUE=18>Strips left up
    <OPTION VALUE=19>Strips right down
    <OPTION VALUE=20>Strips right up
    <OPTION VALUE=21>Random bars horizontally
    <OPTION VALUE=22>Random bars vertically
    <OPTION VALUE=23>Random effect
</SELECT>
</FORM>
<P>Click on the image to cause a reveal transition.</P>
<IMG ID="myIMG" SRC="desk1.gif" HEIGHT=90 WIDTH=120 onClick="doReveal()">
</BODY>
</HTML>
```

IE5.5 filter syntax changes

While IE5.5/Windows still supports the original IE4 way of controlling filters, the browser also implements a new filter component, which Microsoft strongly encourages authors to use (as evidenced by the difficulty in finding documentation for the IE4 syntax at its developer Web site). In the process of implementing this new filter component, the names of many filters change, as do their individual properties. Moreover, the way the filter component is invoked in the style sheet is also quite different from the original component.

The style sheet syntax requires a reference to the new component as well as the filter name. Here is the old way:

```
#glower {filter:glow(color=yellow, strength=5, enabled=true)}
```

And here is the new way:

```
#glower {filter:progid:DXImageTransform.Microsoft.Glow(color=yellow, strength=5,
enabled=true)}
```

Don't overlook the extra `progid:` pointer in the reference. This program identifier becomes part of the filter name that your scripts use to reference the filter:

```
document.all.glower.style.filters["DXImageTransform.Microsoft.Glow"].color =
"green"
```

While some of the filter names and properties stay the same (except for the huge prefix), several older properties are subsumed by new filters whose properties help identify the specific effect. The former `revealTrans()` filter is now divided among several new filters dedicated to transition effects. Table 30-3 shows the IE5.5 syntax.

Note

Using the new syntax in IE5.5 can cause frequent crashes of the browser (at least early released versions), especially transition filters. If you implement the new syntax, be sure to torture-test your pages extensively.

Table 30-3 IE5.5 DXImageTransform.Microsoft Filter Names

Filter Name	*Description and Properties*		
`Alpha()`	Transparency level		
	Properties:	`opacity`	(0 to 100)
		`finishopacity`	(0 to 100)
		`style`	(gradient shape 0 to 3)
		`startX`	(coordinate integer)
		`startY`	(coordinate integer)
		`finishX`	(coordinate integer)
		`finishY`	(coordinate integer)
`Barn()`	Barn-door style transition		
	Properties:	`duration`	(floating-point number of seconds)
		motion	(`in` or `out`)
		orientation	(`horizontal` or `vertical`)
		`percent`	(0 to 100)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`BasicImage()`	Element rotation, flip, color effects, and opacity		
	Properties:	`grayScale`	(1 or 0)
		`invert`	(1 or 0)
		`mask`	(1 or 0)
		`maskColor`	(color value)
		`mirror`	(1 or 0)
		`opacity`	(0.0 to 1.0)
		`rotation`	0 (no rotation), 1 (90°), 2 (180°), 3 (270°)
		`xRay`	(1 or 0)

Filter Name	Description and Properties		
`Blinds()`	Action transition with Venetian blind effect		
	Properties:	direction	(`up`, `down`, `right`, `left`)
		`squaresX`	(integer column count)
		`squaresY`	(integer row count)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Checkerboard()`	Action transition with checkerboard effect		
	Properties:	`bands`	(1 to 100)
		direction	(`up`, `down`, `right`, `left`)
		`duration`	(floating-point number of seconds)
		`percent`	(0 to 100)
		`slideStyle`	(`HIDE`, `PUSH`, `SWAP`)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Chroma()`	Color transparency		
	Properties:	`color`	(color value)
`DropShadow()`	Shadow effect		
	Properties:	`color`	(color value)
		`offx`	(horizontal offset pixels)
		`offy`	(vertical offset pixels)
		`positive`	(1 or 0)

Continued

Table 30-3 (continued)

Filter Name	Description and Properties		
`Fade()`	Blend transition		
	Properties:	`duration`	(floating-point number of seconds)
		`overlap`	(0.0 to 1.0 seconds)
		`percent`	(0 to 100)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Glow()`	Outer edge radiance		
	Properties:	`color`	(color value)
		`strength`	(intensity 1 to 255)
`Iris()`	Action transition with zoom effect		
	Properties:	`duration`	(floating-point number of seconds)
		`irisStyle`	(`CIRCLE`, `CROSS`, `DIAMOND`, `PLUS`, `SQUARE`, `STAR`)
		`motion`	(`in` or `out`)
		`percent`	(0 to 100)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Light()`	Add light source (controlled by methods)		
	Properties:	None	
	Methods:	`addAmbient(`*`red`*`,`*`green`*`,`*`blue`*`,`*`strength`*`)`	

Filter Name	***Description and Properties***		
		addCone (*sourceLeft*, *sourceTop*, *sourceZAxis*, *targetLeft*, *targetTop*, *red*, *green*, *blue*, *strength*, *spreadAngle*)	
		addPoint (*sourceLeft*, *sourceTop*, *sourceZAxis*, *red*, *green*, *blue*, *strength*)	
		changeColor (*lightID*, *red*, *green*, *blue*, *absoluteColorFlag*)	
		changeStrength (*lightID*, *strength*, *absoluteIntensityFlag*)	
		clear()	
		moveLight (*lightID*, *sourceLeft*, *sourceTop*, *sourceZAxis*, *absoluteMovementFlag*)	
MaskFilter()	Overlay transparent mask		
	Properties:	color	(color value)
MotionBlur()	Simulating blurred motion		
	Properties:	add	(1 or 0)
		direction	(0, 45, 90, 135, 180, 225, 270, 315)
		strength	(pixel count)

Continued

Table 30-3 *(continued)*

Filter Name	*Description and Properties*		
`RandomDissolve()`	Pixelated dissolve	transition	
	Properties:	`duration`	(floating-point number of seconds)
		`percent`	(0 to 100)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`RandomBars()`	Bar style transition		
	Properties:	`duration`	(floating-point number of seconds)
		`orientation`	(`horizontal` or `vertical`)
		`percent`	(0 to 100)
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Shadow()`	Render as silhouette		
	Properties:	`color`	(color value)
		`direction`	(0, 45, 90, 135, 180, 225, 270, 315)
`Strips()`	Striped style transition		
	Properties:	`duration` of seconds)	(floating-point number
		`motion`	(`in` or `out`)
		`percent`	(0 to 100)

Filter Name	Description and Properties		
		`status`	0 (stopped), 1 (applied), 2 (playing)
	Methods:	`apply()`	(freezes current display)
		`play()`	(plays the transition)
		`stop()`	(stops transition mid-stream)
`Wave()`	Add sine-wave distortion		
	Properties:	`add`	(1 or 0)
		`freq`	(integer number of waves)
		`light`	(strength 0 to 100)
		`phase`	(percentage offset 0 to 100)
		`strength`	(intensity 0 to 255)
`xRay()`	Render edges only		
	Properties:	None	

For more details on deploying filters in IE for Windows, visit `http://msdn.microsoft.com/workshop/author/filter/filters.asp`. Because most of the live examples require IE5.5+/Windows, be sure to use that version for the best experience at that page.

✦ ✦ ✦

31

CHAPTER

Positioned Objects

✦ ✦ ✦ ✦

In This Chapter

Layer concepts

How to move, hide, and show content

The end of the LAYER element

✦ ✦ ✦ ✦

This is an oddball chapter within the scheme of Part III. Thus far, I have devoted each chapter to a distinct set of object model objects. This chapter breaks away from that mold for just a moment. The main reason that this chapter even exists has to do more with the history of Dynamic HTML — the capability to alter content on the fly in response to user interaction — particularly with respect to Netscape Navigator 4. The impetus for this separate discussion is the NN4 LAYER element and its associated object. What makes this discussion awkward is that the LAYER element and object became dead-end entities that never made it into the W3C standards process. NN6 instead has adopted the W3C standards for dynamic content, which more closely mimic the way Microsoft implemented its DHTML features starting with IE4. NN6 explicitly does not provide backward compatibility with scripted LAYER element objects, which also means that you must rewrite legacy applications to work in NN6.

That leaves an ungainly task in this chapter to create a bridge between the LAYER element and the more modern way of working with elements that can be positioned on the page, flown across the page, stacked in front of other elements, or hidden from view. The IE4+ and NN6 way to accomplish all of this is through CSS style sheets and the scripting thereof. In years to come, the NN4 LAYER element will be only a distant memory. Until then, we must acknowledge it and understand how to work the same magic with style sheets. To that end, this chapter provides details on both the NN4 layer object and the comparable syntax for using IE4+ and NN6 style sheets to get and set properties or invoke methods. Chapter 48 applies these techniques in some DHTML applications.

What Is a Layer?

Terminology in the area of positioned elements has become a bit confusing over time. Because NN4 was the earliest browser to be released with positioned elements (the LAYER element), the term *layer* became synonymous with any positioned element. When IE4 came on the scene, it was convenient to call a style sheet-positioned element (in other words, an element governed by a style sheet rule with the `position` attribute) a *layer* as a generic term for any positioned element. In fact, NN4 even treated an element that was positioned through style sheets as if it were a genuine layer object (although with some minor differences).

In the end, the layer term made good sense because no matter how it was achieved, a positioned element acted like a layer in front of the body content of a page. Perhaps you have seen how animated cartoons were created before computer animation changed the art. Layers of clear acetate sheets were assembled atop a static background. Each sheet contained one character or portion of a character. When all the sheets were carefully positioned atop each other, the view (as captured by a still camera) formed a composite frame of the cartoon. To create the next frame of the cartoon, the artist moved one of the layers a fraction of an inch along its intended path and then took another picture.

If you can visualize how that operation works, you have a good starting point for understanding how layers work. Each layer contains some kind of HTML content that exists in its own plane above the main document that loads in a window. You can change or replace the content of an individual layer on the fly without affecting the other layers; you can also reposition, resize, or hide the entire layer under script control.

One aspect of layers that goes beyond the cartoon analogy is that a layer can contain other layers. When that happens, any change that affects the primary layer — such as moving the layer 10 pixels downward — also affects the layers nested inside. It's as if the nested layers are passengers of the outer layer. When the outer layer goes somewhere, the passengers do, too. And yet, within the "vehicle," the passengers may change seats by moving around without regard for what's going on outside.

With this analogy in mind, many commercial DHTML development tools and content authors refer to positioned elements as layers, which you can move, resize, stack, and hide independently of the body background. Therefore, references throughout this book to layers may mean anything from the NN4 layer object to an element positioned by way of style sheets.

NN4 Layer Object

Properties	*Methods*	*Event Handlers*
`above`	`captureEvents()`	`onBlur`
`background`	`handleEvent()`	`onFocus`
`below`	`load()`	`onLoad`
`bgcolor`	`moveAbove()`	`onMouseOut`
`clip.bottom`	`moveBelow()`	`onMouseOver`
`clip.left`	`moveBy()`	
`clip.right`	`moveTo()`	

Properties	Methods	Event Handlers
`clip.top`	`moveToAbsolute()`	
`document`	`releaseEvents()`	
`left`	`resizeBy()`	
`name`	`resizeTo()`	
`pageX`	`routeEvent()`	
`pageY`		
`parentLayer`		
`siblingAbove`		
`siblingBelow`		
`src`		
`top`		
`visibility`		
`zIndex`		

Syntax

Accessing layer object properties or methods:

```
[window.]document.layerName.[document.layerName. ...] property |
method([parameters])
[window.]document.layers[index].[document.layerName. ...]property |
method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

About this object

You can create a layer object in NN4 in one of three ways. The first two ways use NN4-only syntax: the `<LAYER>` tag in HTML and the `new Layer()` constructor in JavaScript. The tag offers numerous attributes that establish the location, stacking order, and visibility. These attributes, in turn, become scriptable properties. If you create the layer through the constructor, you then use JavaScript to assign values to the object's properties.

The third way to create an NN4 layer object is to assign an absolute-positioned style sheet rule to a block-level element — most typically a DIV element. This is the way that IE4+ and NN6 do it, too. In practice, however, a positioned DIV element is not as robust (from rendering and scriptability standpoints) in NN4 as a genuine LAYER element. Therefore, it is sometimes necessary to branch a page's code to use `document.write()` for a `<LAYER>` tag in NN4 and a `<DIV>` tag in IE4+ and NN6.

Layer references

The task of assembling JavaScript references to NN4 layers and the objects they contain resembles the same process for framesets (in fact, conceptually, a layer is like a dynamically movable and resizable free-floating frame). Therefore, before you start writing the reference, you must know the relationship between the document *containing* the script and the target of the reference.

To demonstrate how this works, I start with a script in the base document loaded into a window that needs to change the background color (`bgColor` property) of a layer defined in the document. The skeletal HTML is as follows:

```
<HTML>
<HEAD>
</HEAD>
<BODY>
<LAYER NAME="Flintstones" SRC="flintstonesFamily.html">
</LAYER>
</BODY>
</HTML>
```

From a script in the Head section, the statement that changes the layer's `bgColor` property is this:

```
document.Flintstones.bgColor = "yellow"
```

This syntax looks like the way you address any object in a document, such as a link or image. However, things get tricky in that each layer automatically contains a `document` object of its own. That `document` object is what holds the content of the layer. Therefore, if you want to inspect the `lastModified` property of the HTML document loaded into the layer, use this statement:

```
var modDate = document.Flintstones.document.lastModified
```

The situation gets more complex if the layer has another layer nested inside it (one of those "passengers" that goes along for the ride). If the structure changes to

```
<HTML>
<HEAD>
</HEAD>
<BODY>
<LAYER NAME="Flintstones" SRC="flintstonesFamily.html">
    <LAYER NAME="Fred" SRC="fredFlintstone.html"></LAYER>
    <LAYER NAME="Wilma" SRC="wilmaFlintstone.html"></LAYER>
</LAYER>
</BODY>
</HTML>
```

references to items in the second level of layers get even longer. For example, to get the `lastModified` property of the `fredFlintstone.html` file loaded into the nested `Fred` layer, use this reference from the Head script:

```
document.Flintstones.document.Fred.document.lastModified
```

The reason for this is that NN4 does not have a shortcut access to every layer defined in a top-level document. As stated in the description of the `document.layers` property in Chapter 18, the property reflects only the first level of layers defined in a document. You must know the way to San Jose if you want to get its lastModified property.

Layers and forms

Because each layer has its own document, you cannot spread a form across multiple layers. Each layer's document must define its own <FORM> tags. If you need to submit one form from content located in multiple layers, one of the forms should have an onSubmit event handler to harvest all the related form values and place them in hidden input fields in the document containing the submitted form. In this case, you need to know how to devise references from a nested layer outward.

As a demonstration of reverse-direction references, I start with the following skeletal structure that contains multiple nested layers:

```
<HTML>
<HEAD>
</HEAD>
<BODY>
<FORM NAME="personal">
    <INPUT TYPE="text" NAME="emailAddr">
</FORM>
<LAYER NAME="product" SRC="ultraGizmoLine.html">
    <LAYER NAME="color" SRC="colorChoice.html"></LAYER>
    <LAYER NAME="size" SRC="sizeChoice.html"></LAYER>
    <LAYER NAME="sendIt" SRC="submission.html"></LAYER>
</LAYER>
</BODY>
</HTML>
```

Each of the HTML files loaded into the layers also has a <FORM> tag defining some fields or select lists for relevant user choices, such as which specific model of the UltraGizmo line is selected, what color, and in what size. (These last two are defined as separate layers because their positions are animated when they are displayed.) The assumption here is that the Submit button is in the sendIt layer. That layer's document also includes hidden input fields for data to be pulled from the main document's form and three other layer forms. Two of those layers are at the same nested level as sendIt, one is above it, and the main document's form is at the highest level.

To reach the value property of a field named theColor in the color layer, a script in the sendIt layer uses this reference:

```
parentLayer.document.color.document.forms[0].theColor.value
```

Analogous to working with frames, the reference starts with a reference to the next higher level (parentLayer) and then starts working its way down through the parent layer's document, the color layer, the color layer's document, and finally the form therein.

To reach the value property of a field named modelNum in the product layer, the reference starts the same way; but because the form is at the parent layer level, the reference goes immediately to that layer's document and form:

```
parentLayer.document.forms[0].modelNum.value
```

It may seem odd that a reference to an object at a different layer level is shorter than one at the same level (for example, the `color` layer), but the route to the parent layer is shorter than going via the parent layer to a sibling. Finally, to reach the value of the `emailAddr` field in the base document, the reference must ratchet out one more layer as follows:

```
parentLayer.parentLayer.document.forms[0].emailAddr.value
```

The two `parentLayer` entries step the reference out two levels, at which point the scope is in the base layer containing the main document and its form.

Layers and tables

The document-centered nature of NN4 layers also makes it difficult — if not impossible at times — to incorporate them inside tables. Even defining a layer that is contained by a TD table cell can cause countless problems.

If you need to have absolute-positioned elements that look as though they are part of a table, I suggest you define the layers as freestanding elements outside of the table. After that, you can position the layers to make them look like they live in the table. You may also need to create empty placeholders in your table to make room for the overlaid layer. You can do this by way of a relative-positioned element inside the table cell whose visibility is hidden. This allows the element to flow as the page loads to accommodate the current browser window dimensions. Scripts can then read the location of the relative-positioned element and use those coordinates to move the absolute-positioned elements that are to overlay the hidden elements.

Properties

above
below
siblingAbove
siblingBelow

Value: Layer object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Each layer object is its own physical layer. Given that the variables x and y traditionally represent width and height, the third dimension — the position of a layer relative to the stack of layers — is called the *z-order*. Layer orders are assigned automatically according to the loading order, with the highest number being the topmost layer. That topmost layer is the one closest to you as you view the page on the monitor.

If two layers are on a page, one layer must always be in front of the other even if they both appear to be transparent and visually overlap each other. Knowing which layer is above the other is important for scripting purposes, especially if your script needs to reorder the layering in response to user action. Layer objects have four properties to help you determine the layers adjacent to a particular layer.

The first pair of properties, `layerObject.above` and `layerObject.below`, takes a global look at all layers defined on the page regardless of the fact that one layer may contain any number of nested layers separate from other batches on the screen. If a layer lies above the one in question, the property contains a reference to that other layer; if no layer exists in that direction, then the value is `null`. Attempts to retrieve properties of a nonexistent layer result in runtime scripting errors indicating that the object does not have properties (of course not — an object must exist before it can have properties).

To understand these two properties better, consider a document that contains three layers (in any nesting arrangement you like). The first layer to be defined is on the bottom of the stack. It has a layer above it, but none below it. The second layer in the middle has a layer both above and below it. And the topmost layer has a layer only below it, with no more layers above it (that is, coming toward your eye).

Another pair of properties, `layerObject.siblingAbove` and `layerObject.siblingBelow`, confines itself to the group of layers inside a parent layer container. Just as in real family life, siblings are descended from (teens might say "contained by") the same parent. An only child layer has no siblings, so both the `layerObject.siblingAbove` and `layerObject.siblingBelow` values are `null`. For two layers from the same parent, the first one to be defined has a sibling layer above it; the other has a sibling layer below it.

It is important to understand the difference between absolute layering and sibling layering to use these properties correctly. A nested layer might be the fifth layer from the bottom among all layers on the page but at the same time be the first layer among siblings within its family group. As you can see, these two sets of properties enable your script to be very specific about the relationships under examination.

Positioned objects in IE4+ and NN6 have no comparable properties to the four described in this section.

On the CD-ROM

Example (with Listing 31-1) on the CD-ROM

Related Items: `layer.parentLayer property`; `layer.moveAbove()`, `layer.moveBelow()` methods.

background

Value: Image object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

You can assign a background image to a layer. The `BACKGROUND` attribute of the `<LAYER>` tag usually sets the initial image, but you can assign a new image whenever you like via the `layerObject.background` property.

Layer background images are typically like those used for entire Web pages. They tend to be subtle—or at least of such a design and color scheme as not to distract from the primary content of the layer. On the other hand, the background image may in fact be the content. If so, then have a blast with whatever images suit you.

The value of the `layerObject.background` property is an image object (see Chapter 22). To change the image in that property on the fly, you must set the `layerObject.background.src` property to the URL of the desired image (just like changing `document.imageName.src` on the fly). You can remove the background image by setting the `layerObject.background.src` property to `null`. Background images smaller than the rectangle of the layer repeat themselves, just like document background pictures; images larger than the rectangle clip themselves to the rectangle of the layer rather than scaling to fit.

The IE4+ and NN6+ way of handling background images is through the `style.backgroundImage` property.

On the CD-ROM

Example (with Listing 31-2) on the CD-ROM

Related Items: `layer.bgColor` property; `image` object.

bgColor

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

A layer's background color fills the entire rectangle with the color set in the `<LAYER>` tag or from a script at a later time. Color values are the same as for document-related values; they may be in the hexadecimal triplet format or in one of the plain-language color names. You can turn a layer transparent by setting its `bgColor` property to `null`.

You control the corresponding behavior in IE4+ and NN6+ via the `style.backgroundColor` property.

On the CD-ROM

Example (with Listing 31-3) on the CD-ROM

Related Items: `layer.background` property; `layer.onMouseOver` event handler.

clip

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The *layerObject*.clip property is an object (the only one in NN4's document object model that exposes itself as a rectangle object) with six geographical properties defining the position and size of a rectangular area of a layer visible to the user. Those six properties are

✦ clip.top

✦ clip.left

✦ clip.bottom

✦ clip.right

✦ clip.width

✦ clip.height

The unit of measure is pixels, and the values are relative to the top-left corner of the layer object.

A clip region can be the same size as or smaller than the layer object. If the CLIP attribute is not defined in the <LAYER> tag, the clipping region is the same size as the layer. In this case, the clip.left and clip.top values are automatically zero because the clip region starts at the very top-left corner of the layer's rectangle (measurement is relative to the layer object whose clip property you're dealing with). The height and width of the layer object are not available properties in NN4. Therefore, you may have to use other means to get that information into your scripts if you need it. (I do it in Listing 31-4.) Also be aware that even if you set the HEIGHT and WIDTH attributes of a layer tag, the content rules the initial size of the visible layer unless the tag also includes specific clipping instructions. Images, for example, expand a layer to fit the HEIGHT and WIDTH attributes of the <IMG> tag; text (either from an external HTML file or inline in the current file) adheres to the <LAYER> tag's WIDTH attribute but flows down as far as necessary to display every character.

Setting a clip property does not move the layer or the content of the layer — only the visible area of the layer. Each adjustment has a unique impact on the apparent motion of the visible region. For example, if you increase the clip.left value from its original position of 0 to 20, the entire left edge of the rectangle shifts to the right by 20 pixels. No other edge moves. Changes to the clip.width property affect only the right edge; changes to the clip.height property affect only the bottom edge. Unfortunately, no shortcuts exist to adjust multiple edges at once. JavaScript is fast enough on most client machines to give the impression that multiple sides are moving if you issue assignment statements to different edges in sequence.

IE4+ and NN6+ have the style.clip property to assist in adjusting the clipping rectangle of a layer. But the W3C DOM's style.clip object does not offer additional subproperties to access individual edges or dimensions of the clipping rectangle. IE5's read-only `currentStyle` object does provide properties for the four edge dimensions. Listing 31-15 demonstrates how to adjust clipping in IE5+ and NN6+ syntax.

On the CD-ROM

Example (with Listing 31-4) on the CD-ROM

Related Items: `layer.pageX`, `layer.pageY` properties; `layer.resizeTo()` method.

document

Value: `document` object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Your scripts practically never have to retrieve the `document` property of a layer. But it is important to remember that it is always there as the actual container of content in the layer. As described at length in the opening section about the layer object, the `document` object reference plays a large role in assembling addresses to content items and properties in other layers. A document inside a layer has the same powers, properties, and methods of the main document in the browser window or in a frame.

Related Items: `document` object.

left
top

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The *`layerObject`*`.left` and *`layerObject`*`.top` properties correspond to the `LEFT` and `TOP` attributes of the `<LAYER>` tag. These integer values determine the horizontal and vertical pixel coordinate point of the top-left corner of the layer relative to the browser window, frame, or parent layer in which it lives. The coordinate system of the layer's most immediate container is the one that these properties reflect.

Adjustments to these properties reposition the layer without adjusting its size. Clipping area values are untouched by changes in these properties. Thus, if you create a draggable layer object that needs to follow a dragged mouse pointer in a straight line along the x or y axis, it is more convenient to adjust one of these properties than to use the *layerObject*.moveTo() method.

IE4+ and NN6+ provide various properties to determine the coordinate location of a positioned element — all through the style object.

On the CD-ROM

Example (with Listing 31-5) on the CD-ROM

Related Items: layer.clip, layer.parentLayer properties.

name

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The *layerObject*.name property reflects the NAME attribute of the <LAYER> tag or name you assign to a positioned DIV or SPAN element. This property is read-only. If you don't assign a name to a layer when you create it, Navigator generates a name for the layer in this format:

```
js_layer_nn
```

Here, *nn* is a serial number. That serial number is not the same every time the page loads, so you cannot rely on the automatically generated name to help you script an absolute reference to the layer.

Related Items: None.

pageX
pageY

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

In Netscape's coordinate terminology, the *page* is the content area of a document. The top-left corner of the page space is point 0,0, and you can position any layer (including a nested layer) on the page relative to this corner. In the <LAYER> tag, the attributes that enable authors to set the position are PAGEX and PAGEY. These values are retrievable and modifiable as the *layerObject*.pageX and *layerObject*.pageY properties, respectively. Note the capitalization of the final letters of these property names.

The `layerObject.pageX` and `layerObject.pageY` values are identical to `layerObject.left` and `layerObject.top` only when the layer in question is at the main document level. That's because the `layerObject.left` and `layerObject.top` values are measured by the next higher container's coordinate system — which, in this case, is the same as the page.

The situation gets more interesting when you're dealing with nested layers. For a nested layer, the `layerObject.pageX` and `layerObject.pageY` values are still measured relative to the page, while `layerObject.left` and `layerObject.top` are measured relative to the next higher layer. If trying to conceive of these differences makes your head hurt, the example in Listing 31-6 should help clear things up for you.

Adjusting the `layerObject.pageX` and `layerObject.pageY` values of any layer has the same effect as using the `layerObject.moveToAbsolute()` method, which measures its coordinate system based on the page. If you create flying layers on your page, you can't go wrong by setting the `layerObject.pageX` and `layerObject.pageY` properties (or using the `moveToAbsolute()` method) in your script. That way, should you add another layer in the hierarchy between the base document and the flying layer, the animation is in the same coordinate system as before the new layer was added.

IE4+ does not provide a pair of properties to determine the location of a positioned element relative to the page, but the `offsetLeft` and `offsetTop` properties provide coordinates within the element's next outermost positioning context. Thus, you may have to "walk" the `offsetParent` trail to accumulate complete coordinate values. In NN6, the `offsetLeft` and `offsetTop` properties use the page as the positioning context.

On the CD-ROM

Example (with Listing 31-6) on the CD-ROM

Related Items: `layer.left`, `layer.top`, `window.innerHeight`, `window.innerWidth` properties; `layer.moveToAbsolute()` method.

parentLayer

Value: Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Every layer has a parent that contains that layer. In the case of a layer defined at the main document level, its parent layer is the window or frame containing that document (the "page"). For this kind of layer, the `layerObject.parentLayer` property object is a `window` object. But for any nested layer contained by a layer, the `parentLayer` property is a layer object.

Be aware of the important distinction between *layerObject*.parentLayer and *layerObject*.below. As a parent layer can contain multiple layers in the next containment level, each of those layers' parentLayer properties evaluate to that same parent layer. But because each layer object is its own physical layer among the stack of layers on a page, the layer.below property in each layer points to a different object — the layer next lower in z-order.

Keeping the direction of things straight can get confusing. On the one hand, you have a layer's parent, which, by connotation, is higher up the hierarchical chain of layers. On the other hand, the order of physical layers is such that a parent more than likely has a lower z-order than its children because it is defined earlier in the document.

Use the *layerObject*.parentLayer property to assemble references to other nested layers. See the discussion about layer references at the beginning of this chapter for several syntax examples.

IE4+ offers an offsetParent property, which comes close to the functionality of the *layerObject*.parentLayer property.

Related Items: layer.above, layer.below properties.

siblingAbove
siblingBelow

See layer.above and layer.below properties earlier in this chapter.

src

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Content for a layer may come from within the document that defines the layer or from an external source, such as an HTML or image file. If defined by a <LAYER> tag, an external file is specified by the SRC attribute. This attribute is reflected by the *layerObject*.src property.

The value of this property is a string of the URL of the external file. If you do not specify an SRC attribute in the <LAYER> tag, the value returns null. Do not set this property to an empty string in an effort to clear the layer of content: document.write() or load an empty page instead. Otherwise, the empty string is treated like a URL, and it loads the current client directory.

You can, however, change the content of a layer by loading a new source file into the layer. Simply assign a new URL to the *layerObject*.src property. Again, if a layer has nested layers inside it, those nested layers are blown away by the content that loads into the layer whose src property you change. The new file, of course, can be an HTML file that defines its own nested layers, which then become part of the page's object model.

Netscape also provides the *layerObject*.load() method to insert new content into a layer. One advantage of this method is that an optional second parameter enables you to redefine the width of the layer at the same time you specify a new document. But if you are simply replacing the content in the same width layer, you can use either way of loading new content.

Be aware that the height and width of a replacement layer are governed as much by their hard-coded content size as by the initial loading of any layer. For example, if your layer is initially sized at a width of 200 pixels and your replacement layer document includes an image whose width is set to 500 pixels, the layer expands its width to accommodate the larger content — unless you also restrict the view of the layer via the *layerObject*.clip properties. Similarly, longer text content flows beyond the bottom of the previously sized layer unless restricted by clipping properties.

Positioned elements in IE4+ and NN6+ do provide a way to load external content into them. That's what the W3C sees as the purpose of the IFRAME element. Even so, as Listing 31-18 shows, you can script your way around this limitation if it's absolutely necessary.

On the CD-ROM

Example (with Listing 31-7) on the CD-ROM

Related Items: layer.load(), layer.resizeTo() methods.

visibility

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

A layer's visibility property can use one of three settings: show, hide, or inherit — the same values you can assign to the VISIBILITY attribute of the <LAYER> tag. But NN4 also enables you to set the property to hidden and visible, which are the values for the style.visibility property used in IE4+ and NN6+.

Unlike many other layer properties, you can set the visibility property such that a layer can either follow the behavior of its parent or strike out on its own. By default, a layer's visibility property is set to inherit, which means the layer's visibility is governed solely by that of its parent (and of *its* parent, if the nesting includes many layers). When the governing parent's property is, say, hide, the child's property remains inherit. Thus, you cannot tell whether an inheriting layer is presently visible or not without checking up the hierarchy (with the help of the *layerObject*.parentLayer property). However, you can override the parent's behavior by setting the current layer's property explicitly to show or hide. This action does not alter in any way other parent-child relationships between layers.

On the CD-ROM

Example (with Listing 31-8) on the CD-ROM

Related Items: None.

zIndex

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Close relationships exist among the `layerObject.above`, `layerObject.below`, and `layerObject.zIndex` properties. When you define a layer in a document with the `<LAYER>` tag, you can supply only one of the three attributes (`ABOVE`, `BELOW`, and `Z-INDEX`). After the layer is generated with any one of those attributes, the document object model automatically assigns values to at least two of those properties (`layerObject.above` and `layerObject.below`) unless you specify the `Z-INDEX` attribute; in this case, all three properties are assigned to the layer. If you don't specify any of these properties, the physical stacking order of the layers is the same as in the HTML document. The `layerObject.above` and `layerObject.below` properties are set as described in their discussion earlier in this chapter. But the `layerObject.zIndex` properties for all layers are zero.

Note

The CSS attribute is spelled with a hyphen after the "z." Because a JavaScript property name cannot contain a hyphen, the character was removed for the property name. The capital "I" is important because JavaScript properties are case-sensitive.

Changes to `layerObject.zIndex` values affect the stacking order only of sibling layers. You can assign the same value to two layers, but the last layer to have its `layerObject.zIndex` property set lies physically above the other one. Therefore, if you want to ensure a stacking order, set the `zIndex` values for all layers within a container. Each value should be a unique number.

Stacking order is determined simply by the value of the integer assigned to the property. If you want to stack three sibling layers, the order is the same if you assign them the values of 1, 2, 3 or 10, 13, 50. As you modify a `layerObject.zIndex` value, the `layerObject.above` and `layerObject.below` properties for all affected layers change as a result.

Avoid setting `zIndex` property values to negative numbers in NN4. Negative values are treated as their absolute (positive) values for ordering.

For IE4+ and NN6+, the `style.zIndex` property controls z-order.

On the CD-ROM

Example (with Listing 31-9) on the CD-ROM

Related Items: `layer.above`, `layer.below` properties; `layer.moveAbove()`, `layer.moveBelow()` methods.

Methods

load("*URL*", *newLayerWidth*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

One way to change the content of an NN4 layer after it loads is to use the *layerObject*`.load()` method. This method has an advantage over setting the *layerObject*`.src` property because the second parameter is a new layer width for the content if one is desired. If you don't specify the second parameter, a small default value is substituted for you (unless the new document hard-wires widths to its elements that must expand the current width). If you are concerned about a new document being too long for the existing height of the layer, use the *layerObject*`.resizeTo()` method or set the individual *layerObject*`.clip` properties before loading the new document. This keeps the viewable area of the layer at a fixed size.

IE4+ and NN6 object models don't have a method like this, but you can work around the situation (as shown in Listing 31-18) and then adjust the `style.width` property of the positioned element.

On the CD-ROM

Example (with Listing 31-10) on the CD-ROM

Related Item: `layer.src` property.

moveAbove(*layerObject*)
moveBelow(*layerObject*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

With the exception of the *layerObject*`.zIndex` property, the layer object does not let you adjust properties that affect the global stacking order of layers. The *layerObject*`.moveAbove()` and *layerObject*`.moveBelow()` methods enable you to adjust a layer in relation to another layer object. Both layers in the transaction must be siblings — they must be in the same container, whether it be the base document window or some other layer. You cannot move existing layers from one container to another; you must delete the layer from the source and create a new layer in the destination. Neither of these methods affects the viewable size or coordinate system location of the layer.

The syntax for these methods is a little strange at first because the statement that makes these work has two layer object references in it. Named first in the statement (to the left of the method name, separated by a period) is the layer object you want to move. The sole parameter for each method is a reference to the layer object that is the physical reference point for the trip. For example, in this statement,

```
document.fred.moveAbove(document.ginger)
```

the instruction moves the `fred` layer above the `ginger` layer. The `fred` layer can be in any stacking relation to `ginger`; but, again, both layers must be in the same container.

Obviously, after one of these moves, the *layerObject*`.above` and *layerObject*`.below` properties of some or all layers in the container feel the ripple effects of the shift in order. If you have several layers that are out of order because of user interaction with your scripts, you can reorder them using these methods — or, more practically, by setting their *layerObject*`.zIndex` properties. In the latter case, it is easier to visualize through your code how the ordering is handled with increasing `zIndex` values for each layer.

There is no comparable method for IE4+ or NN6.

On the CD-ROM

Example on the CD-ROM

Related Items: `layer.above`, `layer.below`, `layer.zIndex` properties.

moveBy(*deltaX,deltaY*)
moveTo(*x,y*)
moveToAbsolute(*x,y*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Much of what CSS-Positioning is all about is being able to precisely plant an element on a Web page. The unit of measure is the pixel, with the coordinate space starting at an upper-left corner at location 0,0. That coordinate space for a layer is typically the container (parent layer) for that layer. The *layerObject*`.moveTo()` and *layerObject*`.moveBy()` methods let scripts adjust the location of a layer inside that coordinate space — very much the way `window.moveTo()` and `window.moveBy()` work for `window` objects.

Moving a layer entails moving it (and its nested layers) without adjusting its size or stacking order. You can accomplish animation of a layer by issuing a series of *layerObject*.moveTo() methods if you know the precise points along the path. Or you can nudge the layer by increments in one or both axes with the *layerObject*.moveBy() method.

In case you need to position a layer with respect to the page's coordinate system (for example, you are moving items from multiple containers to a common point), the *layerObject*.moveToAbsolute() method bypasses the layer's immediate container. The 0,0 point for this method is the top-left corner of the document. Be aware, however, that you can move a layer to a position such that some or all of it lies out of range of the container's clip rectangle.

Moving positioned layers in IE4+ and NN6 requires adjusting the style.left and style.top properties (or the style.pixelLeft, style.pixelTop, style.posLeft, and style.posTop properties in IE4+).

On the CD-ROM

Example (with Listing 31-11) on the CD-ROM

Related Items: layer.resizeBy(), layer.resizeTo(), window.moveBy(), window.moveTo() methods.

resizeBy(*deltaX,deltaY*)
resizeTo(*width,height*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

The basic functionality and parameter requirements of the *layerObject*.resizeBy() and *layerObject*.resizeTo() methods are similar to the identically named methods of the window object. You should, however, be cognizant of some considerations unique to layers.

Unlike resizing a window, which causes all content to reflow to fit the new size, the layer sizing methods don't adjust the size of the layer. Instead, these methods control the size of the clipping region of the layer. Therefore, the content of the layer does not reflow automatically when you use these methods any more than it does when you change individual *layerObject*.clip values.

Another impact of this clipping region relationship deals with content that extends beyond the bounds of the layer. For example, if you provide HEIGHT and WIDTH attributes to a <LAYER> tag, content that requires more space to display itself than those attribute settings afford automatically expands the viewable area of the layer. To rein in such runaway content, you can set the CLIP attribute. But because the layer resize methods adjust the clipping rectangle, outsized content doesn't overflow the <LAYER> tag's height and width settings. This may be beneficial for you or not, depending on your design intentions. Adjusting the size of a layer with either method affects only the position of the right and bottom edges of the layer. The top-left location of the layer does not move.

Neither IE4+ nor NN6 provides a similar method, but you can accomplish the same effects by adjusting the `style` properties of a positioned element.

On the CD-ROM

Example (with Listings 31-12a and 31-12b) on the CD-ROM

Related Items: `layer.moveBy()`, `layer.moveTo()`, `window.resizeBy()`, `window.resizeTo()` methods.

Event handlers

onBlur
onFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

A user gets no visual cue when a layer receives focus. But a click on the clipping region of a layer triggers a `focus` event that can be handled with an `onFocus` event handler. Clicking anywhere on the page outside of that layer area fires a `blur` event. Changing the stacking order of sibling layers does not fire either event unless mouse activity occurs in one of the layers.

If your layer contains elements that have their own `focus` and `blur` events (such as text fields), those objects' event handlers still fire even if you also have the same event handlers defined for the layer. The layer's events fire after the text field's events.

Unlike comparable event handlers in windows, layer events for `blur` and `focus` do not have companion methods to bring a layer into focus or to blur it. However, if you use the `focus()` and/or `blur()` methods on applicable form elements in a layer, the layer's corresponding event handlers are triggered as a result.

Related Items: `textbox.blur()`, `textbox.focus()` methods.

onLoad

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Scripting layers can sometimes lead to instances of unfortunate sequences of loading. For example, if you want to set some layer object properties via a script (that is, not in the `<LAYER>` tag), you can do so only after the layer object exists in the document object model. One way to make sure the object exists is to place the scripting in `<SCRIPT>` tags at the end of the document. Another way is to specify an `onLoad` event handler in the tag, as shown in Listing 31-12a.

Each time you load a document into the layer — either via the `SRC` attribute in the `<LAYER>` tag or by invoking the *layerObject*`.load()` method — the `onLoad` event handler runs. But also be aware that an interaction occurs between a layer's `onLoad` event handler and an `onLoad` event handler in the `<BODY>` tag of a document loaded into a layer. If the document body has an `onLoad` event handler, then the layer's `onLoad` event handler does not fire. You get one or the other, but not both.

Related Item: `window.onLoad` event handler.

onMouseOut
onMouseOver

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

A layer knows when the cursor rolls into and out of its clipping region. Like several other objects in the document object model, the layer object has `onMouseOver` and `onMouseOut` event handlers that enable you to perform any number of actions in response to those user activities. Typically, a layer's `onMouseOver` event handler changes colors, hides, or shows pseudo-borders devised of colored layers behind the primary layer; sometimes, it even changes the text or image content. The statusbar is also available to plant plain-language legends about the purpose of the layer or offer other relevant help.

Both events occur only once per entrance to, and egress from, a layer's region by the cursor. If you want to script actions dependent upon the location of the cursor in the layer, you can use *layerObject*`.captureEvents()` to grab `mouseMove` and all types of mouse button events. This kind of event capture generates an `event` object (see Chapter 29) that includes information about the coordinate position of the cursor at the time of the event.

Related Items: `link.onMouseOut`, `link.onMouseOver`, `area.onMouseOut`, `area.onMouseOver` event handlers.

Positioned Elements in the Modern DOM

With the dwindling NN4 installed base, you can focus on applying "layer" techniques in browsers whose object models expose every element of an object and whose rendering engines automatically reflow content in response to changes. This section follows the sequence of examples in the discussion about NN4's layer object but shows you how to accomplish the same operations and learn the behavior of positioned elements in IE4+ and NN6+.

An important facet that these newer browsers have in common is the `style` property of every renderable element object. Most adjustments to the location, layering, size, and visibility of positioned elements use the `style` object associated with each element. Cross-browser complications ensue, however, with some aspects of nested layers. Plus, there is the ever-present difference between the IE- and NN-class browsers with respect to the event objects — how to reference the `event` object and the names of its properties. Some of the examples that follow have more code in them than their corresponding NN4 layer version shown earlier in this chapter. Most of the additional code concerns itself with accommodating the different event object models.

One more point about the following examples: The syntax adopted for references to element objects uses the W3C DOM `document.getElementById()` method, which is supported in IE5+ and NN6. If you intend to apply any of the techniques in these examples to applications that run exclusively in an IE environment (and must be compatible with IE4), you can substitute the `document.all` referencing syntax. Conversely, you can employ the `document.all` equalization routine shown in Chapter 14 to let IE4+ and NN6 use `document.all` references.

Changing element backgrounds

Listing 31-13 demonstrates the syntax and behavior of setting background images via the `style.backgroundImage` property. Note the CSS-style syntax for the URL value assigned to the `style.backgroundImage` property. It's a good lesson to learn that most `style` properties are strings, and their values are in the same format as the values normally assigned in a style sheet definition.

Removing a background image requires setting the URL to `null`. Also, a background image overlays whatever color (if any) you assign to the element. If the background image has transparent regions, the background color shows through.

Listing 31-13: **Setting Layer Backgrounds (W3C)**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setBg(URL) {
    document.getElementById("bgExpo").style.backgroundImage = "url(" + URL + ")"
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Layer Backgrounds (W3C)</H1>
<HR>
<DIV ID="buttons" STYLE="position:absolute; top:100">
<FORM>
<INPUT TYPE="button" VALUE="The Usual" onClick="setBg('cr_kraft.gif')"><BR>
<INPUT TYPE="button" VALUE="A Big One" onClick="setBg('arch.gif')"><BR>
<INPUT TYPE="button" VALUE="Not So Usual" onClick="setBg('wh86.gif')"><BR>
<INPUT TYPE="button" VALUE="Decidedly Unusual" onClick="setBg('sb23.gif')"><BR>
<INPUT TYPE="button" VALUE="Quick as..." onClick="setBg('lightnin.gif')"><P>
<INPUT TYPE="button" VALUE="Remove Image" onClick="setBg(null)"><BR>
</FORM>
</DIV>
```

Continued

Listing 31-13 *(continued)*

```
<DIV ID="bgExpo" STYLE="position:absolute; top:100; left:250; width:300;
height:260; background-color:gray" >
<SPAN STYLE="font-weight:bold; color:white">Some text, which may or may not read
well with the various backgrounds.</SPAN>
</DIV>
</BODY>
</HTML>
```

Listing 31-14 focuses on background color. A color palette is laid out as a series of rectangles. As the user rolls atop a color in the palette, the color is assigned to the background of the layer. Because of the regularity of the DIV elements generated for the palette, this example uses scripts to dynamically write them to the page as the page loads. This lets the `for` loop handle all the positioning math based on initial values set as global variables.

Perhaps of more interest here than the background color setting is the event handling. First of all, because the target browsers all employ event bubbling, the page lets a single event handler at the document level wait for `mouseover` events to bubble up to the document level. But because the `mouseover` event of every element on the page bubbles there, the event handler must filter the events and process only those on the palette elements.

The `setColor()` method begins by equalizing the IE4+ and NN6 event object models. If an object is assigned to the `evt` parameter variable, then that means the NN6 browser is processing the event; otherwise, it's IE4+ — meaning that the `window.event` object contains the event information. Whichever browser performs the processing, the event object is assigned to the `evt` variable. After verifying that a valid event triggered the function, the next step is to equalize the different, event-model-specific property names for the event's target element. For NN6, the property is `target`, while IE4+ uses `srcElement`. The final validation is to check the `className` property of the event's target element. Because all elements acting as palette colors share the same `CLASS` attribute, the `className` property is examined. If the value is `palette`, then the `mouseover` event has occurred on one of the colors. Now it's time to extract the target element's `style.backgroundColor` property and assign that color to the same property of the main positioned element.

Listing 31-14: **Layer Background Colors (W3C)**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setColor(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    if (evt) {
        var elem = (evt.target) ? evt.target : evt.srcElement
        if (elem.className == "palette") {
```

```
            document.getElementById("display").style.backgroundColor =
elem.style.backgroundColor
        }
    }
}
document.onmouseover = setColor
</SCRIPT>
</HEAD>
<BODY>
<H1>Layer Background Colors (W3C)</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
var oneLayer
var colorTop = 100
var colorLeft = 20
var colorWidth = 40
var colorHeight = 40
var colorPalette = new Array("aquamarine","coral","forestgreen",
                   "goldenrod","red","magenta","navy","teal")
for (var i = 0; i < colorPalette.length; i++) {
    oneLayer = "<DIV ID='swatch" + i + "' CLASS='palette'"
    oneLayer += "STYLE='position:absolute; top:" + colorTop + ";"
    oneLayer += "left:" + ((colorWidth * i) + colorLeft) + ";"
    oneLayer += "width:" + colorWidth + "; height:" + colorHeight + ";"
    oneLayer += "background-color:" + colorPalette[i] + "'></DIV>\n"
    document.write(oneLayer)
}
</SCRIPT>
<DIV ID="display" STYLE="position:absolute; top:150; left:80; width:200;
height:200; background-color:gray">
<SPAN STYLE="font-weight:bold; color:white; text-align:center">
Some reversed text to test against background colors.</SPAN>
</DIV>
</BODY>
</HTML>
```

Layer clipping

Working with clipping rectangles is a bit cumbersome using CSS syntax because the object model standard does not provide separate readouts or controls over individual edges of a clipping rectangle. IE5+ enables you to read individual edge dimensions via the `currentStyle` object (for example, `currentStyle.clipTop`), but these properties are read-only. NN6 has not connected all the pieces of W3C DOM Level 2 that expose individual edges of a clipping rectangle yet.

Based on these limitations, Listing 31-15 is implemented in a way that, for the sake of convenience, preserves the current clipping rectangle edge values as global variables. Any adjustments to individual edge values are first recorded in those variables (in the `setClip()` function), and then the `style.clip` property is assigned the long string of values in the required format (in the `adjustClip()` function). The `showValues()` function reads the variable values and displays updated values after making the necessary calculations for the width and height of the clipping rectangle.

As a demonstration of a "reveal" visual effect (which you can carry out more simply in IE4+/Windows via a transition filter), the `revealClip()` function establishes beginning clip values at the midpoints of the width and height of the layer. Then the `setInterval()` method loops through `stepClip()` until the clipping rectangle dimensions match those of the layer.

Listing 31-15: Adjusting Layer Clip Properties (W3C)

```
<HTML>
<HEAD>
<TITLE>Layer Clip</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var origLayerWidth = 0
var origLayerHeight = 0
var currTop, currRight, currBottom, currLeft
function init() {
    origLayerWidth = parseInt(document.getElementById("display").style.width)
    origLayerHeight = parseInt(document.getElementById("display").style.height)
    currTop = 0
    currRight = origLayerWidth
    currBottom = origLayerHeight
    currLeft = 0
    showValues()
}

function setClip(field) {
    var val = parseInt(field.value)
    switch (field.name) {
        case "top" :
            currTop = val
            break
        case "right" :
            currRight = val
            break
        case "bottom" :
            currBottom = val
            break
        case "left" :
            currLeft = val
            break
        case "width" :
            currRight = currLeft + val
            break
        case "height" :
            currBottom = currTop + val
            break
    }
    adjustClip()
    showValues()
}

function adjustClip() {
    document.getElementById("display").style.clip = "rect(" + currTop + "px " +
    currRight + "px " + currBottom + "px " + currLeft + "px)"
}
```

```
function showValues() {
    var form = document.forms[0]
    form.top.value = currTop
    form.right.value = currRight
    form.bottom.value = currBottom
    form.left.value = currLeft
    form.width.value = currRight - currLeft
    form.height.value = currBottom - currTop
}
var intervalID
function revealClip() {
    var midWidth = Math.round(origLayerWidth /2)
    var midHeight = Math.round(origLayerHeight /2)
    currTop = midHeight
    currBottom = midHeight
    currRight = midWidth
    currLeft = midWidth
    intervalID = setInterval("stepClip()",1)
}
function stepClip() {
    var widthDone = false
    var heightDone = false
    if (currLeft > 0) {
        currLeft += -2
        currRight += 2
    } else {
        widthDone = true
    }
    if (currTop > 0) {
        currTop += -1
        currBottom += 1
    } else {
        heightDone = true
    }
    adjustClip()
    showValues()
    if (widthDone && heightDone) {
        clearInterval(intervalID)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>Layer Clipping Properties (W3C)</H1>
<HR>
Enter new clipping values to adjust the visible area of the layer.<P>
<DIV STYLE="position:absolute; top:130">
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right">layer.style.clip (left):</TD>
    <TD><INPUT TYPE="text" NAME="left" SIZE=3 onChange="setClip(this)"></TD>
</TR>
```

Continued

Listing 31-15 *(continued)*

```
<TR>
    <TD ALIGN="right">layer.style.clip (top):</TD>
    <TD><INPUT TYPE="text" NAME="top" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (right):</TD>
    <TD><INPUT TYPE="text" NAME="right" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (bottom):</TD>
    <TD><INPUT TYPE="text" NAME="bottom" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (width):</TD>
    <TD><INPUT TYPE="text" NAME="width" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (height):</TD>
    <TD><INPUT TYPE="text" NAME="height" SIZE=3 onChange="setClip(this)"></TD>
</TR>
</TABLE>
<INPUT TYPE="button" VALUE="Reveal Original Layer" onClick="revealClip()">
</FORM>
</DIV>
<DIV ID="display" STYLE="position:absolute; top:130; left:220; width:360;
height:180; clip:rect(0px 360px 180px 0px); background-color:coral">
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</DIV>
</BODY>
</HTML>
```

Listing 31-16 enables you to compare the results of adjusting a clipping rectangle versus the size of a positioned element. This example goes a bit further than the corresponding NN4 layer version (Listing 31-5) in that it enables you to adjust the dimensions of the entire layer (via the `style.left` and `style.right` properties) as well as the right and bottom edges of the clipping rectangle associated with the layer. As a bonus, the code includes a function that converts the `style.clip` string into an object representing the rectangle of the clipping rectangle (in other words, with four properties, one for each edge). Values from that `rectangle` object populate two of the fields on the page, providing dynamic readouts of the clipping rectangle's right and bottom edges.

Global variables still temporarily store the clipping rectangle values so that the adjustClip() function can operate just as it does in Listing 31-15. Note that the clipping rectangle is explicitly defined in the style sheet rule for the positioned element. This is necessary for the element's style.clip property to have some values with which to start.

Listing 31-16: Comparison of Layer and Clip Location Properties (W3C)

```
<HTML>
<HEAD>
<TITLE>Layer vs. Clip</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var currClipTop = 0
var currClipLeft = 0
var currClipRight = 360
var currClipBottom = 180
function setClip(field) {
    var val = parseInt(field.value)
    switch (field.name) {
        case "clipBottom" :
            currClipBottom = val
            break
        case "clipRight" :
            currClipRight = val
            break
    }
    adjustClip()
    showValues()
}
function adjustClip() {
    document.getElementById("display").style.clip = "rect(" + currClipTop +
    "px " + currClipRight + "px " + currClipBottom + "px " + currClipLeft +
    "px)"
}

function setLayer(field) {
    var val = parseInt(field.value)
    switch (field.name) {
        case "width" :
            document.getElementById("display").style.width = val + "px"
            break
        case "height" :
            document.getElementById("display").style.height = val + "px"
            break
    }
    showValues()
}
function showValues() {
    var form = document.forms[0]
```

Continued

Listing 31-16 *(continued)*

```
    var elem = document.getElementById("display")
    var clipRect = getClipRect(elem)
    form.width.value = parseInt(elem.style.width)
    form.height.value = parseInt(elem.style.height)
    form.clipRight.value = clipRect.right
    form.clipBottom.value = clipRect.bottom
}
// convert clip property string to an object
function getClipRect(elem) {
    var clipString = elem.style.clip
    // assumes "rect(npx, npx, npx, npx)" form
    // get rid of "rect("
    clipString = clipString.replace(/rect\(/,"")
    // get rid of "px)"
    clipString = clipString.replace(/px\)/,"")
    // get rid of remaining "px" strings
    clipString = clipString.replace(/px/g,",")
    // turn remaining string into an array
    clipArray = clipString.split(",")
    // make object out of array values
    var clipRect = {top:parseInt(clipArray[0]), right:parseInt(clipArray[1]),
    bottom:parseInt(clipArray[2]), left:parseInt(clipArray[3])}
    return clipRect
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<H1>Layer vs. Clip Dimension Properties (W3C)</H1>
<HR>
Enter new layer and clipping values to adjust the layer.<P>
<DIV STYLE="position:absolute; top:130">
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right">layer.style.width:</TD>
    <TD><INPUT TYPE="text" NAME="width" SIZE=3 onChange="setLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.height:</TD>
    <TD><INPUT TYPE="text" NAME="height" SIZE=3 onChange="setLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (right):</TD>
    <TD><INPUT TYPE="text" NAME="clipRight" SIZE=3
onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.style.clip (bottom):</TD>
    <TD><INPUT TYPE="text" NAME="clipBottom" SIZE=3
onChange="setClip(this)"></TD>
</TR>
</TABLE>
```

```
</FORM>
</DIV>
<DIV ID="display" STYLE="position:absolute; top:130; left:250; width:360;
height:180; clip:rect(0px, 360px, 180px, 0px); background-color:coral">
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</DIV>
</BODY>
</HTML>
```

Scripting nested layers

Working with nested layer locations, especially in a cross-browser manner, presents numerous browser-specific syntax problems that need equalization to behave the same to all users. Some discrepancies even appear between Windows and Macintosh versions of IE.

The scenario for Listing 31-17 consists of one positioned layer (greenish) nested inside another (reddish). The inner layer is initially sized and positioned so that the outer layer extends five pixels in each direction. Text boxes enable you to adjust the coordinates for either layer relative to the entire page as well as the layer's positioning context. If you make a change to any one value, all the others are recalculated and displayed to show you the effect the change has on other coordinate values.

As you see when you load the page, the outer element's positioning context is the page, so the "page" and "container" coordinates are the same (although the calculations to achieve this equality are not so simple across all browsers). The inner layer's initial page coordinates are to the right and down five pixels in each direction, and the coordinates within the container show those five pixels.

Because of browser idiosyncrasies, calculating the coordinates within the page takes the most work. The `getGrossOffsetLeft()` and `getGrossOffsetTop()` functions perform those calculations in the page. Passed a reference to the positioned element to be measured, the first number to grab is whatever the browser returns as the `offsetLeft` or `offsetTop` value of the element (see Chapter 15). These values are independent of the `style` property, and they can report different values for different browsers. IE, for example, measures the offset with respect to whatever it determines as the next outermost positioning context. NN6, on the other hand, treats the page as the positioning context regardless of nesting. So, as long as there is an `offsetParent` element, a `while` loop starts accumulating the `offsetLeft` measures of each succeeding offset parent element going outward from the element. But even before that happens, a correction for IE/Macintosh must be accounted for. If there is a difference between the `style.left` and `offsetLeft` property values of an element, that difference is added to the offset. In IE5/Mac, for example, failure to correct this results in the "page" and "container" values of the outer layer being 10 pixels different in each direction. Values returned from these two gross measures are inserted in the readouts for the "page" measures of both inner and outer elements.

Reading the coordinates relative to each element's "container" is easy: The `style.left` and `style.top` properties have the correct values for all browsers. Moving a layer with respect to its positioning context (the "container" values) is equally easy: assign the entered values to the same `style.left` and `style.top` properties.

Moving the layers with respect to the page coordinate planes (via the `setOuterPage()` and `setInnerPage()` functions) involves going the long way to assign values that take each browser's positioning idiosyncrasies into account. The way you move a positioned element (cross-browser, anyway) is to assign a value to the `style.left` and `style.top` properties. These values are relative to their positioning context, but NN6 doesn't offer any shortcuts to reveal what element is the positioning context for a nested element. Calls to the `getNetOffsetLeft()` and `getNetOffsetTop()` functions do the inverse of the `getGrossOffsetLeft()` and `getGrossOffsetTop()` functions. Because the values received from the text box are relative to the entire page, the values must have any intervening positioning contexts subtracted from that value in order to achieve the net positioning values that can be applied to the `style.left` and `style.top` properties. To get there, however, a call to the `getParentLayer()` function cuts through the browser-specific implementations of container references to locate the positioning context so that its coordinate values can be subtracted properly. The same kind of correction for IE/Mac is required here as in the gross offset calculations; but here, the correction is subtracted from the value that eventually is returned as the value for either the `style.left` or `style.top` of the layer.

Let me add one quick word about the condition statements of the `while` constructions in the `getNetOffsetLeft()` and `getNetOffsetTop()` functions. You see here a construction not used frequently in this book, but one that is perfectly legal. When the conditional expression evaluates, the `getParentLayer()` method is invoked, and its returned value is assigned to the `elem` variable. That expression evaluates to the value returned by the function. As you can see from the `getParentLayer()` function definition, a value is returned as either an element reference or `null`. The `while` condition treats a value of `null` as `false`; any reference to an object is treated as `true`. Thus, the conditional expression does not use a comparison operator but rather executes some code and branches based on the value returned by that code. NN6 reports JavaScript warnings (not errors) for this construction because it tries to alert you to a common scripting bug that occurs when you use the = operator when you really mean the == operator. But an NN6 warning is not the same as a script error, so don't be concerned when you see these messages in the JavaScript Console window during your debugging.

Listing 31-17: **Testing Nested Layer Coordinate Systems (W3C)**

```
<HTML>
<HEAD>
<TITLE>Nested Layer Coordinates (W3C)</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// offsets within page
function getGrossOffsetLeft(elem) {
    var offset = 0
    while (elem.offsetParent) {
```

```
        // correct for IE/Mac discrepancy between offset and style coordinates,
        // but not if the parent is HTML element (NN6)
        offset += (elem.offsetParent.tagName != "HTML") ?
            parseInt(elem.style.left) - parseInt(elem.offsetLeft) : 0
        elem = elem.offsetParent
        offset += elem.offsetLeft
    }
    return offset
}
function getGrossOffsetTop(elem) {
    var offset = 0
    while (elem.offsetParent) {
        // correct for IE/Mac discrepancy between offset and style coordinates,
        // but not if the parent is HTML element (NN6)
        offset += (elem.offsetParent.tagName != "HTML") ?
            parseInt(elem.style.top) - parseInt(elem.offsetTop) : 0
        elem = elem.offsetParent
        offset += elem.offsetTop
    }
    return offset
}

// offsets within element's positioning context
function getNetOffsetLeft(offset, elem) {
    while (elem = getParentLayer(elem)) {
        // correct for IE/Mac discrepancy between offset and style coordinates,
        // but not if the parent is HTML element (NN6)
        offset -= (elem.offsetParent.tagName != "HTML") ?
            parseInt(elem.style.left) - parseInt(elem.offsetLeft) : 0
        offset -= elem.offsetLeft
    }
    return offset
}
function getNetOffsetTop(offset, elem) {
    while (elem = getParentLayer(elem)) {
        // correct for IE/Mac discrepancy between offset and style coordinates,
        // but not if the parent is HTML element (NN6)
        offset -= (elem.offsetParent.tagName != "HTML") ?
            parseInt(elem.style.top) - parseInt(elem.offsetTop) : 0
        offset -= elem.offsetTop
    }
    return offset
}
// find positioning context parent element
function getParentLayer(elem) {
    if (elem.parentNode) {
        while (elem.parentNode != document.body) {
            elem = elem.parentNode
            while (elem.nodeType != 1) {
                elem = elem.parentNode
            }
            if (elem.style.position == "absolute" || elem.style.position ==
"relative") {
```

Continued

Listing 31-17 *(continued)*

```
                return elem
            }
            elem = elem.parentNode
        }
        return null
    } else if (elem.offsetParent && elem.offsetParent.tagName != "HTML") {
        return elem.offsetParent
    } else {
        return null
    }
}

// functions that respond to changes in text boxes
function setOuterPage(field) {
    var val = parseInt(field.value)
    var elem = document.getElementById("outerDisplay")
    switch (field.name) {
        case "pageX" :
            elem.style.left = ((elem.offsetParent) ? getNetOffsetLeft(val, elem) :
val) + "px"
            break
        case "pageY" :
            elem.style.top = ((elem.offsetParent) ? getNetOffsetTop(val, elem) :
val) + "px"
            break
    }
    showValues()
}
function setOuterLayer(field) {
    var val = parseInt(field.value)
    switch (field.name) {
        case "left" :
            document.getElementById("outerDisplay").style.left = val + "px"
            break
        case "top" :
            document.getElementById("outerDisplay").style.top = val + "px"
            break
    }
    showValues()
}
function setInnerPage(field) {
    var val = parseInt(field.value)
    var elem = document.getElementById("innerDisplay")
    switch (field.name) {
        case "pageX" :
          elem.style.left = ((elem.offsetParent) ? getNetOffsetLeft(val, elem) :
val) + "px"
            break
        case "pageY" :
          elem.style.top = ((elem.offsetParent) ? getNetOffsetTop(val, elem) :
val) + "px"
            break
```

```
    }
    showValues()
}
function setInnerLayer(field) {
    var val = parseInt(field.value)
    switch (field.name) {
        case "left" :
            document.getElementById("innerDisplay").style.left = val + "px"
            break
        case "top" :
            document.getElementById("innerDisplay").style.top = val + "px"
            break
    }
    showValues()
}
function showValues() {
    var form = document.forms[0]
    var outer = document.getElementById("outerDisplay")
    var inner = document.getElementById("innerDisplay")
    form.elements[0].value = outer.offsetLeft +
    ((outer.offsetParent) ? getGrossOffsetLeft(outer) : 0)
    form.elements[1].value = outer.offsetTop +
    ((outer.offsetParent) ? getGrossOffsetTop(outer) : 0)
    form.elements[2].value = parseInt(outer.style.left)
    form.elements[3].value = parseInt(outer.style.top)
    form.elements[4].value = inner.offsetLeft +
    ((inner.offsetParent) ? getGrossOffsetLeft(inner) : 0)
    form.elements[5].value = inner.offsetTop +
    ((inner.offsetParent) ? getGrossOffsetTop(inner) : 0)
    form.elements[6].value = parseInt(inner.style.left)
    form.elements[7].value = parseInt(inner.style.top)
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<H1>Nested Layer Coordinates (W3C)</H1>
<HR>
Enter new page and layer coordinates for the <FONT COLOR="coral">outer
layer</FONT> and <FONT COLOR="aquamarine">inner layer</FONT> objects.<P>
<DIV STYLE="position:absolute; top:130">
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">Page X:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="pageX" SIZE=3
        onChange="setOuterPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">Page Y:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="pageY" SIZE=3
        onChange="setOuterPage(this)"></TD>
</TR>
<TR>
```

Continued

Listing 31-17 *(continued)*

```
    <TD ALIGN="right" BGCOLOR="coral">Container X:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="left" SIZE=3
        onChange="setOuterLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">Container Y:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="top" SIZE=3
        onChange="setOuterLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">Page X:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="pageX" SIZE=3
        onChange="setInnerPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">Page Y:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="pageY" SIZE=3
        onChange="setInnerPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">Container X:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="left" SIZE=3
        onChange="setInnerLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">Container Y:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="top" SIZE=3
        onChange="setInnerLayer(this)"></TD>
</TR>
</TABLE>
</FORM>
</DIV>
<DIV ID="outerDisplay" STYLE="position:absolute; top:130; left:200; width:370;
height:190; background-color:coral">
<DIV ID="innerDisplay" STYLE="position:absolute; top:5; left:5; width:360;
height:180; background-color:aquamarine" >
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</DIV>
</DIV>
</BODY>
</HTML>
```

Try entering a variety of values in all text boxes to see what happens. Here is one possible sequence of tests and explanations:

1. Increase the red Page X value to 250. This moves the outer layer to the right by 50 pixels. Because the green layer is nested inside, it moves along with it. The green's Page X value also increases by 50, but its Container X value remains the same because the inner layer maintains the same relationship with the outer layer as before.
2. Increase the green Page X value to 300. This action shifts the position of the green inner layer by 45 pixels, making it a total of 50 pixels inset within its positioning context. Because the outer layer does not have its clipping rectangle set, the inner layer's content bleeds beyond the width of the red layer.
3. Set the Container Y value to -50. This action moves the green inner layer upward so that its top is 50 pixels above the top of its red container. As a result, the Page Y value of the inner layer is 80, while the Page Y value of the red outer layer remains at 130 (thus, the 50-pixel difference).

As you experiment with moving the layers around, you may encounter some screen refresh problems where traces of the inner layer remain when moved beyond the outer layer's rectangle. Take these bugs into account when you design the actions of your script-controlled positioning.

Loading external HTML into a layer

The NN4 layer object had an unfair advantage when it came to loading external content into it: the element was designed to do just that, acting in some ways like the W3C-endorsed IFRAME element.

Because the IE4+ and NN6 object models embrace the IFRAME element, using that element may be the easy way for you to designate a space within a page for external content. In fact, you can even assign a style sheet rule that absolute-positions the IFRAME precisely on the page where you want it. Be sure to set the `FRAMEBORDER` attribute to `0` unless you want the border to be visible to the user (and then watch out for content that may overrun the rectangle and cause scrollbars to appear). In this case, you must then leave all the formatting and style sheet control of that content to the HTML loaded into the IFRAME, just as if it were in a separate window or frame. To load different content into the element, assign a different URL to the `src` property of the IFRAME element object.

As one more example that more closely simulates the loading of external content into a layer, Listing 31-18 demonstrates a somewhat ugly workaround that lets a layer's background color or image show through some kinds of HTML content. The technique works only in IE5.5+ and NN6 because these browser generations are the first to offer scripted access to the HTML you need to load into an intermediate (and hidden) IFRAME before stuffing the content into the layer.

A hidden IFRAME element is the initial recipient of the external HTML file, as loaded by the `loadOuter()` method. When that file loads, the `transferHTML()` method is invoked to copy the `innerHTML` of just the BODY element of the content window of the IFRAME (note the different syntax for NN6 — the `contentDocument` property — and IE5.5 — the `contentWindow` property). By eliminating the BODY element and any tags in the HEAD, you prevent the tags in the layer from conflicting with the tags for the main document. As a result, however, notice how the background color set for the layer shows through the HTML plugged into the layer.

HTML element objects (other than IFRAME) were not designed to get their content from external files. But, as Listing 31-18 shows, where there is a will there is a way — even if the workaround isn't pretty.

Listing 31-18: Setting Layer Source Content (W3C)

```
<HTML>
<HEAD>
<TITLE>Loading External Content into a Layer (W3C)</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function loadOuter(doc) {
    document.getElementById("hiddenContent").src = doc
    // workaround for missing onLoad event in IFRAME for NN6
    if (!document.getElementById("hiddenContent").onload) {
        setTimeout("transferHTML()", 1000)
    }
}
function transferHTML() {
    var srcFrame = document.getElementById("hiddenContent")
    var srcContent = (srcFrame.contentDocument) ?
    srcFrame.contentDocument.getElementsByTagName("BODY")[0].innerHTML :
    (srcFrame.contentWindow) ?
    srcFrame.contentWindow.document.body.innerHTML : ""
    document.getElementById("outerDisplay").innerHTML = srcContent
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Loading External Content into a Layer (W3C)</H1>
<HR>
<P>Click the buttons to see what happens when you load new source documents into
the <FONT COLOR="coral">layer</FONT> object.</P>
<DIV STYLE="position:absolute; top:150; width:200; background-color:coral">
<FORM>
Load into outer layer:<BR>
<INPUT TYPE="button" VALUE="Article I" onClick="loadOuter('article1.htm')"><BR>
<INPUT TYPE="button" VALUE="Entire Bill of Rights"
onClick="loadOuter('bofright.htm')"><BR>
</FORM>
</DIV>
<DIV ID="outerDisplay" STYLE="position:absolute; top:150; left:250; width:370;
height:190; background-color:coral">
    <P><B>Placeholder text for layer.</B></P>
</DIV>
<IFRAME ID="hiddenContent" STYLE="visibility:hidden"
onLoad="transferHTML()"></IFRAME>
</BODY>
</HTML>
```

Positioned element visibility behavior

There is very little code in Listing 31-19 because it simply adjusts the `style.visibility` property of an outer layer and a nested, inner layer. You can see that when the page loads, the green inner layer's `visibility` is automatically set to inherit the `visibility` of its containing outer layer. When you click the outer layer buttons, the inner layer blindly follows the settings.

Things change, however, once you start adjusting the properties of the inner layer independently of the outer layer. With the outer layer hidden, you can show the inner layer. Only by setting the `visibility` property of the inner layer to `inherit` can you make it rejoin the outer layer in its behavior.

Listing 31-19: **Nested Layer Visibility Relationships (W3C)**

```
<HTML>
<HEAD>
<TITLE>layer.style.visibility (W3C)</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setOuterVis(type) {
    document.getElementById("outerDisplay").style.visibility = type
}
function setInnerVis(type) {
    document.getElementById("innerDisplay").style.visibility = type
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Setting the <TT>layer.style.visibility</TT> Property of Nested Layers
(W3C)</H1>
<HR>
Click the buttons to see what happens when you change the visibility of the
<FONT COLOR="coral">outer layer</FONT> and <FONT COLOR="aquamarine">inner
layer</FONT> objects.<P>
<DIV STYLE="position:absolute; top:150; width:180; background-color:coral">
<FORM>
Control outer layer property:<BR>
<INPUT TYPE="button" VALUE="Hide Outer Layer"
onClick="setOuterVis('hidden')"><BR>
<INPUT TYPE="button" VALUE="Show Outer Layer"
onClick="setOuterVis('visible')"><BR>
</FORM>
</DIV>
<DIV STYLE="position:absolute; top:270; width:180; background-color:aquamarine">
<FORM>
Control inner layer property:<BR>
<INPUT TYPE="button" VALUE="Hide Inner Layer"
onClick="setInnerVis('hidden')"><BR>
<INPUT TYPE="button" VALUE="Show Inner Layer"
onClick="setInnerVis('visible')"><BR>
<INPUT TYPE="button" VALUE="Inherit Outer Layer"
onClick="setInnerVis('inherit')"><BR>
```

Continued

Listing 31-19 *(continued)*

```
</FORM>
</DIV>
<DIV ID="outerDisplay" STYLE="position:absolute; top:150; left:200; width:370;
height:190; background-color:coral">
    <DIV ID="innerDisplay" STYLE="position:absolute; top:5; left:5; width:360;
height:180; background-color:aquamarine">
    <P><B>Placeholder text for raw inner layer.</B></P>
    </DIV>
</DIV>
</BODY>
</HTML>
```

Scripting layer stacking order

Listing 31-20 is simpler than its NN4 layer-specific version (Listing 31-9) because the W3C DOM, as implemented in IE4+ and NN6, does not have properties that reveal the equivalent of the `layerObject.above` or `layerObject.below` properties. Therefore, Listing 31-20 confines itself to enabling you to adjust the `style.zIndex` property values of three overlapping layers. All three layers (none of which are nested inside another) initially set their `zIndex` values to `0`, meaning that the source code order rules the stacking order.

If you try this example on both IE4+ and NN6, however, you will experience a significant difference in the behavior of overlapping layers in the two browser categories. For example, if you reload the page to let source code order lay out the layers initially, and then set the green middle layer to, say, 5, the middle layer plants itself in front of the other two in both browser categories. But if you restore the middle layer's `zIndex` value to `0`, IE puts it back in source code order. NN6, on the other hand, leaves it in front of the other two. The rule of thumb (which also applies to NN4) is that if scripts modify the `zIndex` property of multiple layers to all the same value, the most recently set layer stays in front of the others.

There is some method to this seeming madness, which you can experience in Chapter 56's map puzzle game. If you drag one of several draggable elements around the page, you probably will set its `zIndex` to a value higher than that of all the others so that the currently active element stays in front of the rest. But when you complete the dragging, you will want to restore the `zIndex` to its original value, which may be the same as that of all the other draggable items. By keeping the most recently adjusted layer on top, you keep the layer you just dropped in front of the others in case you want to pick it up again.

Listing 31-20: **Relationships Among zIndex Values (W3C)**

```
<HTML>
<HEAD>
<TITLE>layer.style.zIndex</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setZ(field) {
    switch (field.name) {
        case "top" :
```

```
            document.getElementById("topLayer").style.zIndex =
parseInt(field.value)
            break
        case "mid" :
            document.getElementById("middleLayer").style.zIndex =
parseInt(field.value)
            break
        case "bot" :
            document.getElementById("bottomLayer").style.zIndex =
parseInt(field.value)
    }
    showValues()
}
function showValues() {
    var botLayer = document.getElementById("bottomLayer")
    var midLayer = document.getElementById("middleLayer")
    var topLayer = document.getElementById("topLayer")

    document.forms[0].bot.value = botLayer.style.zIndex
    document.forms[1].mid.value = midLayer.style.zIndex
    document.forms[2].top.value = topLayer.style.zIndex
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<H1><TT>layer.style.zIndex</TT> Property of Sibling Layers</H1>
<HR>
Enter new zIndex values to see the effect on three layers.<P>
<DIV STYLE="position:absolute; top:140; width:240; background-color:coral">
<FORM>
Control Original Bottom Layer:<BR>
<TABLE>
<TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="bot" SIZE=3
onChange="setZ(this)"></TD></TR>
</TABLE>
</FORM>
</DIV>
<DIV STYLE="position:absolute; top:220; width:240; background-color:aquamarine">
<FORM>
Control Original Middle Layer:<BR>
<TABLE>
<TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="mid" SIZE=3
onChange="setZ(this)"></TD></TR>
</TABLE></FORM>
</DIV>
<DIV STYLE="position:absolute; top:300; width:240; background-color:yellow">
<FORM>
Control Original Top Layer:<BR>
<TABLE>
<TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="top" SIZE=3
onChange="setZ(this)"></TD></TR>
</TABLE>
</FORM>
</DIV>
```

Continued

Listing 31-20 *(continued)*

```
<DIV ID="bottomLayer" STYLE="position:absolute; top:140; left:260; width:300;
height:190; z-Index:0; background-color:coral">
    <SPAN><B>Original Bottom Layer</B></SPAN>
</DIV>
<DIV ID="middleLayer" STYLE="position:absolute; top:160; left:280; width:300;
height:190; z-Index:0; background-color:aquamarine">
    <SPAN><B>Original Middle DIV</B></SPAN>
</DIV>
<DIV ID="topLayer" STYLE="position:absolute; top:180; left:300; width:300;
height:190; z-Index:0; background-color:yellow">
    <SPAN><B>Original Top Layer</B></SPAN>
</DIV>
</BODY>
</HTML>
```

Dragging and resizing a layer

Listing 31-21 is an IE4+- and NN6-compatible version of the layer dragging example shown earlier in Listing 31-11. The basic structure is the same, with event handler functions for engaging the drag mode, handling the mouse movement while in drag mode, and releasing the element at the end of the journey.

There is a lot more code in this version for several reasons. The main reason is to accommodate the two event object models in the IE and NN browsers. First of all, event bubbling is used so that all mouse events are handled at the document level. Thus, all of the event handlers need to equalize the `event` object and event target element, as well as filter events so that the action occurs only when a draggable element (as identified by its `className` property) is the target of the event action.

The toughest job involves the `engage()` function because it must use the two different event and element object models to establish the offset of the `mousedown` event within the draggable element. For IE/Windows, this also means taking the scrolling of the body into account. To get the element to reposition itself with mouse motion, the `dragIt()` function applies browser-specific coordinate values to the `style.left` and `style.top` properties of the draggable element. This function is invoked very frequently in response to the `mousemove` event.

One extra event handler in this version, `onmouseout`, disengages the drag action. This event occurs only if the user moves the cursor faster than the browser can update the position.

Nothing in this example, however, treats the `zIndex` stacking order, which must be addressed if the page contains multiple, draggable items. See the map puzzle game in Chapter 56 for an example of processing multiple, draggable items.

Listing 31-21: **Dragging a Layer (W3C)**

```
<HTML>
<HEAD>
<TITLE>Layer Dragging</TITLE>
<STYLE TYPE="text/css">
```

```
.draggable {cursor:hand}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
var engaged = false
var offsetX = 0
var offsetY = 0
function dragIt(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
    if (engaged) {
        if (targElem.className == "draggable") {
            while (targElem.id != "myLayer" && targElem.parentNode) {
                targElem = targElem.parentNode
            }
            if (evt.pageX) {
                targElem.style.left = evt.pageX - offsetX + "px"
                targElem.style.top = evt.pageY - offsetY + "px"
            } else {
                targElem.style.left = evt.clientX - offsetX + "px"
                targElem.style.top = evt.clientY - offsetY + "px"
            }
            return false
        }
    }
}
function engage(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
    if (targElem.className == "draggable") {
        while (targElem.id != "myLayer" && targElem.parentNode) {
            targElem = targElem.parentNode
        }
        if (targElem.id == "myLayer") {
            engaged = true
            if (evt.pageX) {
                offsetX = evt.pageX - targElem.offsetLeft
                offsetY = evt.pageY - targElem.offsetTop
            } else {
                offsetX = evt.offsetX - document.body.scrollLeft
                offsetY = evt.offsetY - document.body.scrollTop
                if (navigator.userAgent.indexOf("Win") == -1) {
                    offsetX += document.body.scrollLeft
                    offsetY += document.body.scrollTop
                   }

            }
            return false
        }
    }
}
function release(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
```

Continued

Listing 31-21 *(continued)*

```
    if (targElem.className == "draggable") {
        while (targElem.id != "myLayer" && targElem.parentNode) {
            targElem = targElem.parentNode
        }
        if (engaged && targElem.id == "myLayer") {
            engaged = false
        }
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Dragging a Layer</H1>
<HR>
<DIV ID="myLayer" CLASS="draggable" STYLE="position:absolute; top:90; left:100;
width:300; height:190; background-color:lightgreen">
    <SPAN CLASS="draggable"><B>Drag me around the window.</B></SPAN>
</LAYER>
<SCRIPT LANGUAGE="JavaScript">
document.onmousedown = engage
document.onmouseup = release
document.onmousemove = dragIt
document.onmouseout = release
</SCRIPT>
</BODY>
</HTML>
```

The final listing in this section applies many example components used thus far to let scripts control the resizing of a positionable element by dragging the lower-right, 20-pixel region. A lot of the hairy code in the `engage()` function is for determining if the `onmousedown` event occurs in the invisible 20-pixel square.

The `resizeIt()` function of Listing 31-22 resembles the `dragIt()` function of Listing 31-21, but the adjustments are made to the width and height of the positionable element. A fair amount of math determines the width of the element in response to the cursor's instantaneous location and sets the `style.width` and `style.height` properties accordingly.

A user's success with resizing an element this way depends a lot on the browser he or she uses. IE, particularly for Windows, may not redraw the resized element very quickly. In this case, the cursor can easily slip out of the hot spot to end the drag. In other browsers, however, response is very fast, and it's very difficult to have the `onmouseout` event fire the `release()` function.

Listing 31-22: **Resizing a Layer (W3C)**

```
<HTML>
<HEAD>
<TITLE>Layer Resizing</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var engaged = false
```

```
var offsetX = 0
var offsetY = 0

function resizeIt(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
    if (targElem.className == "draggable") {
        if (engaged) {
            if (evt.pageX) {
                targElem.style.width = (evt.pageX - targElem.offsetLeft -
offsetX) + "px"
                targElem.style.height = (evt.pageY - targElem.offsetTop -
offsetY) + "px"
            } else {
                var elemWidth = evt.clientX - targElem.offsetLeft - offsetX -
                    (parseInt(targElem.style.left) -
parseInt(targElem.offsetLeft))
                var elemHeight = evt.clientY - targElem.offsetTop - offsetY -
                    (parseInt(targElem.style.top) -
parseInt(targElem.offsetTop))
                targElem.style.width = elemWidth + "px"
                targElem.style.height = elemHeight + "px"
            }
        }
    }
}

function engage(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
    if (targElem.className == "draggable") {
        while (targElem.id != "myLayer" && targElem.parentNode) {
            targElem = targElem.parentNode
        }
        if (targElem.id == "myLayer") {
            if (evt.pageX && (evt.pageX > ((parseInt(targElem.style.width) - 20) +
                targElem.offsetLeft)) && (evt.pageY >
                ((parseInt(targElem.style.height) - 20) + targElem.offsetTop))) {
                offsetX = evt.pageX - parseInt(targElem.style.width) -
                    targElem.offsetLeft
                offsetY = evt.pageY - parseInt(targElem.style.height) -
                    targElem.offsetTop
                engaged = true
                } else if ((evt.offsetX > parseInt(targElem.style.width) - 20) &&
                (evt.offsetY > parseInt(targElem.style.height) - 20))
                {offsetX = evt.offsetX - parseInt(targElem.style.width) -
                     document.body.scrollLeft
                offsetY = evt.offsetY - parseInt(targElem.style.height) -
                     document.body.scrollTop
                engaged = true
                if (navigator.userAgent.indexOf("Win") == -1) {
                    offsetX += document.body.scrollLeft
```

Continued

Listing 31-22 *(continued)*

```
                    offsetY += document.body.scrollTop
                }
            }
            return false
        }
    }
}
function release(evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    var targElem = (evt.target) ? evt.target : evt.srcElement
    if (targElem.className == "draggable") {
        while (targElem.id != "myLayer" && targElem.parentNode) {
            targElem = targElem.parentNode
        }
        if (engaged && targElem.id == "myLayer") {
            engaged = false
        }
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Resizing a Layer (W3C)</H1>
<HR>
<DIV ID="myLayer" CLASS="draggable" STYLE="position:absolute; top:170; left:100;
width:300; height:190; background-color:lightblue">
<SPAN>Here is some content inside the layer. See what happens to it as you
resize the layer via the bottom-right 20-pixel handle.</SPAN>
</DIV>
<SCRIPT LANGUAGE="JavaScript">
document.onmousedown = engage
document.onmouseup = release
document.onmousemove = resizeIt
document.onmouseout = release
</SCRIPT>
</BODY>
</HTML>
```

This chapter only scratches the surface in the kinds of positioned element actions you can control via scripts. You may have seen examples of positioned element scripting at sites around the Web. For example, some pages have subject headers fly into place — even "bounce" around until they settle into position. Or elements can go in circles or spirals to get your attention (or distract you, as the case may be). The authors of those tricks apply formulas from other disciplines (such as games programming) to the `style` object properties of a positioned element.

Sometimes the effects are there just for the sake of looking (at first anyway) cool or because the page author knows how to script those effects. Your chief guide in implementing such features, however, should be whether the scripting genuinely adds value to the content offering. If you don't improve the content by adding a flying doo-dad or pulsating images, then leave them out. A greater challenge is finding meaningful ways to apply positioning techniques. Done the right way and for the right reason, they can significantly enhance the visitor's enjoyment of your application.

✦ ✦ ✦

CHAPTER 32

Embedded Objects

In This Chapter

Using EMBED element objects

Exploring the OBJECT element object

Understanding the unusual PARAM element

In addition to the typical content that you see in Web pages — primarily text and images — you can embed other kinds of content into the page. Such embedded content usually requires the powers of additional software, such as plug-in players or other external code processors, to load and display the content. All of this external content is added to a page by one of three HTML elements: APPLET, EMBED, or OBJECT. In the HTML 4.0 standard, the APPLET element, which was intended originally for loading Java applets, is deprecated in favor of the newer OBJECT element. An OBJECT element is intended to be more extensible, meaning that it has enough attributes and power to summon the Java virtual machine if the incoming code is a Java applet, or run an ActiveX program (in IE for Windows, that is). The EMBED element is commonly used to display a plug-in control panel directly in the document, rather than having the panel appear in a separate window.

In all cases, when a visual element is embedded via any of these elements, the control panel or applet occupies a segregated rectangular space on the page and generally confines its activities to that rectangle. But in many cases, JavaScript can also interact with the content or the player, allowing your scripts to extend themselves with powers for actions, such as controlling audio playback or the operation of a Java applet.

This chapter's primary focus is not on the content and players that you can control as it is on the HTML element objects that load the content or players into the page in the first place. Most of the properties represent nothing more than scriptable access to the element HTML attributes. The property descriptions in this chapter are therefore not extensive. Online HTML references (including the W3C HTML 4.0 specification and the Microsoft Developer Network documentation) should fill in the attribute value information quite well. In practice, scripts have very little interaction with these element objects, but if you ever need to know what's scriptable, you'll find that information here. As for controlling applets and plug-ins, you can find information about that in Chapter 44.

APPLET Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align`	(Applet methods)	`onCellChange`
`alt`		`onDataAvailable`
`altHTML`		`onDatasetChanged`
`archive`		`onDatasetComplete`
`code`		`onLoad`
`codeBase`		`onRowEnter`
`height`		`onRowExit`
`hspace`		`onRowsDelete`
`name`		`onRowsInserted`
`object`		`onScroll`
`vspace`		
`width`		
(Applet variables)		

Syntax

Accessing APPLET element object properties or methods:

```
(NN3+/IE4+)    [window.]document.appletName.property | method([parameters])
(NN3+/IE4+)    [window.]document.applets[index].property | method([parameters])
(IE4+)         [window.]document.all.appletID.property | method([parameters])
(IE5+/NN6)     [window.]document.getElementById("appletID").property |
               method([parameters])
```

About this object

Starting with NN3 and IE4, Java applets are treated as scriptable objects. While IE4+ treats both the applet and the APPLET element as objects, NN3 and NN4 offered access to only one property of the APPLET element object (`name`). In NN6, however, many more APPLET object properties are also scriptable.

The fact that the applet, itself, can expose public instance variables and public methods as properties and methods of the `applet` object means that the scriptable characteristics of an `applet` object are highly dependent upon the way the applet was written. You can learn more about how to compose an applet that exposes its innards to JavaScript in Chapter 44.

Perhaps the most important point to remember about accessing applets is that you must have them loaded and running before you can address them as objects.

Although you cannot query an applet to find out whether it's loaded (as you can with an image), you can rely on the `onLoad` event handler of a window to fire only when all applets in the window are loaded and running (with the occasional version- or platform-specific bug in frames, as described in the `window.onLoad` event handler discussion in Chapter 16). IE4+ also features an `onLoad` event handler for the APPLET element directly, but applets tend to be the last things to load on a page. Therefore, you won't be able to use an applet embedded in a document to help you create the HTML content of that page as it loads, but an applet can provide content for new documents or for modifiable elements of a page. With the highly dynamic object models of IE4+ and NN6, this can lead to all kinds of possibilities.

Java applets have also been used to maintain contact with a server after the page has loaded by way of a servlet running on the server. A servlet allows the applet to query or be refreshed with instantaneously updated information without having to reload the page. Of course, getting a sophisticated applet to run in a wide range of browsers and operating systems is a challenge unto itself.

A large set of event handlers for this element (all but `onLoad` and `onScroll`) is related to the application of IE/Windows data binding for PARAM elements nested inside an APPLET element. These events fire when a variety of actions occur to the data source or recordset associated with the applet. For more about applying data binding to an APPLET element, see `http://msdn.microsoft.com/workshop/author/databind/dataconsumer.asp`.

Properties

align

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property controls either the horizontal or vertical alignment of the element with regard to surrounding content. String values of `left` or `right` cause the applet rectangle to cling to the left or right edges of its next outermost positioning context. String values of `absbottom`, `absmiddle`, `baseline`, `bottom`, `middle`, `text-top`, or `top` influence the vertical alignment with respect to adjacent text, with the same kind of results as corresponding values of the `style.verticalAlign` property.

Related Items: `style.verticalAlign` property.

alt

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `alt` property represents the `ALT` attribute, which should contain text that displays in the browser in the event that the applet does not load or the user has Java turned off in the browser preferences. This information should be set as the APPLET element's attribute, because assigning text to the property after the applet attempts to load does not insert the text into the page.

Related Items: `altHTML` property.

altHTML

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `altHTML` property is supposed to provide an APPLET element with HTML content to render if the applet doesn't load. In practice, assigning an HTML string to this property has no effect on an APPLET element.

Related Items: `alt` property.

archive

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `archive` property represents the `ARCHIVE` attribute, which points to the URL of a compressed (`.zip`) file containing Java class files needed for the applet. The archive must include the class file that is assigned to the `CODE` attribute to get the applet loaded and started.

Related Items: `code` property.

code

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `code` property is the URL string of the Java class file that is to begin loading the applet (or the property may be the entire applet if it consists of a single class file). You cannot change the code assigned to an applet after the element has loaded (even if the applet code did not load successfully).

Related Items: `codeBase` property.

codeBase

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `codeBase` property is the string of the path on the server to the Java class file that is to begin loading the applet (or the property may be the entire applet if it consists of a single class file). The actual Java class file name is not part of the `codeBase` property.

Related Items: `code` property.

height
width

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `height` and `width` properties represent the `HEIGHT` and `WIDTH` attributes of the APPLET element. While these values should be set via attributes in the tag, these properties can adjust the size of the applet after the fact in IE5+.

Related Items: `hspace`, `vspace` properties.

hspace
vspace

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `hspace` and `vspace` properties represent the `HSPACE` and `VSPACE` attributes of the APPLET element, which control the number of pixels of transparent padding around the APPLET element on the page. While these values should be set via attributes in the tag, these properties can adjust the size of the applet padding after the fact in IE5+.

Related Items: `height`, `width` properties.

name

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `name` property represents the `NAME` attribute, a holdover from the early implementations of the APPLET element before `ID` attributes were used to identify elements. The value assigned to the `NAME` attribute is the name you can use to reference applets in all browsers that support accessing applets: `document.`*`appletName`*.

object

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `object` property represents the `OBJECT` attribute, which, according to the W3C HTML standard, points to the URL of a serialized (that is, “saved”) version of the applet’s current state. This attribute, and thus the associated property, may not be fully implemented in NN6.

Related Items: code property.

vspace

See `hspace`.

width

See `height`.

OBJECT Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	Methods	Event Handlers
align	(Object methods)	onCellChange
alt		onDataAvailable
altHTML		onDatasetChanged
archive*		onDatasetComplete
BaseHref		onLoad
border*		onRowEnter
classid		onRowExit
code		onRowsDelete
codeBase		onRowsInserted
codeType		onScroll
contentDocument*		
data*		
declare*		
form*		
height		
hspace		
name		
object		
standby*		
type		
useMap*		
vspace		
width		
(Object variables)		

*See Text.

Syntax

Accessing OBJECT element object properties or methods:

```
(IE4+)        [window.]document.all.objectID.property | method([parameters])
(IE5+/NN6)    [window.]document.getElementById("objectID").property |
              method([parameters])
```

About this object

The OBJECT element is intended to be the primary way to add external content (that is, content that the browser itself does not render) to a page. For example, IE/Windows uses it to load ActiveX controls (whether from the server or locally). The OBJECT element is also destined to replace usage of the APPLET and EMBED elements.

As with the APPLET element object, scripts can frequently control the programs and plug-ins that get loaded into the browser through the OBJECT tag. Chapter 44 shows you how to do that for common objects. The property listings here are merely for the properties of the element, most of which mimic the attributes available for the OBJECT element. Even though the properties are exposed, they are very rarely scripted, except perhaps to adjust the size of the space occupied by a media controller. Most properties are read-only after their values are set by attributes in the element's tag. But if your scripts are creating the OBJECT element anew, then scripts can set the property values the first time to initialize the object.

In the list of properties that begins this object's coverage, several are marked with an asterisk (*). These properties are defined in the W3C DOM Level 2 specification, and placeholders are included in the NN6 code. But as of this writing, there is no indication that these properties are "connected."

A large set of event handlers for this element (all but `onLoad` and `onScroll`) is related to the application of IE/Windows data binding for PARAM elements nested inside an OBJECT element. These events fire when a variety of actions occur to the data source or recordset associated with the program associated with the element. For more about applying data binding to an OBJECT element, see `http://msdn.microsoft.com/workshop/author/databind/dataconsumer.asp`.

Properties

align

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property controls either the horizontal or vertical alignment of the element with regard to surrounding content. String values of `left` or `right` cause the object rectangle to cling to the left or right edges of its next outermost positioning context. String values of `absbottom`, `absmiddle`, `baseline`, `bottom`, `middle`, `texttop`, or `top` influence the vertical alignment with respect to adjacent text, with the same kind of results as corresponding values of the `style.verticalAlign` property.

Related Items: `style.verticalAlign` property.

alt

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `alt` property represents the `ALT` attribute, which should contain text that displays in the browser in the event that the object or its data do not load. This information should be set as the OBJECT element's attribute, because assigning text to the property after the object attempts to load does not insert the text into the page.

Related Items: `altHTML` property.

altHTML

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `altHTML` property is supposed to provide an OBJECT element with HTML content to render if the object doesn't load. In practice, assigning an HTML string to this property has no effect on an OBJECT element.

Related Items: `alt` property.

BaseHref

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `BaseHref` property returns the full URL path to the current document.

Related Items: None.

classid

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `classid` property represents the `CLASSID` attribute of the OBJECT element. IE for Windows uses this attribute to assign the Globally Unique ID (GUID) of an ActiveX control. For example, to load a (nearly) invisible Windows Media Player object into a page, the HTML is as follows:

```
<OBJECT ID="medPlayer" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=1,0,0,0">
```

If your script then accesses the `classid` property of the `medPlayer` object, the value returned is the complete string as assigned to the attribute:
`CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95`

Note that the `CLSID:` prefix is also part of the string value. Even if the object does not load (for example, because the object is missing or an error is in the long `CLASSID` string), the property value reports the value as assigned to the attribute.
The HTML 4.0 specification indicates that the `CLASSID` attribute be used for any kind of external class files, including Java applets. But in practice, IE wants applet URLs supplied to the `CODE` attribute (a non-HTML 4.0 attribute).

Related Items: `code` property.

code

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `code` property is the URL string of a Java class file that is to begin loading the applet (or the property may be the entire applet if it consists of a single class file). You cannot change the code assigned to an applet after the element has loaded (even if the applet code did not load successfully).

Related Items: `codeBase` property.

codeBase

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `codeBase` property is the string of the path on the server to the source of the applet or ActiveX control referenced by the `CLASSID` or `CODE` attributes. IE4+ also uses the `CODEBASE` attribute to specify a minimum version of control that is to load, if the attribute is available. This facet is discussed in Chapter 28's coverage of plug-in detection for IE/Windows.

Related Items: `code` property.

codeType

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `codeType` property is a string of the MIME type of whatever object is pointed to by the `CODE` attribute value.

Related Items: `type` property.

height
width

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `height` and `width` properties represent the `HEIGHT` and `WIDTH` attributes of the OBJECT element. While these values should be set via attributes in the tag, these properties can adjust the size of the embedded element after the fact in IE5+.

Related Items: `hspace`, `vspace` properties.

hspace
vspace

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `hspace` and `vspace` properties represent the `HSPACE` and `VSPACE` attributes of the OBJECT element, which control the number of pixels of transparent padding around the OBJECT element on the page. While these values should be set via attributes in the tag, these properties can adjust the size of the padding around the element after the fact in IE5+.

Related Items: `height`, `width` properties.

name

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `name` property represents the `NAME` attribute of the OBJECT element. The better form is to assign an ID to the OBJECT element and use accepted reference syntax for element ids.

Related Items: None.

object

Value: External Object Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `object` property returns a reference to the object contained by the OBJECT element. This property is essential if the program running inside the OBJECT element has the same property or method names as the OBJECT element itself. For example, consider a Java applet loaded into the OBJECT element as follows:

```
<OBJECT CODE="coolApplet" ID="myAPPLET" ... >
```

If the applet code contained a public variable called `height`, an attempt to read or write that property through the OBJECT element will cause the element's properties to be read, and not the applet's properties. Therefore, if you insert the `object` property in the reference, the script reaches into the `applet` object for the property:

```
document.getElementById("myAPPLET").object.height = 40
```

If there is no ambiguity between element and object property and method names, the browser looks first at the element and then the object to find a match.

Related Items: None.

type

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `type` property represents the `TYPE` attribute of the OBJECT element, which, in theory anyway, is intended to warn the browser about the MIME type of data that is to be loaded into the object's process. I say "in theory" because the HTML 4.0 specification links the `TYPE` attribute to the `DATA` attribute, which points to the data to be loaded to support whatever program code is loaded via the `CLASSID` or `CODE` attribute. But through IE5.5, there is no support for the `DATA` attribute.

Related Items: `codeType` property.

vspace

See `hspace`.

width

See `height`.

EMBED Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	*Methods*	*Event Handlers*
`align`	(Object methods)	`onLoad`
`height`		`onScroll`
`hidden`		
`name`		
`pluginspage`		
`src`		
`units`		
`width`		
(Object variables)		

Syntax

Accessing EMBED element object properties or methods:

```
(IE4+)        [window.]document.all.objectID.property | method([parameters])
(IE5+/NN6)    [window.]document.getElementById("objectID").property |
              method([parameters])
```

About this object

An EMBED element is a carryover from the early browser days. Although never adopted by the W3C HTML standard, the EMBED element has been used in NN and IE as a way to embed non-native content (for example, sounds, video clips, and custom MIME types for plug-ins, such as Shockwave) into a page. What gets embedded into the page is the controller or viewer for whatever kind of data the EMBED element points to (via the SRC attribute).

The EMBED element is far less sophisticated than the OBJECT element, but current browsers continue to support it. If you have been using the EMBED element in previous applications, it may be a good idea to start gravitating toward the OBJECT element. For backward compatibility purposes, nesting an EMBED element inside an OBJECT element is not uncommon, both of which attempt to load the same content and plug-in. Browsers that know about the OBJECT element will load the content that way; older browsers will use the EMBED element and its attributes and parameters.

Because an EMBED element loads a plug-in (including ActiveX control types of plug-ins in IE/Windows), you can reference the plug-in's properties and methods through the EMBED object's reference.

Properties

`align`

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `align` property controls either the horizontal or vertical alignment of the element with regard to surrounding content. String values of `left` or `right` cause the object rectangle to cling to the left or right edges of its next outermost positioning context. String values of `absbottom`, `absmiddle`, `baseline`, `bottom`, `middle`, `texttop`, or `top` influence the vertical alignment with respect to adjacent text, with the same kind of results as corresponding values of the `style.verticalAlign` property.

Related Items: `style.verticalAlign` property.

height
width

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `height` and `width` properties represent the `HEIGHT` and `WIDTH` attributes of the EMBED element. While these values should be set via attributes in the tag, these properties can adjust the size of the element after the fact in IE5+.

Related Items: None.

hidden

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `hidden` property represents the `HIDDEN` attribute of the EMBED element. When an EMBED element is hidden, neither controller nor the content is shown. Application of this element in modern browsers should use style sheets to hide and show the element.

Related Items: `style.visibility` property.

name

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `name` property represents the `NAME` attribute of the EMBED element. The better form is to assign an ID to the EMBED element and use accepted reference syntax for element ids.

Related Items: None.

pluginspage

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `pluginspage` property represents the `PLUGINSPAGE` attribute of the EMBED element. This attribute is a URL that gets applied to a link in the browser if the plug-in associated with the external file's MIME type cannot be found on the client.

Related Items: None.

src

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

The `src` property represents the `SRC` attribute of the EMBED element. This attribute points to the external file that is to be loaded into the browser via the associated plug-in. Scripts can assign a new URL string to this property to load a different file into the current plug-in.

Related Items: None.

units

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

The `units` property returns the unit of measure assigned with the length value of the `height` and `width` properties. In IE4, this property returned only `px`. The property does not appear to be connected in IE5.5, so it is probably deprecated in IE.

Related Items: `height`, `width` properties.

The Odd Case of the PARAM Element

HTML pages pass parameters to Java applets, plug-ins, and ActiveX controls by way of PARAM elements that are nested inside APPLET, EMBED, and OBJECT elements. Although a PARAM element object is defined by the W3C DOM Level 2 specification, it does not show up on some browsers' radar when you try to reference the PARAM element by itself. Even assigning an ID to a PARAM element or using `document.getElementsByTagName("PARAM")` fail to allow references to access an individual PARAM element object. At most, you can retrieve the `innerHTML` property of the surrounding element. But even here, the values returned may not necessarily be precisely the HTML you specify in the document.

In practice, this limitation is not particularly important. For one thing, even if you could access the PARAM elements of an embedded object or program, attempts to modify the values would be wasted: Those values are read at load time only. Secondly, a well-designed plug-in, applet, or ActiveX control will provide its own properties or methods to retrieve the current settings of whatever properties are initialized via the PARAM elements.

✦ ✦ ✦

CHAPTER 33

XML Objects

In This Chapter

Treating XML elements as objects

Creating IE XML data islands

Accessing XML element attributes

XML (eXtensible Markup Language) is an undeniably hot topic in the Internet world. Not only has the W3C organization formed multiple working groups and recommendations for XML and its offshoots, but the W3C DOM recommendation also has XML in mind when it comes to defining how elements, attributes, and data of any kind — not just the HTML vocabulary — are exposed to browsers as an object model. Most of the arcana of the W3C DOM Core specification — especially the structure based on the node — are in direct response to the XML possibilities of documents that are beginning to travel the Internet.

While XML documents can stand alone as containers of structured data in both IE5+ and NN6, the Windows version of IE5+ permits XML data to be embedded as "islands" in an HTML document. Such islands are encased in an XML element — an IE-specific extension of HTML.

It's important to distinguish between "the" XML element — the element generated in a document by the IE-specific `<XML>` tag set — and a generic XML element that is a part of the XML data island. Generic XML elements have tag names that are meaningful to a data application, and they are usually defined by a separate Document Type Declaration (DTD) that contains a formal specification of the element names, their attributes (if any) and the nature of the data they can contain. Out of necessity, this book assumes that you are already familiar with XML such that your server-based applications serve up XML data exclusively, embed XML islands into HTML documents, or convert database data into XML. The focus of this chapter, and an extended application example of Chapter 57, is how to access custom elements that reside inside an IE XML element.

Elements and Nodes

Once you leave the specialized DOM vocabulary of HTML elements, the world can appear rather primitive — a highly granular world of node hierarchies, elements, element attributes, and node data. This granularity is a necessity in an environment in which the elements are far from generic and the structure of data in a document does not have to follow a format handed down from above. One Web application can describe an individual's contact information with one set of elements, while another application uses a completely different approach to element names, element nesting, and their sequence.

Fortunately, most, if not all, scripting you do on XML data is on data served up by your own applications. Therefore, you know what the structure of the data is — or you know enough of it to let your scripts access the data.

The discussion of the W3C DOM in Chapter 14 should serve as a good introduction to the way you need to think about elements and their content. All relevant properties and methods are listed among the items shared by all elements in Chapter 15.

Note

Microsoft has created a separate document object model exclusively for XML documents. To distinguish between the DOMs for XML and HTML documents, Microsoft calls the former the XML DOM and the latter the DHTML DOM. Specifications for the two DOMs overlap in some terminology, but the two models are not interchangeable. Read more about the Microsoft XML DOM at `http://msdn.microsoft.com`.

An XML *data island* is a hierarchy of nodes. Typically, the outermost nodes are elements. Some elements have attributes, each of which is a typical name/value pair. Some elements have data that goes between the start and end tags of the element (such data is a text node nested inside the element node). And some elements can have both attributes and data. When an XML island contains the equivalent of multiple database records, an element container whose tag name is the same as each of the other records surrounds each record. Thus, the `getElementsByTagName()` method frequently accesses a collection of like-named elements.

Once you have a reference to an element node, you can reference that element's attributes as properties; however, a more formal access route is via the `getAttribute()` method of the element. If the element has data between its start and end tags, you can access that data from the element's reference by calling the `firstChild.data` property (although you may want to verify that the element has a child node of the text type before committing to retrieving the data).

Of course, your specific approach to XML elements and their data varies with what you intend to script with the data. For example, you may wish to do nothing more with scripting than enable a different style sheet for the data based on a user choice. The evolving XSL (eXtensible Stylesheet Language) standard is a kind of (non-JavaScript) scripting language for transforming raw XML data into a variety of presentations. But you can still use JavaScript to connect user-interface elements that control which of several style sheets renders the data. Or, as demonstrated in Chapters 52 and 57, you may wish to use JavaScript for more explicit control over the data and its rendering, taking advantage of JavaScript sorting and data manipulation facilities along the way.

Table 33-1 is a summary of W3C DOM Core objects, properties, and methods that you are most likely to use in extracting data from XML elements. You can find details of all of these items in Chapter 15.

Table 33-1 Properties and Methods for XML Element Reading

Property or Method	***Description***
`Node.nodeValue`	Data of a text node
`Node.nodeType`	Which node type
`Node.parentNode`	Reference to parent node
`Node.childNodes`	Array of child nodes
`Node.firstChild`	First of all child nodes
`Node.lastChild`	Last of all child nodes
`Node.previousSibling`	Previous node at same level
`Node.nextSibling`	Next node at same level
`Element.parentNode`	Reference to parent node
`Element.childNodes`	Array of child nodes
`Element.firstChild`	First of all child nodes
`Element.lastChild`	Last of all child nodes
`Element.previousSibling`	Previous node at same level
`Element.nextSibling`	Next node at same level
`Element.tagName`	Tag name
`Element.getAttribute(`*name*`)`	Retrieves attribute (Attr) object
`Element.getElementsByTagName(`*name*`)`	Array of nested, named elements
`Attr.name`	Name part of attribute object's name/ value pair
`Attr.value`	Value part of attribute object's name/ value pair

XML Element Object

For HTML element properties, methods, and event handlers, see Chapter 15.

Properties	***Methods***	***Event Handlers***
`src`		
`XMLDocument`		

Syntax

Accessing XML element object properties or methods:

```
(IE5+)     [window.]document.all.elementID.property | method([parameters])
```

About this object

The XML element object is the primary container of an XML data island within an HTML page. If your scripts intend to traverse the node hierarchy within the element, or simply access properties of nested elements, then you should assign an identifier to the `ID` attribute of the XML element. For example, if the XML data contains results from a database query for music recordings that match some user-entered criteria, each returned record might be denoted as a RECORDING element as follows:

```
<XML ID="results">
    <SEARCHRESULTS>
        <RECORDING>
            ...elements with details...
        </RECORDING>
        <RECORDING>
            ...elements with details...
        </RECORDING>
        <RECORDING>
            ...elements with details...
        </RECORDING>
    </SEARCHRESULTS>
</XML>
```

Your script can now obtain an array of references to RECORDING elements as follows:

```
var recs = document.getElementById("results").getElementsByTagName("RECORDING")
```

While it is also true that there is no known HTML element with the tag name `RECORDING` (which enables you to use `document.getElementsByTagName("RECORDING")`), the unpredictability of XML data element names is reason enough to limit the scope of the `getElementsByTagName()` method to the XML data island.

Interestingly, the W3C DOM Level 2 does not define an XML element object within the HTML section. You cannot simply embed an XML document inside an HTML document: The standards clearly indicate that a document can be one or the other, but not both. While the NN6 DOM can recognize custom elements, the browser understandably gets confused when custom elements have tag names that already belong to the HTML DTD. Therefore, I do not recommend attempting to embed custom elements into an HTML document for NN6 unless it some day implements a mechanism similar to IE's XML data islands.

Note IE5/Macintosh does not support XML data islands.

Properties

src

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `src` property represents the `SRC` attribute of the XML element. The attribute points to the URL of an external XML document whose data is embedded within the current HTML document.

XMLDocument

Value: Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `XMLDocument` property returns a reference to Microsoft's proprietary XML `document` object and the object model associated with it (the so-called XML DOM). A lot of this object model is patterned after the W3C DOM model, but access to these properties is via a rather roundabout way. For more details, visit

`http://msdn.microsoft.com/xml/reference/xmldom/start.asp`

✦ ✦ ✦

PART IV

JavaScript Core Language Reference

✦ ✦ ✦ ✦

In This Part

✦ ✦ ✦ ✦

CHAPTER 34

The String Object

In This Chapter

How to parse and work with text

Performing search-and-replace operations

Scripted alternatives to text formatting

Chapter 6's tutorial introduced you to the concepts of values and the types of values that JavaScript works with — features, such as strings, numbers, and Boolean values. In this chapter, you look more closely at the very important String data type, as well as its relationship to the Number data type. Along the way, you encounter the many ways in which JavaScript enables scripters to manipulate strings.

Note

Much of the syntax that you see in this chapter is identical to that of the Java programming language. Because the scope of JavaScript activity is narrower than that of Java, you don't have nearly as much to learn for JavaScript as for Java. At the same time, certain string object language features apply to scripting but not to Java programming. Improvements to the string object's methods in Navigator 4 greatly simplify a number of string manipulation tasks. If you must script for a lower common denominator of browser, however, you may need some of the same kind of string micro-management skills that a C programmer needs. I soften the blow by providing some general purpose functions that you can plug into your scripts to make those jobs easier.

String and Number Data Types

Although JavaScript is not what is known as a "strongly typed" language, you still need to be aware of several data types because of their impact on the way you work with the information in those forms. In this section, I focus on strings and two types of numbers.

Simple strings

A *string* consists of one or more standard text characters between matching quote marks. JavaScript is forgiving in one regard: You can use single or double quotes, as long as you match two single quotes or two double quotes around a string. Another benefit to this scheme becomes apparent when you try to include a quoted string inside a string. For example, say that you're assembling a line of HTML code in a variable that you will eventually write to a new window completely controlled by JavaScript. The line of text that you want to assign to a variable is the following:

```
<INPUT TYPE="checkbox" NAME="candy">Chocolate
```

To assign this entire line of text to a variable, you have to surround the line in quotes. But because quotes appear inside the string, JavaScript (or any language) has problems deciphering where the string begins or ends. By carefully placing the other kind of quote pairs, however, you can make the assignment work. Here are two equally valid ways:

```
result = '<INPUT TYPE="checkbox" NAME="candy">Chocolate'
result = "<INPUT TYPE='checkbox' NAME='candy'>Chocolate"
```

Notice that in both cases, the same unique pair of quotes surrounds the entire string. Inside the string, two quoted strings appear that are treated as such by JavaScript. I recommend that you settle on one form or the other, and then use that form consistently throughout your scripts.

Building long string variables

The act of joining strings together — concatenation — enables you to assemble long strings out of several little pieces. This feature is very important for some of your scripting — for example, when you need to build an HTML page's specifications entirely within a variable before writing the page to another frame with one `document.write()` statement.

One tactic that I use keeps the length of each statement in this building process short enough so that it's easily readable in your text editor. This method uses the add-by-value assignment operator (+=) that appends the right-hand side of the equation to the left-hand side. Here is a simple example, which begins by initializing a variable as an empty string:

```
var newDocument = ""
newDocument += "<HTML><HEAD><TITLE>Life and Times</TITLE></HEAD>"
newDocument += "<BODY><H1>My Life and Welcome to It</H1>"
newDocument += "by Sidney Finortny<HR>"
```

Starting with the second line, each statement adds more data to the string being stored in `newDocument`. You can continue appending string data until the entire page's specification is contained in the `newDocument` variable.

Joining string literals and variables

In some cases, you need to create a string out of literal strings (characters with quote marks around them) and string variable values. The methodology for concatenating these types of strings is no different from that of multiple string literals. The plus-sign operator does the job. Therefore, in the following example, a variable contains a name. That variable value is made a part of a larger string whose other parts are string literals:

```
yourName = prompt("Please enter your name:","")
var msg = "Good afternoon, " + yourName + "."
alert(msg)
```

Some common problems that you may encounter while attempting this kind of concatenation include the following:

✦ Accidentally omitting one of the quotes around a literal string

✦ Failing to insert blank spaces in the string literals to accommodate word spaces

✦ Forgetting to concatenate punctuation after a variable value

Also, don't forget that what I show here as variable values can be any expression that evaluates to a string, including property references and the results of some methods. For example

```
var msg = "The name of this document is " + document.title + "."
alert(msg)
```

Special inline characters

The way string literals are created in JavaScript makes adding certain characters to strings difficult. I'm talking primarily about adding quotes, carriage returns, apostrophes, and tab characters to strings. Fortunately, JavaScript provides a mechanism for entering such characters into string literals. A backslash symbol, followed by the character that you want to appear as inline, makes that task happen. For the "invisible" characters, a special set of letters following the backslash tells JavaScript what to do.

The most common backslash pairs are as follows:

✦ `\"` Double quote

✦ `\'` Single quote (apostrophe)

✦ `\\` Backslash

✦ `\b` Backspace

✦ `\t` Tab

✦ `\n` New line

✦ `\r` Carriage return

✦ `\f` Form feed

Use these "inline characters" (also known as "escaped characters," but this terminology has a different connotation for Internet strings) inside quoted string literals to make JavaScript recognize them. When assembling a block of text that needs a new paragraph, insert the `\n` character pair. Here are some examples of syntax using these special characters:

```
msg = "You\'re doing fine."
msg = "This is the first line.\nThis is the second line."
msg = document.title + "\n" + document.links.length + " links present."
```

Technically speaking, a complete carriage return, as known from typewriting days, is both a line feed (advance the line by one) and a carriage return (move the carriage all the way to the left margin). Although JavaScript strings treat a line feed (`\n` new line) as a full carriage return, you may have to construct `\r\n` breaks when assembling strings that go back to a CGI script on a server. The format that you use all depends on the string-parsing capabilities of the CGI program. (Also see the special requirements for the TEXTAREA object in Chapter 22.)

Confusing the strings assembled for display in TEXTAREA objects or alert boxes with strings to be written as HTML is easy. For HTML strings, make sure that you use the standard HTML tags for line breaks (`<BR>`) and paragraph breaks (`<P>`) rather than the inline return or line feed symbols.

String Object

Properties	***Methods***
`constructor`	`anchor()`
`length`	`big()`
`prototype`†	`blink()`
	`bold()`
	`charAt()`
	`charCodeAt()`
	`concat()`
	`fixed()`
	`fontcolor()`
	`fontsize()`
	`fromCharCode()`†
	`indexOf()`
	`italics()`
	`lastIndexOf()`
	`link()`
	`localeCompare()`
	`match()`
	`replace()`
	`search()`
	`slice()`
	`small()`
	`split()`

Properties	Methods
	`strike()`
	`sub()`
	`substr()`
	`substring()`
	`sup()`
	`toLocaleLowerCase()`
	`toLocaleUpperCase()`
	`toLowerCase()`
	`toString()`
	`toUpperCase()`
	`valueOf()`

†Member of the static String object

Syntax

Creating a string object:

```
var myString = new String("characters")
```

Accessing static `String` object properties and methods:

```
String.property | method([parameters])
```

Accessing string object properties and methods:

```
string.property | method([parameters])
```

About this object

JavaScript draws a fine line between a string value and a string object. Both let you use the same methods on their contents, so that by and large, you do not have to create a string object (with the `new String()` constructor) every time you want to assign a string value to a variable. A simple assignment operation (`var myString = "fred"`) is all you need to create a string value that behaves on the surface very much like a full-fledged string object.

Where the difference comes into play is when you want to exploit the "object-ness" of a genuine string object, which I explain further in the discussion of the *`string`*`.prototype` property later in this chapter. You may also encounter the need to use a full-fledged string object when passing string data to Java applets. If you find that your applet doesn't receive a string value as a Java String data type, then create a new string object via the JavaScript constructor function before passing the value onto the applet.

With string data often comes the need to massage that text in scripts. In addition to concatenating strings, you at times need to extract segments of strings, delete parts of strings, and replace one part of a string with some other text. Unlike many plain-language scripting languages, JavaScript is fairly low-level in its built-in facilities for string manipulation. This characteristic means that unless you can take advantage of the regular expression powers of NN4+ and IE4+, you must fashion your own string handling routines out of very elemental powers built into JavaScript. Later in this chapter, I provide several functions that you can use in your own scripts for common string handling in a manner fully compatible with older browsers.

As you work with string values, visualize every string value as an object with properties and methods like other JavaScript objects. The latest versions of JavaScript define a few properties and a slew of methods for any string value (and one extra property for the static `String` object that is always present in the context of the browser window). The syntax is the same for string methods as it is for any other object method:

```
stringObject.method()
```

What may seem odd at first is that the *`stringObject`* part of this reference can be any expression that evaluates to a string, including string literals, variables containing strings, methods or functions that return strings, or other object properties. Therefore, the following examples of calling the `toUpperCase()` method are all valid:

```
"george burns".toUpperCase()
yourName.toUpperCase() // yourName is a variable containing a string
window.prompt("Enter your name","").toUpperCase()
document.forms[0].entry.value.toUpperCase() // entry is a text field object
```

An important concept to remember is that invoking a string method does not change the string object that is part of the reference. Rather, the method returns a value, which can be used as a parameter to another method or function call, or assigned to a variable value.

Therefore, to change the contents of a string variable to the results of a method, you must use an assignment operator, as in

```
yourName = yourName.toUpperCase() // variable is now all uppercase
```

Note In Navigator 2, avoid nesting method calls for the same string object when the methods modify the string. The evaluation does not work as you may expect. Instead, break out each call as a separate JavaScript statement.

Properties

constructor

Value: Function Reference Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `constructor` property is a reference to the function that was invoked to create the current string. For a native JavaScript string object, the constructor function is the built-in `String()` constructor.

When you use the `new String()` constructor to create a string object, the type of the value returned by the constructor is `object` (meaning the `typeof` operator returns `object`). Therefore, you can use the `constructor` property on an object value to see if it is a string object:

```
if (typeof someValue == "object" ) {
    if (someValue.constructor == String) {
        // statements to deal with string object
    }
}
```

Although the property is read/write, and you can assign a different constructor to the `String.prototype`, the native behavior of a `String` object persists through the new constructor.

On the CD-ROM

Example on the CD-ROM

Related Items: `prototype` property.

length

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The most frequently used property of a string is `length`. To derive the length of a string, read its property as you would read the `length` property of any object:
`string``.length`

The length value represents an integer count of the number of characters within the string. Spaces and punctuation symbols count as characters. Any backslash special characters embedded in a string count as one character, including such characters as newline and tab. Here are some examples:

```
"Lincoln".length // result = 7
"Four score".length // result = 10
"One\ntwo".length // result = 7
"".length // result = 0
```

The `length` property is commonly summoned when dealing with detailed string manipulation in repeat loops.

prototype

Value: Object Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

String objects defined with the `new String("stringValue")` constructor are robust objects compared with plain, old variables that are assigned string values. You certainly don't have to create this kind of string object for every string in your scripts, but these objects do come in handy if you find that strings in variables go awry. This happens occasionally while trying to preserve string information as script variables in other frames or windows. By using the string object constructor, you can be relatively assured that the string value will be available in the distant frame when needed.

Another byproduct of true string objects is that you can assign prototype properties and methods to all string objects in the document. A *prototype* is a property or method that becomes a part of every new object created after the prototype items are added. For strings, as an example, you may want to define a new method for converting a string into a new type of HTML font tag not already defined by the JavaScript string object. Listing 34-1 shows how to create and use such a prototype.

Listing 34-1: A String Object Prototype

```
<HTML>
<HEAD>
<TITLE>String Object Prototype</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function makeItHot() {
    return "<FONT COLOR='red'>" + this.toString() + "</FONT>"
}
String.prototype.hot = makeItHot
</SCRIPT>
<BODY>
<SCRIPT LANGUAGE="JavaScript1.1">
document.write("<H1>This site is on " + "FIRE".hot() + "!!</H1>")
</SCRIPT>
</BODY>
</HTML>
```

A function definition (`makeItHot()`) accumulates string data to be returned to the object when the function is invoked as the object's method. The `this` keyword refers to the object making the call, which you convert to a string for concatenation with the rest of the strings to be returned. In the page's Body, that prototype method is invoked in the same way one invokes existing `String` methods that turn strings into HTML tags (discussed later in this chapter).

In the next sections, I divide string object methods into two distinct categories. The first, parsing methods, focuses on string analysis and character manipulation within strings. The second group, formatting methods, is devoted entirely to assembling strings in HTML syntax for those scripts that assemble the text to be written into new documents or other frames.

Parsing methods

string.charAt(*index*)

Returns: One-Character String

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Use the *string*.charAt() method to read a single character from a string when you know the position of that character. For this method, you specify an index value in the string as a parameter to the method. The index value of the first character of the string is 0. To grab the last character of a string, mix string methods: myString.charAt(myString.length - 1)

If your script needs to get a range of characters, use the *string*.substring() method. Using *string*.substring() to extract a character from inside a string is a common mistake, when the *string*.charAt() method is more efficient.

On the CD-ROM

Example on the CD-ROM

Related Items: string.lastIndexOf(), string.indexOf(), string.substring() methods.

string.charCodeAt([*index*]) String.fromCharCode(*num1* [, *num2* [, ... *numn*]])

Returns: Integer code number for a character; concatenated string value of code numbers supplied as parameters.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Conversions from plain language characters to their numeric equivalents have a long tradition in computer programming. For a long time, the most common numbering scheme was the ASCII standard, which covers the basic English, alphanumeric characters and punctuation within 128 values (numbered 0 through 127). An extended version with a total of 256 characters, with some variations depending on the operating system, accounts for other roman characters in other languages, particularly vowels with umlauts and other pronunciation marks. To bring all languages, including pictographic languages and other nonroman alphabets, into the computer age, a world standard called Unicode provides space for thousands of characters.

In JavaScript, the character conversions are string methods. Acceptable values depend on the browser that you are using. NN4 works only with the 256 ISO-Latin-I values; NN6 and IE4+ work with the Unicode system.

The two methods that perform these conversions work in very different ways syntactically. The first, *string*.charCodeAt(), converts a single string character to its numerical equivalent. The string being converted is the one to the left of the method name — and the string may be a literal string or any other expression that evaluates to a string value. If no parameter is passed, the character being converted is by default the first character of the string. However, you can also specify a different character as an index value into the string (first character is 0), as demonstrated here:

```
"abc".charCodeAt()  // result = 97
"abc".charCodeAt(0)  // result = 97
"abc".charCodeAt(1)  // result = 98
```

If the string value is an empty string or the index value is beyond the last character, the result is NaN.

To convert numeric values to their characters, use the String.fromCharCode() method. Notice that the object beginning the method call is the static String object, not a string value. Then, as parameters, you can include one or more integers separated by commas. In the conversion process, the method combines the characters for all of the parameters into one string, an example of which is shown here:

```
String.fromCharCode(97, 98, 99)  // result "abc"
```

Note

The string.charCodeAt() method is broken on the first release of the Macintosh version of Navigator 4, and always returns NaN. This error is fixed in subsequent releases.

On the CD-ROM

Example (with Listing 34-2) on the CD-ROM

Related Items: None.

string.concat(*string2*)

Returns: Combined string.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

JavaScript's add-by-value operator (+=) provides a convenient way to concatenate strings. Recent browsers, however, include a string object method that performs the same task. The base string to which more text is appended is the object or value to the left of the period. The string to be appended is the parameter of the method, as the following example demonstrates:

```
"abc".concat("def")  // result: "abcdef"
```

As with the add-by-value operator, the `concat()` method doesn't know about word endings. You are responsible for including the necessary space between words if the two strings require a space between them in the result.

Related Items: Add-by-value (+=) operator.

string.indexOf(*searchString* [, *startIndex*])

Returns: Index value of the character within *string* where *searchString* begins.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Like some languages' offset string function, JavaScript's `indexOf()` method enables your script to obtain the number of the character in the main string where a search string begins. Optionally, you can specify where in the main string the search should begin — but the returned value is always relative to the very first character of the main string. Such as all string object methods, index values start their count with `0`. If no match occurs within the main string, the returned value is `-1`. Thus, this method is a convenient way to determine whether one string contains another, regardless of position.

A bug exists in some versions of Navigator 2 and 3 that can trip up your scripts if you don't guard against it. If the string being searched is empty, the `indexOf()` method returns an empty string rather than the expected `-1` value. Therefore, you may want to test to make sure the string is not empty before applying this method. A look at the following examples tells you more about this method than a long description. In all examples, you assign the result of the method to a variable named `offset`.

On the CD-ROM

Example on the CD-ROM

Related Items: `string.lastIndexOf()`, `string.charAt()`, `string.substring()` methods.

string.lastIndexOf(*searchString*[, *startIndex*])

Returns: Index value of the last character within string where *searchString* begins.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The *string*`.lastIndexOf()` method is closely related to the method *string*`.indexOf()`. The only difference is that this method starts its search for a match from the end of the string (*string*`.length - 1`) and works its way backward through the string. All index values are still counted, starting with 0, from the front of the string. The examples that follow use the same values as in the examples for *string*`.indexOf()` so that you can compare the results. In cases where only one instance of the search string is found, the results are the same; but when multiple instances of the search string exist, the results can vary widely — hence the need for this method.

Caution

This string method has experienced numerous bugs, particularly in Navigator 2, and in later versions for UNIX. Scripts using this method should be tested exhaustively.

On the CD-ROM

Example on the CD-ROM

Related Items: `string.lastIndexOf()`, `string.charAt()`, `string.substring()` methods.

string.localeCompare(*string2*)

Returns: Integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `localeCompare()` method lets a script compare the cumulative Unicode values of two strings, taking into account the language system for the browser. The need for this method affects only some language systems (Turkish is said to be one). If the two strings, adjusted for the language system, are equal, the value returned is zero. If the string value on which the method is invoked (meaning the string to the left of the period) sorts ahead of the parameter string, the value returned is a negative integer; otherwise the returned value is a positive integer.

The ECMA standard for this method leaves the precise positive or negative values up to the browser designer. NN6 calculates the cumulative Unicode values for both strings and subtracts the string parameter's sum from the string value's sum. IE5.5, on the other hand, returns `-1` or `1` if the strings are not colloquially equal.

Related Items: `string.toLocaleLowerCase()`, `string.toLocaleUpperCase()` methods.

string.match(*regExpression*)

Returns: Array of matching strings.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The *`string`*`.match()` method relies on the `RegExp` (regular expression) object introduced to JavaScript in NN4 and IE4. The string value under scrutiny is to the left of the dot, while the regular expression to be used by the method is passed as a parameter. The parameter must be a regular expression object, created according to the two ways these objects can be generated.

This method returns an array value when at least one match turns up; otherwise the returned value is `null`. Each entry in the array is a copy of the string segment that matches the specifications of the regular expression. You can use this method to uncover how many times a substring or sequence of characters appears in a larger string. Finding the offset locations of the matches requires other string parsing.

On the CD-ROM

Example (with Listing 34-3) on the CD-ROM

Related Items: `RegExp` object (Chapter 38).

string.replace(*regExpression*, *replaceString*)

Returns: Changed string.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Regular expressions are commonly used to perform search-and-replace operations. JavaScript's *string*.replace() method provides a simple framework in which to perform this kind of operation on any string.

Searching and replacing requires three components. The first is the main string that is the target of the operation. Second is the regular expression to search for. And third is the string to replace each instance of the text found by the operation. For the *string*.replace() method, the main string is the string value or object referenced to the left of the period. This string can also be a literal string (that is, text surrounded by quotes). The regular expression to search for is the first parameter, while the replacement string is the second parameter.

The regular expression definition determines whether the replacement is of just the first match encountered in the main string or all matches in the string. If you add the g parameter to the end of the regular expression, then one invocation of the replace() method performs global search-and-replace through the entire main string.

As long as you know how to generate a regular expression, you don't have to be a whiz to use the *string*.replace() method to perform simple replacement operations. But using regular expressions can make the operation more powerful. Consider these soliloquy lines by Hamlet:

```
To be, or not to be: that is the question:
Whether 'tis nobler in the mind to suffer
```

If you wanted to replace both instances of "be" with "exist," you can do it in this case by specifying

```
var regexp = /be/g
soliloquy.replace(regexp, "exist")
```

But you can't always be assured that the letters "b" and "e" will be standing alone as a word. What happens if the main string contains the word "being" or "saber"? The above example replaces the "be" letters in them as well.

The regular expression help comes from the special characters to better define what to search for. In the example here, the search is for the word "be." Therefore, the regular expression surrounds the search text with word boundaries (the \b special character), as in

```
var regexp = /\bbe\b/g
soliloquy.replace(regexp, "exist")
```

This syntax also takes care of the fact that the first two "be" words are followed by punctuation, rather than a space, as you may expect for a freestanding word. For more about regular expression syntax, see Chapter 38.

On the CD-ROM

Example (with Listing 34-4) on the CD-ROM

Related Items: string.match() method; RegExp object.

string.search(*regExpression*)

Returns: Offset Integer.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The results of the *string*.search() method may remind you of the *string*.indexOf() method. In both cases, the returned value is the character number where the matching string first appears in the main string, or -1 if no match occurs. The big difference, of course, is that the matching string for *string*.search() is a regular expression.

On the CD-ROM

Example on the CD-ROM

Related Items: string.match() method; RegExp object.

string.slice(*startIndex* [, *endIndex*])

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The *string*.slice() method resembles the method *string*.substring() in that both let you extract a portion of one string and create a new string as a result (without modifying the original string). A helpful improvement in *string*.slice(), however, is that specifying an ending index value relative to the end of the main string is easier.

Using *string*.substring() to extract a substring that ends before the end of the string requires machinations, such as the following:

```
string.substring(4, (string.length-2))
```

Instead, you can assign a negative number to the second parameter of *string*.slice() to indicate an offset from the end of the string:

```
string.slice(4, -2)
```

The second parameter is optional. If you omit the second parameter, the returned value is a string from the starting offset to the end of the main string.

On the CD-ROM

Example (with Listing 34-5) on the CD-ROM

Related Items: `string.substr()`, `string.substring()` methods.

string.split("*delimiterCharacter*" [, *limitInteger*])

Returns: Array of delimited items.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

The `split()` method is the functional opposite of the *array*`.join()` method (see Chapter 37). From the string object point of view, JavaScript splits a long string into pieces delimited by a specific character and then creates a dense array with those pieces. You do not need to initialize the array via the `new Array()` constructor. Given the powers of array object methods, such as *array*`.sort()`, you may want to convert a series of string items to an array to take advantage of those powers. Also, if your goal is to divide a string into an array of single characters, you can still use the `split()` method, but specify an empty string as a parameter. For NN3 and IE4, only the first parameter is observed.

In NN4+ and IE4+, you can use a regular expression object for the first parameter, enhancing the powers of finding delimiters in strings. For example, consider the following string:

```
var nameList  = "1.Fred,2.Jane,3.Steve"
```

To convert that string into a three-element array of only the names takes a lot of parsing without regular expressions before you can even use *string*`.split()`. However, with a regular expression as a parameter,

```
var regexp = /,*\d.\b/
var newArray = nameList.split(regexp)
    // result = an array "Fred", "Jane", "Steve"
```

the new array entries hold only the names and not the leading numbers or periods. A second addition is an optional second parameter. This integer value allows you to specify a limit to the number of array elements generated by the method.

And finally, NN4+ provides some extra (but non-ECMA-standard) functionality if you use the *string*`.split()` method inside a `<SCRIPT>` tag that specifies JavaScript1.2 (only). A space character as a single parameter, such as *string*.`split`(“ “), is interpreted to mean any white space (spaces, tabs, carriage returns, line feeds) between runs of characters. Even if the number of spaces between elements is not uniform, they are treated all the same. This special feature may not be adopted by ECMA and is omitted from later JavaScript versions in NN.

On the CD-ROM

Example on the CD-ROM

Related Items: `array.join()` method.

string.substr(*start* [, *length*])

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The *string*.substr() method offers a variation of the *string*.substring() method that has been in the language since the beginning. The distinction is that the *string*.substr() method's parameters specify the starting index and a number of characters to be included from that start point. In contrast, the *string*.substring() method parameters specify index points for the start and end characters within the main string.

As with all string methods requiring an index value, the *string*.substr() first parameter is zero-based. If you do not specify a second parameter, the returned substring starts at the indexed point and extends to the end of the string. A second parameter value that exceeds the end point of the string means that the method returns a substring to the end of the string.

Even though this method is newer than its partner, it is not part of the ECMA standard as of Edition 3 of the language spec. But because the method is so widely used, the standard does acknowledge it so that other scripting contexts can implement the method consistent with browser practice.

Caution NN4/Mac users should avoid setting the second parameter to a negative number to prevent a crash.

On the CD-ROM Example (with Listing 34-6) on the CD-ROM

Related Items: string.substring() method.

string.substring(*indexA*, *indexB*)

Returns: String of characters between index values *indexA* and *indexB*.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The *string*.substring() method enables your scripts to extract a copy of a contiguous range of characters from any string. The parameters to this method are the starting and ending index values (first character of the string object is index value 0) of the main string from which the excerpt should be taken. An important item to note is that the excerpt goes up to, but does not include, the character pointed to by the higher index value.

It makes no difference which index value in the parameters is larger than the other: The method starts the excerpt from the lowest value and continues to (but does not include) the highest value. If both index values are the same, the method returns an empty string; and if you omit the second parameter, the end of the string is assumed to be the endpoint.

Note

NN4 experimented with a slight variation of this method. If you use this method in a `<SCRIPT LANGUAGE="JavaScript1.2">` tag, the first index value is always the start of the excerpt, and the end is at the second index value, even if it means that the string value comes out in reverse. This variation has not been carried forward in later versions of JavaScript in NN.

On the CD-ROM

Example (with Listing 34-7) on the CD-ROM

Related Items: `string.substr()`, `string.slice()` methods.

string.toLocaleLowerCase()
string.toLocaleUpperCase()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

These two methods are variations on the standard methods for changing the case of a string. They take into account some language systems whose cases for a particular character don't necessarily map to the Latin alphabet character mappings.

Related Items: `string.toLowerCase()`, `string.toUpperCase()` methods.

string.toLowerCase()
string.toUpperCase()

Returns: The string in all lower- or uppercase, depending on which method you invoke.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A great deal of what takes place on the Internet (and in JavaScript) is case-sensitive. URLs on some servers, for instance, are case-sensitive for directory names and filenames. These two methods, the simplest of the string methods, return a copy of a string converted to either all lowercase or all uppercase. Any mixed-case strings get converted to a uniform case. If you want to compare user input from a field against some coded string without worrying about matching case, you can convert both strings to the same case for the comparison.

On the CD-ROM

Example on the CD-ROM

Related Items: `string.toLocaleLowerCase()`, `string.toLocaleUpperCase()` methods.

string.toString()
string.valueOf()

Returns: String value.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Both of these methods return string values (as opposed to full-fledged string objects). If you have created a string object via the `new String()` constructor, the type of that item is object. Therefore, if you want to examine more precisely what kind of value is held by the object, you can use the `valueOf()` method to get the value and then examine it via the `typeof` operator. The `toString()` method is present for this object primarily because a string object inherits the method from the root object of JavaScript.

On the CD-ROM

Example on the CD-ROM

Related Items: `typeof` operator (Chapter 40).

String Utility Functions

Figuring out how to apply the various string object methods to a string manipulation challenge is not always an easy task, especially if you need backward compatibility with older scriptable browsers. I also find it difficult to anticipate every possible way you may need to massage strings in your scripts. But to help you get started, Listing 34-8 contains a library of string functions for inserting, deleting, and replacing chunks of text in a string. If your audience uses browsers capable of including external `.js` library files, that would be an excellent way to make these functions available to your scripts.

Listing 34-8: Utility String Handlers

```
// extract front part of string prior to searchString
function getFront(mainStr,searchStr){
    foundOffset = mainStr.indexOf(searchStr)
    if (foundOffset == -1) {
        return null
    }
    return mainStr.substring(0,foundOffset)
}

// extract back end of string after searchString
function getEnd(mainStr,searchStr) {
    foundOffset = mainStr.indexOf(searchStr)
    if (foundOffset == -1) {
        return null
    }
    return mainStr.substring(foundOffset+searchStr.length,mainStr.length)
}

// insert insertString immediately before searchString
function insertString(mainStr,searchStr,insertStr) {
    var front = getFront(mainStr,searchStr)
    var end = getEnd(mainStr,searchStr)
    if (front != null && end != null) {
        return front + insertStr + searchStr + end
    }
    return null
}

// remove deleteString
function deleteString(mainStr,deleteStr) {
    return replaceString(mainStr,deleteStr,"")
}

// replace searchString with replaceString
function replaceString(mainStr,searchStr,replaceStr) {
    var front = getFront(mainStr,searchStr)
    var end = getEnd(mainStr,searchStr)
    if (front != null && end != null) {
        return front + replaceStr + end
    }
    return null
}
```

The first two functions extract the front or end components of strings as needed for some of the other functions in this suite. The final three functions are the core of these string-handling functions. If you plan to use these functions in your scripts, be sure to notice the dependence that some functions have on others. Including all five functions as a group ensures that they work as designed.

Formatting methods

Now we come to the other group of string object methods, which ease the process of creating the numerous string display characteristics when you use JavaScript to assemble HTML code. The following is a list of these methods:

`string.anchor("`*anchorName*`")`	`string.link(`*locationOrURL*`)`
`string.blink()`	`string.big()`
`string.bold()`	`string.small()`
`string.fixed()`	`string.strike()`
`string.fontcolor(`*colorValue*`)`	`string.sub()`
`string.fontsize(`*integer1to7*`)`	`string.sup()`
`string.italics()`	

First examine the methods that don't require any parameters. You probably see a pattern: All of these methods are font-style attributes that have settings of on or off. To turn on these attributes in an HTML document, you surround the text in the appropriate tag pairs, such as `<B>`...`</B>` for boldface text. These methods take the string object, attach those tags, and return the resulting text, which is ready to be put into any HTML that your scripts are building. Therefore, the expression

```
"Good morning!".bold()
```

evaluates to

```
<B>Good morning!</B>
```

Of course, nothing is preventing you from building your HTML by embedding real tags instead of by calling the string methods. The choice is up to you. One advantage to the string methods is that they never forget the ending tag of a tag pair. Listing 34-9 shows an example of incorporating a few simple string methods in a string variable that is eventually written to the page as it loads. Internet Explorer does not support the `<BLINK>` tag and therefore ignores the *`string`*`.blink()` method.

Listing 34-9: **Using Simple String Methods**

```
<HTML>
<HEAD>
<TITLE>HTML by JavaScript</TITLE>
</HEAD>

<BODY>
<SCRIPT LANGUAGE="JavaScript">
var page = ""
```

Continued

Listing 34-9 *(continued)*

```
page += "JavaScript can create HTML on the fly.<P>Numerous string object methods
facilitate creating text that is " + "boldfaced".bold() + ", " +
"italicized".italics() + ", or even the terribly annoying " + "blinking
text".blink() + "."
document.write(page)
</SCRIPT>
</BODY>
</HTML>
```

Of the remaining string methods, two more (*string*.fontsize() and *string*.fontcolor()) also affect the font characteristics of strings displayed in the HTML page. The parameters for these items are pretty straightforward — an integer between 1 and 7 corresponding to the seven browser font sizes and a color value (as either a hexadecimal triplet or color constant name) for the designated text. Listing 34-10 adds a line of text to the string of Listing 34-9. This line of text not only adjusts the font size of some parts of the string but also nests multiple attributes inside one another to set the color of one word in a large-font-size string. Because these string methods do not change the content of the string, you can safely nest methods here.

Listing 34-10: **Nested String Methods**

```
<HTML>
<HEAD>
<TITLE>HTML by JavaScript</TITLE>
</HEAD>

<BODY>
<SCRIPT LANGUAGE="JavaScript">
var page = ""
page += "JavaScript can create HTML on the fly.<P>Numerous string object methods
facilitate creating text that is " + "boldfaced".bold() + ", " +
"italicized".italics() + ", or even the terribly annoying " + "blinking
text".blink() + ".<P>"
page += "We can make " + "some words big".fontsize(5) + " and some words both "
+ ("big and " + "colorful".fontcolor('coral')).fontsize(5) + " at the same
time."
document.write(page)
</SCRIPT>
</BODY>
</HTML>
```

The final two string methods let you create an anchor and a link out of a string. The *string*.anchor() method uses its parameter to create a name for the anchor. Thus, the following expression

```
"Table of Contents".anchor("toc")
```

evaluates to

```
<A NAME="toc">Table of Contents</A>
```

In a similar fashion, the *string*.link() method expects a valid location or URL as its parameter, creating a genuine HTML link out of the string:

```
"Back to Home".link("index.html")
```

This evaluates to the following:

```
<A HREF="index.html">Back to Home</A>
```

Again, the choice of whether you use string methods to build HTML anchors and links over assembling the actual HTML is up to you. The methods may be a bit easier to work with if the values for the string and the parameters are variables whose content may change based on user input elsewhere in your Web site.

URL String Encoding and Decoding

When browsers and servers communicate, some non-alphanumeric characters that we take for granted (such as a space) cannot make the journey in their native form. Only a narrower set of letters, numbers, and punctuation is allowed. To accommodate the rest, the characters must be encoded with a special symbol (%) and their hexadecimal ASCII values. For example, the space character is hex 20 (ASCII decimal 32). When encoded, it looks like %20. You may have seen this symbol in browser history lists or URLs.

JavaScript includes two functions, escape() and unescape(), that offer instant conversion of whole strings. To convert a plain string to one with these escape codes, use the escape function, as in

```
escape("Howdy Pardner") // result = "Howdy%20Pardner"
```

The unescape() function converts the escape codes into human-readable form. Both of these functions and some newer, more robust versions for recent browsers are covered in Chapter 42.

✦ ✦ ✦

35

CHAPTER

The Math, Number, and Boolean Objects

✦ ✦ ✦ ✦

In This Chapter

Advanced math operations

Number base conversions

Working with integers and floating-point numbers

✦ ✦ ✦ ✦

The introduction to data types and values in Chapter 6's tutorial scratched the surface of JavaScript's numeric and Boolean powers. In this chapter, you look more closely at JavaScript's way of working with numbers and Boolean data.

Math often frightens away budding programmers; but as you've seen so far in this book, you don't really have to be a math genius to program in JavaScript. The powers described in this chapter are here when you need them — if you need them. So if math is not your strong suit, don't freak out over the terminology here.

An important point to remember about the objects described in this chapter is that (like string values and string objects) numbers and Booleans are both values and objects. Fortunately for script writers, the differentiation is rarely, if ever, a factor unless you get into some very sophisticated programming. To those who actually write the JavaScript interpreters inside the browsers we use, the distinctions are vital.

For most scripters, the information about numeric data types and conversions as well as the `Math` object are important to know. I present other details in this chapter about the number and Boolean objects primarily for completeness because their direct powers are almost never used in day-to-day scripting of Web applications.

Numbers in JavaScript

More powerful programming languages have many different kinds of numbers, each related to the amount of memory it occupies in the computer. Managing all these different types may be fun for some, but it gets in the way of quick scripting. A JavaScript number has only two possibilities. It can be an integer or a floating-point value. An *integer* is any whole number within a humongous range that does not have any fractional part. Integers never contain a decimal point in their representation. *Floating-point numbers* in JavaScript spread across the same range, but they are represented with a decimal point and some fractional value. If you are an experienced programmer, refer to the discussion about the `Number` object later in this chapter to see how the JavaScript number type lines up with numeric data types you use in other programming environments.

Integers and floating-point numbers

Deep inside a computer, the microprocessor has an easier time performing math on integer values as compared to any number with a decimal value tacked on it, which requires the microprocessor to go through extra work to add even two such floating-point numbers. We, as scripters, are unfortunately saddled with this historical baggage and must be conscious of the type of number used in certain calculations.

Most internal values generated by JavaScript, such as index values and `length` properties, consist of integers. Floating-point numbers usually come into play as the result of the division of numeric values, special values such as pi, and human-entered values such as dollars and cents. Fortunately, JavaScript is forgiving if you try to perform math operations on mixed numeric data types. Notice how the following examples resolve to the appropriate data type:

```
3 + 4 = 7 // integer result
3 + 4.1 = 7.1 // floating-point result
3.9 + 4.1 = 8 // integer result
```

Of the three examples, perhaps only the last result is unexpected. When two floating-point numbers yield a whole number, the result is rendered as an integer.

When dealing with floating-point numbers, be aware that not all browser versions return the precise same value down to the last digit to the right of the decimal. For example, the following table shows the result of 8/9 as calculated by numerous scriptable browsers (all Windows 95) and converted for string display:

Navigator 2	0.88888888888888884
Navigator 3	.8888888888888888
Navigator 4	.8888888888888888
Navigator 6	0.8888888888888888
Internet Explorer 3	0.888888888888889
Internet Explorer 4+	0.8888888888888888

Clearly, from this display, you don't want to use floating-point math in JavaScript browsers to plan space flight trajectories. For everyday math, however, you need to be cognizant of floating-point errors that accrue in PC arithmetic.

In Navigator, JavaScript relies on the operating system's floating-point math for its own math. Operating systems that offer accuracy to as many places to the right of the decimal as JavaScript displays are exceedingly rare. As you can detect from the preceding table, the modern versions of browsers from Netscape and Microsoft agree about how many digits to display and how to perform internal rounding for this display. That's good for the math, but not particularly helpful when you need to display numbers in a specific format.

Until you get to IE5.5 and NN6, JavaScript does not offer built-in facilities for formatting the results of floating-point arithmetic. (For the newer browsers, see the `Number` object later in this chapter for formatting methods.) Listing 35-1 demonstrates a generic formatting routine for positive values, plus a specific call that turns a value into a dollar value. Remove the comments and the routine is fairly compact.

Listing 35-1: A Generic Number-Formatting Routine

```
<HTML>
<HEAD>
<TITLE>Number Formatting</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// generic positive number decimal formatting function
function format (expr, decplaces) {
    // raise incoming value by power of 10 times the
    // number of decimal places; round to an integer; convert to string
    var str = "" + Math.round (eval(expr) * Math.pow(10,decplaces))
    // pad small value strings with zeros to the left of rounded number
    while (str.length <= decplaces) {
        str = "0" + str
    }
    // establish location of decimal point
    var decpoint = str.length - decplaces
    // assemble final result from: (a) the string up to the position of
    // the decimal point; (b) the decimal point; and (c) the balance
    // of the string. Return finished product.
    return str.substring(0,decpoint) + "." + str.substring(decpoint,str.length);
}
// turn incoming expression into a dollar value
function dollarize (expr) {
    return "$" + format(expr,2)
}
</SCRIPT>
</HEAD>
<BODY>
<H1>How to Make Money</H1>
<FORM>
Enter a positive floating-point value or arithmetic expression to be converted
to a currency format:<P>
<INPUT TYPE="text" NAME="entry" VALUE="1/3">
<INPUT TYPE="button" VALUE=">Dollars and Cents>"
onClick="this.form.result.value=dollarize(this.form.entry.value)">
<INPUT TYPE="text" NAME="result">
</FORM>
</BODY>
</HTML>
```

This routine may seem like a great deal of work, but it's essential if your application relies on floating-point values and specific formatting for all browsers.

You can also enter floating-point numbers with exponents. An exponent is signified by the letter "e" (upper- or lowercase), followed by a sign (+ or -) and the exponent value. Here are examples of floating-point values expressed as exponents:

```
1e6 // 1,000,000 (the "+" symbol is optional on positive exponents)
1e-4 // 0.0001 (plus some error further to the right of the decimal)
-4e-3 // -0.004
```

For values between 1e-5 and 1e15, JavaScript renders numbers without exponents (although you can force a number to display in exponential notation in IE5.5 and NN6). All other values outside these boundaries return with exponential notation in all browsers.

Hexadecimal and octal integers

JavaScript enables you to work with values in decimal (base-10), hexadecimal (base-16), and octal (base-8) formats. You have only a few rules to follow when dealing with any of these values.

Decimal values cannot begin with a leading 0. Therefore, if your page asks users to enter decimal values that begin with a 0, your script must strip those zeroes from the input string or use the number parsing global functions (described in the next section) before performing any math on the values.

Hexadecimal integer values are expressed with a leading 0x or 0X. (That's a zero, not the letter "o.") The A through F values can appear in upper- or lowercase, as you prefer. Here are some hex values:

```
0X2B
0X1a
0xcc
```

Don't confuse the hex values used in arithmetic with the hexadecimal values used in color property specifications for Web documents. Those values are expressed in a special *hexadecimal triplet* format, which begins with a crosshatch symbol followed by the three hex values bunched together (such as #c0c0c0).

Octal values are represented by a leading 0 followed by any digits between 0 and 7. Octal values consist only of integers.

You are free to mix and match base values in arithmetic expressions, but JavaScript renders all results in decimal form. For conversions to other number bases, you have to employ a user-defined function in your script. Listing 35-2, for example, is a function that converts any decimal value from 0 to 255 into a JavaScript hexadecimal value.

Listing 35-2: **Decimal-to-Hexadecimal Converter Function**

```
function toHex(dec) {
    hexChars = "0123456789ABCDEF"
    if (dec > 255) {
        return null
    }
    var i = dec % 16
```

```
    var j = (dec - i) / 16
    result = "0X"
    result += hexChars.charAt(j)
    result += hexChars.charAt(i)
    return result
}
```

The `toHex()` conversion function assumes that the value passed to the function is a decimal integer. If you simply need a hexadecimal representation of a number in string format, see the `toString()` method in Chapter 42.

Converting strings to numbers

What is missing so far from this discussion is a way to convert a number represented as a string to a number with which the JavaScript arithmetic operators can work. Before you get too concerned about this, be aware that most JavaScript operators and math methods gladly accept string representations of numbers and handle them without complaint. You will run into data type incompatibilities most frequently when trying to accomplish addition with the + operator (which is also the string concatenation operator). Also know that if you perform math operations on values retrieved from form text boxes, those object `value` properties are strings. Therefore, in many cases, you need to convert those values to values of the number type for math operations.

Conversion to numbers requires one of two JavaScript functions:

```
parseInt(string [,radix])
parseFloat(string  [,radix])
```

These functions, inspired by the Java language. The term *parsing* has many implied meanings in programming. One meaning is the same as *extracting*. The `parseInt()` function returns whatever integer value it can extract from the string passed to it; the `parseFloat()` function returns the floating-point number that can be extracted from the string. Here are some examples and their resulting values:

```
parseInt("42")        // result = 42
parseInt("42.33")     // result = 42
parseFloat("42.33")   // result = 42.33
parseFloat("42")      // result = 42
parseFloat("fred")    // result = NaN
```

Because the `parseFloat()` function can also work with an integer and return an integer value, you may prefer using this function in scripts that have to deal with either kind of number, depending on the string entered into a text field by a user.

An optional second parameter to both functions enables you to specify the base of the number represented by the string. This comes in handy particularly when you need a decimal number from a string that starts with one or more zeros. Normally, the leading zero indicates an octal value. But if you force the conversion to recognize the string value as a decimal, it is converted the way you expect:

```
parseInt("010")       // result = 8
parseInt("010",10)    // result = 10
parseInt("F2")        // result = NaN
parseInt("F2", 16)    // result = 242
```

Use these functions wherever you need the integer or floating-point value. For example:

```
var result = 3 + parseInt("3")    // result = 6
var ageVal = parseInt(document.forms[0].age.value)
```

The latter technique ensures that the string value of this property is converted to a number (although you should do more data validation — see Chapter 43 — before trying any math on a user-entered value).

Both the `parseInt()` and `parseFloat()` methods start working on the first character of a string and continue until there are no more numbers or decimal characters. That's why you can use them on strings — such as the one returned by the `navigator.appVersion` property (for example, `4.0 (compatible; MSIE 5.5; Windows95)`) — to obtain just the leading, numeric part of the string. If the string does not begin with an acceptable character, the methods return `NaN` (not a number).

Converting numbers to strings

If you attempt to pass a numeric data type value to many of the string methods discussed in Chapter 34, JavaScript complains. Therefore, you should convert any number to a string before you, for example, find out how many digits make up a number.

There are several ways to force conversion from any numeric value to a string. The old-fashioned way is to precede the number with an empty string and the concatenation operator. For example, assume that a variable named `dollars` contains the integer value of `2500`. To use the string object's `length` property (discussed later in this chapter) to find out how many digits the number has, use this construction:

```
("" + dollars).length    // result = 4
```

The parentheses force JavaScript to evaluate the concatenation before attempting to extract the `length` property.

A more elegant way is to use the `toString()` method. Construct such statements as you do to invoke any object's method. For example, to convert the `dollars` variable value to a string, use this statement:

```
dollars.toString()    // result = "2500"
```

This method has one added power in NN3+ and IE4+: You can specify a number base for the string representation of the number. Called the *radix,* the base number is added as a parameter to the method name. Here is an example of creating a numeric value for conversion to its hexadecimal equivalent as a string:

```
var x = 30
var y = x.toString(16)    // result = "1e"
```

Use a parameter of `2` for binary results and `8` for octal. The default is base `10`. Be careful not to confuse these conversions with true numeric conversions. You cannot use results from the `toString()` method as numeric operands in other statements.

Finally, in IE5.5 and NN6, three additional methods of the `Number` object — `toExponential()`, `toFixed()`, and `toPrecision()` — return string versions of numbers formatted according to the rules and parameters passed to the methods. I describe these in detail later in this chapter.

When a number isn't a number

In a couple of examples in the previous section, you probably noticed that the result of some operations was a value named `NaN`. That value is not a string but rather a special value that stands for Not a Number. For example, if you try to convert the string `"joe"` to an integer with `parseFloat()`, the function cannot possibly complete the operation. It reports back that the source string, when converted, is not a number.

When you design an application that requests user input or retrieves data from a server-side database, you cannot be guaranteed that a value you need to be numeric is, or can be converted to, a number. If that's the case, you need to see if the value is a number before performing some math operation on it. JavaScript provides a special global function, `isNaN()`, that enables you to test the "numberness" of a value. The function returns `true` if the value is not a number and `false` if it is a number. For example, you can examine a form field that should be a number:

```
var ageEntry = parseInt(document.forms[0].age.value)
if (isNaN(ageEntry)) {
    alert("Try entering your age again.")
}
```

Note `NaN` and `isNaN()` are implemented in Navigator 2 only on UNIX versions. You can find these terms on all OS platforms of NN3+ and IE4+.

Math Object

Whenever you need to perform math that is more demanding than simple arithmetic, look through the list of `Math` object methods for the solution.

Syntax

Accessing `Math` object properties and methods:

```
Math.property
Math.method(value [, value])
```

About this object

In addition to the typical arithmetic operations (covered in detail in Chapter 40), JavaScript includes more advanced mathematical powers that you can access in a way that may seem odd to you if you have not programmed in true object-oriented environments before. Although most arithmetic takes place on the fly (such as var result = 2 + 2), the rest requires use of the JavaScript internal `Math` object (with a capital "M"). The `Math` object brings with it several properties (which behave like some other languages' constants) and many methods (which behave like some other languages' math functions).

The way you use the `Math` object in statements is the same way you use any JavaScript object: You create a reference beginning with the `Math` object's name, a period, and the name of the property or method you need:

```
Math.property | method([parameter]. . . [,parameter])
```

Property references return the built-in values (things such as pi). Method references require one or more values to be sent as parameters of the method. Every method returns a result.

Properties

JavaScript `Math` object properties represent a number of valuable constant values in math. Table 35-1 shows you those methods and their values as displayed to 16 decimal places.

Table 35-1 JavaScript Math Properties

Property	Value	Description
Math.E	2.718281828459045091	Euler's constant
Math.LN2	0.6931471805599452862	Natural log of 2
Math.LN10	2.302585092994045901	Natural log of 10
Math.LOG2E	1.442695040888963387	Log base-2 of E
Math.LOG10E	0.4342944819032518167	Log base-10 of E
Math.PI	3.141592653589793116	π
Math.SQRT1_2	0.7071067811865475727	Square root of 0.5
Math.SQRT2	1.414213562373095145	Square root of 2

Because these property expressions return their constant values, you use them in your regular arithmetic expressions. For example, to obtain the circumference of a circle whose diameter is in variable `d`, employ this statement:

```
circumference = d * Math.PI
```

Perhaps the most common mistakes scripters make with these properties are failing to capitalize the `Math` object name and observing the case-sensitivity of property names.

Methods

Methods make up the balance of JavaScript `Math` object powers. With the exception of the `Math.random()` method, all `Math` object methods take one or more values as parameters. Typical trigonometric methods operate on the single values passed as parameters; others determine which of the numbers passed along are the highest or lowest of the group. The `Math.random()` method takes no parameters but returns a randomized, floating-point value between `0` and `1` (note that the method does not work on Windows or Macintosh versions of

Navigator 2). Table 35-2 lists all the `Math` object methods with their syntax and descriptions of the values they return.

Table 35-2 Math Object Methods

Method Syntax	***Returns***
`Math.abs(val)`	Absolute value of *val*
`Math.acos(val)`	Arc cosine (in radians) of *val*
`Math.asin(val)`	Arc sine (in radians) of *val*
`Math.atan(val)`	Arc tangent (in radians) of *val*
`Math.atan2(val1, val2)`	Angle of polar coordinates *x* and *y*
`Math.ceil(val)`	Next integer greater than or equal to *val*
`Math.cos(val)`	Cosine of *val*
`Math.exp(val)`	Euler's constant to the power of *val*
`Math.floor(val)`	Next integer less than or equal to *val*
`Math.log(val)`	Natural logarithm (base e) of *val*
`Math.max(val1, val2)`	The greater of *val1* or *val2*
`Math.min(val1, val2)`	The lesser of *val1* or *val2*
`Math.pow(val1, val2)`	*Val1* to the *val2* power
`Math.random()`	Random number between 0 and 1
`Math.round(val)`	N+1 when *val* >= N.5; otherwise N
`Math.sin(val)`	Sine (in radians) of *val*
`Math.sqrt(val)`	Square root of *val*
`Math.tan(val)`	Tangent (in radians) of *val*

HTML is not exactly a graphic artist's dream environment, so using trig functions to obtain a series of values for HTML-generated charting is not a hot JavaScript prospect. Only with the advent of positionable elements have scripters been able to apply their knowledge of using these functions to define fancy trajectories for flying elements. For scripters who are not trained in programming, math is often a major stumbling block. But as you've seen so far, you can accomplish a great deal with JavaScript by using simple arithmetic and a little bit of logic — leaving the heavy-duty math for those who love it.

Creating random numbers

The `Math.random()` method returns a floating-point value between 0 and 1. If you design a script to act like a card game, you need random integers between 1 and 52; for dice, the range is 1 to 6 per die. To generate a random integer between zero and any top value, use the following formula:

```
Math.floor(Math.random() * n)
```

Here, *n* is the top number. To generate random numbers between a different range, use this formula:

```
Math.floor(Math.random() * n) + m
```

Here, *m* is the lowest possible integer value of the range and *n* equals the top number of the range. For the dice game, the formula for each die is

```
newDieValue = Math.floor(Math.random() * 6) + 1
```

Math object shortcut

In Chapter 39, you see details about a JavaScript construction that enables you to simplify the way you address multiple `Math` object properties and methods in statements. The trick is to use the `with` statement.

In a nutshell, the `with` statement tells JavaScript that the next group of statements (inside the braces) refers to a particular object. In the case of the `Math` object, the basic construction looks like this:

```
with (Math) {
    //statements
}
```

For all intervening statements, you can omit the specific references to the `Math` object. Compare the long reference way of calculating the area of a circle (with a radius of six units)

```
result = Math.pow(6,2) * Math.PI
```

to the shortcut reference way:

```
with (Math) {
    result = pow(6,2) * PI
}
```

Though the latter occupies more lines of code, the object references are shorter and more natural when reading the code. For a longer series of calculations involving `Math` object properties and methods, the `with` construction saves keystrokes and reduces the likelihood of a case-sensitive mistake with the object name in a reference. You can also include other full-object references within the `with` construction; JavaScript attempts to attach the object name only to those references lacking an object name. On the downside, the `with` construction is not particularly efficient in JavaScript because it must perform a lot of internal tracking in order to work.

Number Object

Properties	***Methods***
`constructor`	`toExponential()`
`MAX_VALUE`	`toFixed()`

`MIN_VALUE`	`toLocaleString()`
`NaN`	`toString()`
`NEGATIVE_INFINITY`	`toPrecision()`
`POSITIVE_INFINITY`	`valueOf()`
`prototype`	

Syntax

Creating a number object:

```
var val = new Number(number)
```

Accessing number and `Number` object properties and methods:

```
number.property | method([parameters])
Number.property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

About this object

The `Number` object is rarely used because (for the most part) JavaScript satisfies day-to-day numeric needs with a plain number value. But the `Number` object contains some information and power of value to serious programmers.

First on the docket are properties that define the ranges for numbers in the language. The largest number (in both Navigator and Internet Explorer) is 1.79E+308; the smallest number is 2.22E-308. Any number larger than the maximum is `POSITIVE_INFINITY`; any number smaller than the minimum is `NEGATIVE_INFINITY`. Rarely will you accidentally encounter these values.

More to the point of a JavaScript object, however, is the `prototype` property. In Chapter 34, you see how to add a method to a `string` object's prototype such that every newly created object contains that method. The same goes for the `Number.prototype` property. If you have a need to add common functionality to every number object, this is where to do it. This prototype facility is unique to full-fledged number objects and does not apply to plain number values. For experienced programmers who care about such matters, JavaScript number objects and values are defined internally as IEEE double-precision 64-bit values.

Properties

constructor

See `string.constructor` (Chapter 34).

MAX_VALUE
MIN_VALUE

NEGATIVE_INFINITY
POSITIVE_INFINITY

Value: Number Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

The `Number.MAX_VALUE` and `Number.MIN_VALUE` properties belong to the static `Number` object. They represent constants for the largest and smallest possible positive numbers that JavaScript (and ECMAScript) can work with. Their actual values are 1.7976931348623157 *, 10^{308}, and 5 * 10^{-324}, respectively.

A number that falls outside the range of allowable numbers is equal to the constant `Number.POSITIVE_INFINITY` or `Number.NEGATIVE_INFINITY`.

On the CD-ROM

Example on the CD-ROM

Related Items: `NaN` property; `isNaN()` global function.

NaN

Value: NaN Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

The `NaN` property is a constant that JavaScript uses to report when a number-related function or method attempts to work on a value other than a number or the result is something other than a number. You encounter the `NaN` value most commonly as the result of the `parseInt()` and `parseFloat()` functions whenever a string undergoing conversion to a number lacks a numeral as the first character. Use the `isNaN()` global function to see if a value is an `NaN` value.

Example

See the discussion of the `isNaN()` function in Chapter 42.

Related Item: `isNaN()` global function.

prototype

See `String.prototype` (Chapter 34).

Methods

number.toExponential(*fractionDigits*)
number.toFixed(*fractionDigits*)
number.toPrecision(*precisionDigits*)

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

A recent addition to the ECMA language — and thus to the JavaScript-enabled browsers — are three `Number` object methods that let scripts control the formatting of numbers for display as string text. Each method has a unique purpose, but they all return strings. You should perform all math operations as unformatted number objects because the values have the most precision. Only after you are ready to display the results should you use one of these methods to convert the number to a string for display as body text or assignment to a text field.

The `toExponential()` method forces a number to display in exponential notation, even if the number is in the range in which JavaScript normally uses standard notation. The parameter is an integer specifying how many digits to the right of the decimal should be returned. All digits to the right of the decimal are returned, even if they are zero. For example, if a variable contains the numeric value `345`, applying `toExponential(3)` to that value yields `3.450e+2`, which is JavaScript's exponential notation for 3.45×10^2.

Use the `toFixed()` method when you want to format a number with a specific number of digits to the right of the decimal. This is the method you use, for instance, to display the results of a financial calculation in units and hundredths of units (for example, dollars and cents). The parameter to the method is an integer indicating the number of digits to be displayed to the right of the decimal. If the number being formatted has more numbers to the right of the decimal than the number of digits specified by the parameter, the method rounds the rightmost visible digit — but only with respect to the unrounded value of the next digit. For example, the value `123.455` fixed to two digits to the right of the decimal is rounded up to `123.46`. But if the starting value is `123.4549`, the method ignores the 9 and sees that the 4 to the right of the 5 should be rounded down; therefore, the result is `123.45`. Do not consider the `toFixed()` method to be an accurate rounder of numbers; however, it does a satisfactory job in most cases.

The final method is `toPrecision()`, which enables you to define how many total digits (including digits to the left and right of the decimal) to display of a number. In other words, you define the precision of a number. The following list demonstrates the results of several parameter values signifying a variety of precisions:

```
var num = 123.45
num.toPrecision(1)    // result = 1e+2
num.toPrecision(2)    // result = 1.2e+2
num.toPrecision(3)    // result = 123
```

```
num.toPrecision(4)    // result = 123.5
num.toPrecision(5)    // result = 123.45
num.toPrecision(6)    // result = 123.450
```

Notice that the same kind of rounding can occur with `toPrecision()` as it does for `toFixed()`.

On the CD-ROM

Example on the CD-ROM

Related Item: `Math` object.

number.toLocaleString()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

According to the ECMA Edition 3 standard, browsers have some leeway in determining exactly how the `toLocaleString()` method should return a string value that conforms with the language standard of the client system or browser. IE5.5 appears to return the same value as the `toFixed(2)` method.

Related Items: `number.toFixed(), number.toString()` methods.

number.toString([*radix*])

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

The `number.toString()` method returns a string value version of the current number. The default radix parameter (`10`) converts the value to base-10 notation if the original number isn't already of that type. Or you can specify other number bases (for example, `2` for binary, `16` for hexadecimal) to convert the original number to the other base — as a string, not a number, for further calculation.

On the CD-ROM

Example on the CD-ROM

Related Item: `toLocaleString()` method.

number.valueOf()

See `string.valueOf()` (Chapter 34).

Boolean Object

Properties	***Methods***
`constructor`	`toString()`
`prototype`	`valueOf()`

Syntax

Creating a `Boolean` object:

```
var val = new Boolean(BooleanValue)
```

Accessing `Boolean` object properties:

```
BooleanObject.property | method
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

About this object

You work with Boolean values a lot in JavaScript — especially as the result of conditional tests. Just as string values benefit from association with string objects and their properties and methods, so, too, do Boolean values receive aid from the `Boolean` object. For example, when you display a Boolean value in a text box, the `"true"` or `"false"` string is provided by the `Boolean` object's `toString()` method so you don't have to invoke it directly.

The only time you need to even think about a `Boolean` object is if you wish to attach some property or method to `Boolean` objects that you create with the new `Boolean()` constructor. Parameter values for the constructor include the string versions of the values, numbers (0 for `false`; any other integer for `true`), and expressions that evaluate to a Boolean value. Any such new `Boolean` object is imbued with the new properties or methods you add to the `prototype` property of the core `Boolean` object.

For details about the properties and methods of the `Boolean` object, see the corresponding listings for the `String` object in Chapter 34.

✦ ✦ ✦

CHAPTER 36

The Date Object

✦ ✦ ✦ ✦

In This Chapter

Working with date and time values in JavaScript

Performing date calculations

Validating date entry form fields

✦ ✦ ✦ ✦

Perhaps the most untapped power of JavaScript is its date and time handling. Scripters passed over the `Date` object with good cause in the early days of JavaScript, because in earlier versions of scriptable browsers, significant bugs and platform-specific anomalies made date and time programming hazardous without significant testing. Even with the improved bug situation, working with dates requires a working knowledge of the world's time zones and their relationships with the standard reference point, known as Greenwich Mean Time (GMT) or Coordinated Universal Time (abbreviated UTC).

Now that date- and time-handling has improved in the latest browsers, I hope more scripters look into incorporating these kinds of calculations into their pages. In Chapter 54, for example, I show you an application that lets your Web site highlight the areas that have been updated since each visitor's last surf ride through your pages — an application that relies heavily on date arithmetic and time zone conversion.

Before getting to the JavaScript part of date discussions, however, the chapter summarizes key facts about time zones and their impact on scripting date and time on a browser. If you're not sure what GMT and UTC mean, the following section is for you.

Time Zones and GMT

By international agreement, the world is divided into distinct time zones that allow the inhabitants of each zone to say with confidence that when the Sun appears directly overhead, it is roughly noon, squarely in the middle of the day. The current time in the zone is what we set our clocks to — the local time.

That's fine when your entire existence and scope of life go no further than the width of your own time zone. But with instant communication among all parts of the world, your scope reaches well beyond local time. Periodically you must be aware of the local time in other zones. After all, if you live in New York, you don't want to wake up someone in Los Angeles before dawn with a phone call from your office.

Note

For the rest of this section, I speak of the Sun "moving" as if Earth were the center of the solar system. I do so for the convenience of our daily perception of the Sun arcing across what appears to us as a stationary sky. In point of fact, I believe Copernicus's theories, so delete that e-mail you were about to send me.

From the point of view of the time zone over which the Sun is positioned at any given instant, all time zones to the east have already had their noon, so it is later in the day for them — one hour later per time zone (except for those few time zones offset by fractions of an hour). That's why when U.S. television networks broadcast simultaneously to the eastern and central time zones, the announced schedule for a program is "10 eastern, 9 central."

Many international businesses must coordinate time schedules of far-flung events. Doing so and taking into account the numerous time zone differences (not to mention seasonal national variations, such as daylight saving time) would be a nightmare. To help everyone out, a standard reference point was devised: the time zone running through the celestial observatory at Greenwich (pronounced GREN-itch), England. This time zone is called Greenwich Mean Time, or GMT for short. The "mean" part comes from the fact that on the exact opposite side of the globe (through the Pacific Ocean) is the international date line, another world standard that decrees where the first instance of the next calendar day appears on the planet. Thus, GMT is located at the middle, or mean, of the full circuit of the day. Not that many years ago, GMT was given another abbreviation that is not based on any one language of the planet. The abbreviation is UTC (pronounced as its letters: yu-tee-see), and the English version is Coordinated Universal Time. Whenever you see UTC, it is for all practical purposes the same as GMT.

If your personal computer's system clock is set correctly, the machine ticks away in GMT time. But because you set your local time zone in the appropriate control panel, all file time stamps and clock displays are in your local time. The machine knows what the offset time is between your local time and GMT. For daylight saving time, you may have to check a preference setting so that the offset is adjusted accordingly; in Windows 95 and later, the operating system knows when the changeover occurs and prompts you if changing the offset is okay. In any case, if you travel across time zones with a laptop, you should change the computer's time zone setting, not its clock.

JavaScript's inner handling of date and time works a lot like the PC clock (on which your programs rely). Date values that you generate in a script are stored internally in GMT time; however, almost all the displays and extracted values are in the local time of the visitor (not the Web site server). And remember that the date values are created on the visitor's machine by virtue of your script's generating that value — you don't send "living" date objects to the client from the server. This concept is perhaps the most difficult to grasp as you work with JavaScript date and time.

Whenever you program time and date in JavaScript for a public Web page, you must take the worldview. This view requires knowing that the visitor's computer settings determine the accuracy of the conversion between GMT and local time. You'll also have to do some testing by changing your PC's clock to times in other parts of the world and making believe you are temporarily in those remote locations, which isn't always easy to do. It reminds me of the time I was visiting Sydney, Australia. I was turning in for the night and switched on the television in the hotel. This hotel received a live satellite relay of a long-running U.S. television program, *Today*. The program broadcast from New York was for the morning of the same day I was just finishing in Sydney. Yes, this time zone stuff can make your head hurt.

The Date Object

Like a handful of other objects in JavaScript and the document object models, there is a distinction between the single, static `Date` object that exists in every window (or frame) and a date object that contains a specific date and time. The static `Date` object (uppercase "D") is used in only a few cases: Primarily to create a new instance of a date and to invoke a couple of methods that the `Date` object offers for the sake of some generic conversions.

Most of your date and time work, however, is with instances of the `Date` object. These instances are referred to generically as date objects (lowercase "d"). Each date object is a snapshot of an exact millisecond in time, whether it be for the instant at which you generate the object or for a specific time in the past or future you need for calculations. If you need to have a live clock ticking away, your scripts will repeatedly create new date objects to grab up-to-the-millisecond snapshots of your computer's clock. To show the time on the page, extract the hours, minutes, and seconds from the snapshot date object, and then display the values as you like (for example, a digital readout, a graphical bar chart, and so on). By and large, it is the methods of a date object instance that your scripts invoke to read or modify individual components of a date object (for example, the month or hour).

Despite its name, every date object contains information about date and time. Therefore, even if you're concerned only about the date part of an object's data, time data is standing by as well. As you learn in a bit, the time element can catch you off-guard for some operations.

Creating a date object

The statement that asks JavaScript to make an object for your script uses the special object construction keyword `new`. The basic syntax for generating a new date object is as follows:

```
var dateObjectName = new Date([parameters])
```

The date object evaluates to an object data type rather than to some string or numeric value.

With the date object's reference safely tucked away in the variable name, you access all date-oriented methods in the dot-syntax fashion with which you're already familiar:

```
var result = dateObjectName.method()
```

With variables, such as result, your scripts perform calculations or displays of the date object's data (some methods extract pieces of the date and time data from the object). If you then want to put some new value into the date object (such as adding a year to the date object), you assign the new value to the object by way of the method that lets you set the value:

```
dateObjectName.method(newValue)
```

This example doesn't look like the typical JavaScript assignment statement, which has an equals sign operator. But this statement is the way in which methods that set date object data work.

You cannot get very far into scripting dates without digging into time zone arithmetic. Although JavaScript may render the string equivalent of a date object in your local time zone, the internal storage is strictly GMT.

Even though you haven't yet seen details of a date object's methods, here is how you use two of them to add one year to today's date.

```
var oneDate = new Date()           // creates object with current GMT date
var theYear = oneDate.getYear()    // theYear is now storing the value 98
theYear = theYear + 1              // theYear now is 99
oneDate.setYear(theYear)           // new year value now in the object
```

At the end of this sequence, the `oneDate` object automatically adjusts all the other date components for the next year's date. The day of the week, for example, will be different, and JavaScript takes care of that for you, should you need to extract that data. With next year's data in the `oneDate` object, you may now want to extract that new date as a string value for display in a field on the page or submit it quietly to a CGI program on the server.

The issue of parameters for creating a new date object is a bit complex, mostly because of the flexibility that JavaScript offers the scripter. Recall that the job of the `new Date()` statement is to create a place in memory for all data that a date needs to store. What is missing from that task is the data — what date and time to enter into that memory spot. That's where the parameters come in.

If you leave the parameters empty, JavaScript takes that to mean you want today's date and the current time to be assigned to that new date object. JavaScript isn't any smarter, of course, than the setting of the internal clock of your page visitor's personal computer. If the clock isn't correct, JavaScript won't do any better of a job identifying the date and time.

Note

Remember that when you create a new date object, it contains the current time as well. The fact that the current date may include a time of 16:03:19 (in 24-hour time) may throw off things, such as days-between-dates calculations. Be careful.

To create a date object for a specific date or time, you have five ways to send values as a parameter to the `new Date()` constructor function:

```
new Date("Month dd, yyyy hh:mm:ss")
new Date("Month dd, yyyy")
new Date(yy,mm,dd,hh,mm,ss)
new Date(yy,mm,dd)
new Date(milliseconds)
```

The first four variations break down into two styles — a long string versus a comma-delimited list of data — each with optional time settings. If you omit time settings, they are set to 0 (midnight) in the date object for whatever date you entered. You cannot omit date values from the parameters — every date object must have a real date attached to it, whether you need it or not.

In the long string versions, the month is spelled out in full in English. No abbreviations are allowed. The rest of the data is filled with numbers representing the date, year, hours, minutes, and seconds, even if the order is different from your local way of indicating dates. For single-digit values, you can use either a one- or two-digit version (such as 4:05:00). Colons separate hours, minutes, and seconds.

The short versions contain a non-quoted list of integer values in the order indicated. JavaScript cannot know that a 30 means the date if you accidentally place it in the month slot.

You use the last version only when you have the millisecond value of a date and time available. This generally occurs after some math arithmetic (described later in this chapter), leaving you with a date and time in millisecond format. To convert that numeric value to a date object, use the `new Date()` constructor. From the new date object created, you can retrieve more convenient values about the date and time.

Native object properties and methods

Like the `String` and `Array` objects, the `Date` object features a small handful of properties and methods that all native JavaScript objects have in common. On the property side, the `Date` object in NN3+ and IE3/J2+ has a `prototype` property, which enables you to apply new properties and methods to every date object created in the current page. You can see examples of how this works in discussions of the prototype property for `String` and `Array` objects (Chapters 34 and 37, respectively). At the same time, every instance of a date object in IE4+ and NN6 has a `constructor` property that references the constructor function that generated the object.

Methods in common are `toString()` and `valueOf()` (both NN4+ and IE3/J2+). A date object has numerous methods that convert date object types to strings, most of which are more specific than the generic `toString()` one. The `valueOf()` method returns the millisecond integer that is stored for a particular date — the same value that you get with the more object-specific `getUTCMilliseconds()` method (see the following section).

Date methods

The bulk of a date object's methods are for reading parts of the date and time information and for changing the date and time stored in the object. These two categories of methods are easily identifiable because they all begin with the word "get" or "set." Table 36-1 lists all of the methods of both the static `Date` object and, by inheritance, date object instances. The list is impressive — some would say frightening — but there are patterns you should readily observe. Most methods deal with a single component of a date and time value: year, month, date, and so forth. Each block of "get" and "set" methods also has two sets of methods: one for the local date and time conversion of the date stored in the object; one for the actual UTC date stored in the object. After you see the patterns, the list should be more manageable. Unless otherwise noted, a method has been part of the `Date` object since the first generation of scriptable browsers.

Table 36-1: Date Object Methods

Method	*Value Range*	*Description*
`dateObj.getFullYear()`	1970-...	Specified year (NN4+, IE3/J2+)
`dateObj.getYear()`	70-...	(See Text)
`dateObj.getMonth()`	0-11	Month within the year (January = 0)
`dateObj.getDate()`	1-31	Date within the month
`dateObj.getDay()`	0-6	Day of week (Sunday = 0)
`dateObj.getHours()`	0-23	Hour of the day in 24-hour time
`dateObj.getMinutes()`	0-59	Minute of the specified hour
`dateObj.getSeconds()`	0-59	Second within the specified minute
`dateObj.getTime()`	0-...	Milliseconds since 1/1/70 00:00:00 GMT
`dateObj.getMilliseconds()`	0-...	Milliseconds since 1/1/70 00:00:00 GMT (NN4+, IE3/J2+)
`dateObj.getUTCFullYear()`	1970-...	Specified UTC year (NN4+, IE3/J2+)
`dateObj.getUTCMonth()`	0-11	UTC month within the year (January = 0) (NN4+, IE3/J2+)
`dateObj.getUTCDate()`	1-31	UTC date within the month (NN4+, IE3/J2+)
`dateObj.getUTCDay()`	0-6	UTC day of week (Sunday = 0) (NN4+, IE3/J2+)
`dateObj.getUTCHours()`	0-23	UTC hour of the day in 24-hour time (NN4+, IE3/J2+)
`dateObj.getUTCMinutes()`	0-59	UTC minute of the specified hour (NN4+, IE3/J2+)
`dateObj.getUTCSeconds()`	0-59	UTC second within the specified minute (NN4+, IE3/J2+)
`dateObj.getUTCMilliseconds()`	0-...	UTC milliseconds since 1/1/70 00:00:00 GMT (NN4+, IE3/J2+)
`dateObj.setYear(val)`	1970-...	Be safe: always specify a four-digit year
`dateObj.setFullYear(val)`	1970-...	Specified year (NN4+, IE3/J2+)
`dateObj.setMonth(val)`	0-11	Month within the year (January = 0)
`dateObj.setDate(val)`	1-31	Date within the month
`dateObj.setDay(val)`	0-6	Day of week (Sunday = 0)
`dateObj.setHours(val)`	0-23	Hour of the day in 24-hour time
`dateObj.setMinutes(val)`	0-59	Minute of the specified hour

dateObj.setSeconds(*val*)	0-59	Second within the specified minute
dateObj.setMilliseconds(*val*)	0-...	Milliseconds since 1/1/70 00:00:00 GMT (NN4+, IE3/J2+)
dateObj.setTime(*val*)	0-...	Milliseconds since 1/1/70 00:00:00 GMT
dateObj.setUTCFullYear(*val*)	1970-...	Specified UTC year (NN4+, IE3/J2+)
dateObj.setUTCMonth(*val*)	0-11	UTC month within the year (January = 0) (NN4+, IE3/J2+)
dateObj.setUTCDate(*val*)	1-31	UTC date within the month (NN4+, IE3/J2+)
dateObj.setUTCDay(*val*)	0-6	UTC day of week (Sunday = 0) (NN4+, IE3/J2+)
dateObj.setUTCHours(*val*)	0-23	UTC hour of the day in 24-hour time (NN4+, IE3/J2+)
dateObj.setUTCMinutes(*val*)	0-59	UTC minute of the specified hour (NN4+, IE3/J2+)
dateObj.setUTCSeconds(*val*)	0-59	UTC second within the specified minute (NN4+, IE3/J2+)
dateObj.setUTCMilliseconds(*val*)	0-...	UTC milliseconds since 1/1/70 00:00:00 GMT (NN4+, IE3/J2+)
dateObj.getTimezoneOffset()	0-...	Minutes offset from GMT/UTC
dateObj.toDateString()		Date-only string in a format determined by browser (IE5.5)
dateObj.toGMTString()		Date/time string in universal format
dateObj.toLocaleDateString()		Date-only string in your system's localized format (NN6, IE5.5)
dateObj.toLocaleString()		Date/time string in your system's localized format
dateObj.toLocaleTimeString()		Time-only string in your system's localized format (NN6, IE5.5)
dateObj.toString()		Date/time string in a format determined by browser
dateObj.toTimeString()		Time-only string in a format determined by browser (IE5.5)
dateObj.toUTCString()		Date/time string in universal format (NN4+, IE3/J2+)
Date.parse("*dateString*")		Converts string date to milliseconds integer
Date.UTC(*date values*)		Converts GMT string date to milliseconds integer

Deciding between using the UTC or local versions of the methods depends on several factors. If the browsers you must support go back to the beginning, you will be stuck with the local versions in any case. But even for newer browsers, activities, such as calculating the number of days between dates or creating a countdown timer for a quiz, won't care which set you use, but you must use the same set for all calculations. If you start mixing local and UTC versions of date methods, you'll be destined to get wrong answers. Where the UTC versions come in most handy is when your date calculations must take into account the time zone of the client machine compared to some absolute in another time zone — calculating the time remaining to the chiming of Big Ben signifying the start of the New Year in London.

JavaScript maintains its date information in the form of a count of milliseconds (thousandths of a second) starting from January 1, 1970, in the GMT (UTC) time zone. Dates before that starting point are stored as negative values (but see the section on bugs and gremlins later in this chapter). Regardless of the country you are in or the date and time formats specified for your computer, the millisecond is the JavaScript universal measure of time. Any calculations that involve adding or subtracting times and dates should be performed in the millisecond values to ensure accuracy. Therefore, though you may never display the milliseconds value in a field or dialog box, your scripts will probably work with them from time to time in variables. To derive the millisecond equivalent for any date and time stored in a date object, use the `dateObj.getTime()` method, as in

```
var startDate = new Date()
var started = startDate.getTime()
```

Although the method has the word "time" in its name, the fact that the value is the total number of milliseconds from January 1, 1970, means the value also conveys a date.

Other date object get methods read a specific component of the date or time. You have to exercise some care here, because some values begin counting with 0 when you may not expect it. For example, January is month `0` in JavaScript's scheme; December is month `11`. Hours, minutes, and seconds all begin with `0`, which, in the end, is logical. Calendar dates, however, use the actual number that would show up on the wall calendar: The first day of the month is date value `1`. For the twentieth century years, the year value is whatever the actual year number is, minus 1900. For 1996, that means the year value is `96`. But for years before 1900 and after 1999, JavaScript uses a different formula, showing the full year value. This means you have to check whether a year value is less than `100` and add `1900` to it before displaying that year.

```
var today = new Date()
var thisYear = today.getYear()
if (thisYear < 100) {
    thisYear += 1900
}
```

This assumes, of course, you won't be working with years before A.D. 100. If your audience is strictly IE3/J2+ and NN4+, then use only the `getFullYear()` method, which returns the complete set of year digits from all ranges.

To adjust any one of the elements of a date value, use the corresponding set method in an assignment statement. If the new value forces the adjustment of other elements, JavaScript takes care of that. For example, consider the following sequence and how some values are changed for us:

```
myBirthday = new Date("September 11, 2001")
result = myBirthday.getDay() // result = 2, a Tuesday
myBirthday.setYear(2002) // bump up to next year
result = myBirthday.getDay() // result = 3, a Wednesday
```

Because the same date in the following year is on a different day, JavaScript tracks that for you.

Accommodating time zones

Understanding the *dateObj*.getTimezoneOffset() method involves both your operating system's time control panel setting and an internationally recognized (in computerdom, anyway) format for representing dates and times. If you have ignored the control panel stuff about setting your local time zone, the values you get for this property may be off for most dates and times. In the eastern part of North America, for instance, the eastern standard time zone is five hours earlier than Greenwich Mean Time. With the getTimezoneOffset() method producing a value of minutes' difference between GMT and the PC's time zone, the five hours difference of eastern standard time is rendered as a value of 300 minutes. On the Windows platform, the value automatically changes to reflect changes in daylight saving time in the user's area (if applicable). Offsets to the east of GMT (to the date line) are expressed as negative values.

Dates as strings

When you generate a date object, JavaScript automatically applies the toString() method to the object if you attempt to display that date either in a page or alert box. The format of this string varies with browser and operating system platform. For example, in Navigator 4 for Windows 98, the string is in the following format:

```
Wed Oct 31 11:43:34 GMT-0800 (Pacific Standard Time) 2001
```

But in the same version for Macintosh, the string is

```
Wed Oct 31 11:43:34 GMT-0800 2001
```

Internet Explorer returns its own variations on the string. The point is not to rely on a specific format and character location of this string for the components of dates. Use the date object methods to read date object components.

JavaScript does, however, provide two methods that return the date object in more constant string formats. One, *dateObj*.toGMTString(), converts the date and time to the GMT equivalent on the way to the variable that you use to store the extracted data. Here is what such data looks like:

```
Wed, 1 Nov 2000 04:25:28 GMT
```

If you're not familiar with the workings of GMT and how such conversions can present unexpected dates, exercise great care in testing your application. Eight o'clock on a Friday evening in California in the winter is four o'clock on Saturday morning GMT.

If time zone conversions make your head hurt, you can use the second string method, `dateObj.toLocaleString()`. In Navigator 3 for North American Windows users, the returned value looks like this:

```
10/31/2000 20:25:28
```

Starting with IE5.5 and NN6, you can also have JavaScript convert a date object to just the date or time portions in a nicely formatted version. The best pair of methods for this are `toLocaleDateString()` and `toLocaleTimeString()`, because these methods return values that make the most sense to the user, based on the localization settings of the user's operating system and browser.

Friendly date formats for older browsers

If you don't have the luxury of writing only for IE5.5+ or NN6+, you can create your own formatting function to do the job for a wide range of browsers. Listing 36-1 demonstrates one way of creating this kind of string from a date object (in a form compatible with Navigator 2 and Internet Explorer 3 pseudo-arrays).

Listing 36-1: **Creating a Friendly Date String**

```
<HTML>
<HEAD>
<TITLE>Date String Maker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function MakeArray(n) {
    this.length = n
    return this
}
monthNames = new MakeArray(12)
monthNames[1] = "January"
monthNames[2] = "February"
monthNames[3] = "March"
monthNames[4] = "April"
monthNames[5] = "May"
monthNames[6] = "June"
monthNames[7] = "July"
monthNames[8] = "August"
monthNames[9] = "September"
monthNames[10] = "October"
monthNames[11] = "November"
monthNames[12] = "December"

dayNames = new MakeArray(7)
dayNames[1] = "Sunday"
dayNames[2] = "Monday"
dayNames[3] = "Tuesday"
dayNames[4] = "Wednesday"
dayNames[5] = "Thursday"
dayNames[6] = "Friday"
dayNames[7] = "Saturday"
```

```
function customDateString(oneDate) {
    var theDay = dayNames[oneDate.getDay() + 1]
    var theMonth = monthNames[oneDate.getMonth() + 1]
    var theYear = oneDate.getYear()
    theYear += (theYear < 100) ? 1900 : 0
    return theDay + ", " + theMonth + " " + oneDate.getDate() + ", " + theYear
}
</SCRIPT>
</HEAD>

<BODY>
<H1> Welcome!</H1>
<SCRIPT LANGUAGE="JavaScript">
document.write(customDateString(new Date()))
</SCRIPT>

<HR>
</BODY>
</HTML>
```

Assuming the user has the PC's clock set correctly (a big assumption), the date appearing just below the opening headline is the current date — making it appear as though the document had been updated today. The downside to this approach (as opposed to the newer `toLocaleDateString()` method) is that international users are forced to view dates in the format you design, which may be different from their local custom.

More conversions

The last two methods shown in Listing 36-1 are methods of the static `Date` object. These utility methods convert dates from string or numeric forms into millisecond values of those dates. The primary beneficiary of these actions is the *dateObj*`.setTime()` method, which requires a millisecond measure of a date as a parameter. You use this method to throw an entirely different date into an existing `date` object.

`Date.parse()` accepts as a parameter date strings similar to the ones you've seen in this section, including the internationally approved version. `Date.UTC()`, on the other hand, requires the comma-delimited list of values (in proper order: *yy,mm,dd,hh,mm,ss*) in the GMT zone. The `Date.UTC()` method gives you a backward-compatible way to hard-code a GMT time (you can do the same in NN4+ and IE4+ via the UTC methods). The following is an example that creates a new date object for 6 p.m. on March 4, 2002, GMT in IE5/Windows:

```
var newObj = new Date(Date.UTC(2002,2,4,18,0,0))
result = newObj.toString()    // result = "Mon, Mar 04 10:00:00 PST 2002"
```

The second statement returns a value in a local time zone, because all non-UTC methods automatically convert the GMT time stored in the object to the client's local time.

Date and time arithmetic

You may need to perform some math with dates for any number of reasons. Perhaps you need to calculate a date at some fixed number of days or weeks in the future or figure out the number of days between two dates. When calculations of these types are required, remember the *lingua franca* of JavaScript date values: milliseconds.

What you may need to do in your date-intensive scripts is establish some variable values representing the number of milliseconds for minutes, hours, days, or weeks, and then use those variables in your calculations. Here is an example that establishes some practical variable values, building on each other:

```
var oneMinute = 60 * 1000
var oneHour = oneMinute * 60
var oneDay = oneHour * 24
var oneWeek = oneDay * 7
```

With these values established in a script, I can use one to calculate the date one week from today:

```
var targetDate = new Date()
var dateInMs = targetDate.getTime()
dateInMs += oneWeek
targetDate.setTime(dateInMs)
```

Another example uses components of a date object to assist in deciding what kind of greeting message to place in a document, based on the local time of the user's PC clock. Listing 36-2 adds to the scripting from Listing 36-1, bringing some quasi-intelligence to the proceedings. Again, this script uses the older array creation mechanism to be compatible with Navigator 2 and Internet Explorer 3.

Listing 36-2: **A Dynamic Welcome Message**

```
<HTML>
<HEAD>
<TITLE>Date String Maker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function MakeArray(n) {
    this.length = n
    return this
}
monthNames = new MakeArray(12)
monthNames[1] = "January"
monthNames[2] = "February"
monthNames[3] = "March"
monthNames[4] = "April"
monthNames[5] = "May"
monthNames[6] = "June"
monthNames[7] = "July"
monthNames[8] = "August"
monthNames[9] = "September"
monthNames[10] = "October"
monthNames[11] = "November"
monthNames[12] = "December"
```

```
dayNames = new MakeArray(7)
dayNames[1] = "Sunday"
dayNames[2] = "Monday"
dayNames[3] = "Tuesday"
dayNames[4] = "Wednesday"
dayNames[5] = "Thursday"
dayNames[6] = "Friday"
dayNames[7] = "Saturday"

function customDateString(oneDate) {
    var theDay = dayNames[oneDate.getDay() + 1]
    var theMonth = monthNames[oneDate.getMonth() + 1]
    var theYear = oneDate.getYear()
    theYear += (theYear < 100) ? 1900 : 0
    return theDay + ", " + theMonth + " " + oneDate.getDate() + ", " + theYear
}
function dayPart(oneDate) {
    var theHour = oneDate.getHours()
    if (theHour <6 )
        return "wee hours"
    if (theHour < 12)
        return "morning"
    if (theHour < 18)
        return "afternoon"
    return "evening"
}
</SCRIPT>
</HEAD>

<BODY>
<H1> Welcome!</H1>
<SCRIPT LANGUAGE="JavaScript">
today = new Date()
var header = (customDateString(today)).italics()
header += "<BR>We hope you are enjoying the "
header += dayPart(today) + "."
document.write(header)
</SCRIPT>
<HR>
</BODY>
</HTML>
```

The script divides the day into four parts and presents a different greeting for each part of the day. The greeting that plays is based, simply enough, on the hour element of a date object representing the time the page is loaded into the browser. Because this greeting is embedded in the page, the greeting does not change no matter how long the user stays logged on to the page.

Counting the days...

You may find one or two more date arithmetic applications useful. One displays the number of shopping days left until Christmas (in the user's time zone); the other is a countdown timer to the start of the year 2100.

Listing 36-3 demonstrates how to calculate the number of days between the current day and some fixed date in the future. The assumption in this application is that all calculations take place in the user's time zone. The example shows the display of the number of shopping days before the next Christmas day (December 25). The basic operation entails converting the current date and the next December 25 to milliseconds, calculating the number of days represented by the difference in milliseconds. If you let the millisecond values represent the dates, JavaScript automatically takes care of leap years.

The only somewhat tricky part is setting the year of the next Christmas day correctly. You can't just slap the fixed date with the current year, because if the program is run on December 26, the year of the next Christmas must be incremented by one. That's why the constructor for the Christmas date object doesn't supply a fixed date as its parameters but, rather, sets individual components of the object.

Listing 36-3: **How Many Days Until Christmas**

```
<HTML>
<HEAD>
<TITLE>Christmas Countdown</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function getDaysUntilXmas() {
    var oneMinute = 60 * 1000
    var oneHour = oneMinute * 60
    var oneDay = oneHour * 24
    var today = new Date()
    var nextXmas = new Date()
    nextXmas.setMonth(11)
    nextXmas.setDate(25)
    if (today.getMonth() == 11 && today.getDate() > 25) {
        nextXmas.setFullYear(nextXmas.getFullYear() + 1)
    }
    var diff = nextXmas.getTime() - today.getTime()
    diff = Math.floor(diff/oneDay)
    return diff
}
</SCRIPT>
</HEAD>

<BODY>
<H1>
<SCRIPT LANGUAGE="JavaScript">
var header = "You have <I>" + getDaysUntilXmas()  + "</I> "
header += "shopping days until Christmas."
document.write(header)
</SCRIPT>
</H1><HR>
</BODY>
</HTML>
```

The second variation on calculating the amount of time before a certain event takes time zones into account. For this demonstration, the page is supposed to display a countdown timer to the precise moment when the flame for the 2004 Summer Games in Athens is to be lit. That event takes place in a time zone that may be different from that of the page's viewer, so the countdown timer must calculate the time difference accordingly.

Listing 36-4 shows a simplified version that simply displays the ticking timer in a text field. The output, of course, could be customized in any number of ways, depending on the amount of dynamic HTML you want to employ on a page. The time of the lighting for this demo is set at 17:00 GMT on August 13, 2004 (the date is certainly accurate, but the officials may set a different time closer to the actual event).

Because this application is implemented as a live ticking clock, the code starts by setting some global variables that should be calculated only once so that the function that gets invoked repeatedly has a minimum of calculating to do (to be more efficient). The `Date.UTC()` method provides the target time and date in standard time. The `getTimeUntil()` function accepts a millisecond value (as provided by the `targetDate` variable) and calculates the difference between the target date and the actual internal millisecond value of the client's PC clock.

The core of the `getCountDown()` function peels off the number of whole days, hours, minutes, and seconds from the total number of milliseconds difference between now and the target date. Notice that each chunk is subtracted from the total so that the next smaller chunk can be calculated from the leftover milliseconds.

One extra touch on this page is that users of Windows operating systems have a display of the local date and time of the actual event. The Mac is excluded because it does not provide accurate daylight saving time adjustments for local dates. Some UNIX flavors may do the right thing, but they were not tested for this example.

Listing 36-4: **Summer Games Countdown**

```
<HTML>
<HEAD>
<TITLE>Summer Games Countdown</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// globals -- calculate only once
// set target date to 1700GMT on August 13, 2004
var targetDate = Date.UTC(2004, 7, 13, 17, 0, 0, 0)
var oneMinute = 60 * 1000
var oneHour = oneMinute * 60
var oneDay = oneHour * 24

function getTimeUntil(targetMS) {
    var today = new Date()
    var diff = targetMS - today.valueOf()
    return Math.floor(diff)
}
function getCountDown() {
    var ms = getTimeUntil(targetDate)
    var output = ""
    var days, hrs, mins, secs
    if (ms >= 0) {
```

Continued

Listing 36-4 *(continued)*

```
        days = Math.floor(ms/oneDay)
        ms -= oneDay * days
        hrs = Math.floor(ms/oneHour)
        ms -= oneHour * hrs
        mins = Math.floor(ms/oneMinute)
        ms -= oneMinute * mins
        secs = Math.floor(ms/1000)
        output += days + " Days, " +
                  hrs + " Hours, " +
                  mins + " Minutes, " +
                  secs + " Seconds"
    } else {
        output += "The time has passed."
    }
    return output
}
function updateCountDown() {
    document.forms[0].timer.value = getCountDown()
    setTimeout("updateCountDown()", 1000)
}
</SCRIPT>
</HEAD>

<BODY onLoad="updateCountDown()">
<H1>Athens Games Torch Lighting Countdown</H1>
<P>
<SCRIPT LANGUAGE="JavaScript">
if (navigator.userAgent.indexOf("Win") >= 0) {
    document.write("(" + (new Date(targetDate)).toLocaleString())
    document.write(" in your time zone.)")
}
</SCRIPT>
</P>
<FORM>
<INPUT TYPE="text" NAME="timer" SIZE=60>
</FORM>
<HR>
</BODY>
</HTML>
```

Date bugs and gremlins

Each new browser generation improves the stability and reliability of scripted date objects. Unfortunately, Navigator 2 has enough bugs and crash problems across many platforms to make scripting complex world-time applications for this browser impossible. The Macintosh version also has bugs that throw off dates by as much as a full day. I recommend avoiding NN2 on all platforms for serious date and time scripting.

The situation is much improved for NN3. Still, some bugs persist. One bug in particular affects Macintosh versions of NN3. Whenever you create a new date object with daylight saving time engaged in the Date and Time control panel, the browser automatically adds one hour to the object. See the time-based application in Chapter 54 for an example of how to counteract the effects of typical time bugs. Also afflicting the Macintosh in NN3 is a faulty calculation of the time zone offset for all time zones east of GMT. Instead of generating these values as negative numbers (getting lower and lower as you head east), the offset values increase continuously as you head west from Greenwich. While the Western Hemisphere is fine, the values continue to increase past the international date line, rather than switch over to the negative values.

Internet Explorer 3 isn't free of problems. It cannot handle dates before January 1, 1970 (GMT). Attempts to generate a date before that one result in that base date as the value. IE3 also completely miscalculates the time zone offset, following the erroneous pattern of Navigator 2. Even Navigators 3 and 4 have problems with historic dates. You are asking for trouble if the date extends earlier than January 1, A.D. 1. Internet Explorer 4, on the other hand, appears to sail very well into ancient history.

You should be aware of one more discrepancy between Mac and Windows versions of Navigator through Version 4. In Windows, if you generate a date object for a date in another part of the year, the browser sets the time zone offset for that object according to the time zone setting for that time of year. On the Mac, the current setting of the control panel governs whether the normal or daylight saving time offset is applied to the date, regardless of the actual date within the year. This discrepancy affects Navigator 3 and 4 and can throw off calculations from other parts of the year by one hour.

It may sound as though the road to `Date` object scripting is filled with land mines. While date and time scripting is far from hassle free, you can put it to good use with careful planning and a lot of testing.

Validating Date Entries in Forms

Given the bug horror stories in the previous section, you may wonder how you can ever perform data entry validation for dates in forms. The problem is not so much in the calculations as it is in the wide variety of acceptable date formats around the world. No matter how well you instruct users to enter dates in a particular format, many will follow their own habits and conventions. Moreover, how can you know whether an entry of 03/04/2002 is the North American March 4, 2002, or the European April 3, 2002? The answer: You can't.

My recommendation is to divide a date field into three components: month, day, and year. Let the user enter values into each field and validate each field individually for its valid range. Listing 36-5 shows an example of how this is done. The page includes a form that is to be validated before it is submitted. Each component field does its own range checking on the fly as the user enters values. But because this kind of validation can be defeated, the page includes one further check triggered by the form's `onSubmit` event handler. If any field is out of whack, the form submission is canceled.

Listing 36-5: Date Validation in a Form

```
<HTML>
<HEAD>
<TITLE>Date Entry Validation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
// **BEGIN GENERIC VALIDATION FUNCTIONS**
// general purpose function to see if an input value has been entered at all
function isEmpty(inputStr) {
    if (inputStr == "" || inputStr == null) {
        return true
    }
    return false
}

// function to determine if value is in acceptable range for this application
function inRange(inputStr, lo, hi) {
    var num = parseInt(inputStr, 10)
    if (num < lo || num > hi) {
        return false
    }
    return true
}
// **END GENERIC VALIDATION FUNCTIONS**

function validateMonth(field, bypassUpdate) {
    var input = field.value
    if (isEmpty(input)) {
        alert("Be sure to enter a month value.")
        select(field)
        return false
    } else {
        input = parseInt(field.value, 10)
        if (isNaN(input)) {
            alert("Entries must be numbers only.")
            select(field)
            return false
        } else {
            if (!inRange(input,1,12)) {
                alert("Enter a number between 1 (January) and 12 (December).")
                select(field)
                return false
            }
        }
    }
    if (!bypassUpdate) {
        calcDate()
    }
    return true
}

function validateDate(field) {
    var input = field.value
```

```
    if (isEmpty(input)) {
        alert("Be sure to enter a date value.")
        select(field)
        return false
    } else {
        input = parseInt(field.value, 10)
        if (isNaN(input)) {
            alert("Entries must be numbers only.")
            select(field)
            return false
        } else {
            var monthField = document.birthdate.month
            if (!validateMonth(monthField, true)) return false
            var monthVal = parseInt(monthField.value, 10)
            var monthMax = new Array(31,31,29,31,30,31,30,31,31,30,31,30,31)
            var top = monthMax[monthVal]
            if (!inRange(input,1,top)) {
                alert("Enter a number between 1 and " + top + ".")
                select(field)
                return false
            }
        }
    }
    calcDate()
    return true
}

function validateYear(field) {
    var input = field.value
    if (isEmpty(input)) {
        alert("Be sure to enter a year value.")
        select(field)
        return false
    } else {
        input = parseInt(field.value, 10)
        if (isNaN(input)) {
            alert("Entries must be numbers only.")
            select(field)
            return false
        } else {
            if (!inRange(input,1900,2005)) {
                alert("Enter a number between 1900 and 2005.")
                select(field)
                return false
            }
        }
    }
    calcDate()
    return true
}
function select(field) {
    field.focus()
    field.select()
}
```

Continued

Listing 36-5 *(continued)*

```
function calcDate() {
    var mm = parseInt(document.birthdate.month.value, 10)
    var dd = parseInt(document.birthdate.date.value, 10)
    var yy = parseInt(document.birthdate.year.value, 10)
    document.birthdate.fullDate.value = mm + "/" + dd + "/" + yy
}

function checkForm(form) {
    if (validateMonth(form.month)) {
        if (validateDate(form.date)) {
            if (validateYear(form.year)) {
                return true
            }
        }
    }
    return false
}
//-->
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="birthdate" ACTION="mailto:fun@dannyg.com" METHOD=POST
onSubmit="return checkForm(this)">
Please enter your birthdate...<BR>
Month:<INPUT TYPE="text" NAME="month" VALUE=1 SIZE=2
onChange="validateMonth(this)">
Date:<INPUT TYPE="text" NAME="date" VALUE=1 SIZE=2
onChange="validateDate(this)">
Year:<INPUT TYPE="text" NAME="year" VALUE=1900 SIZE=4
onChange="validateYear(this)">
<P>
Thank you for entering:<INPUT TYPE="text" NAME="fullDate" SIZE=10><P>
<INPUT TYPE="submit"> <INPUT TYPE="Reset">
</FORM>
</BODY>
</HTML>
```

The page shows the three entry fields as well as a field that is normally hidden on a form to be submitted to a CGI program. On the server end, the CGI program responds only to the hidden field with the complete date, which is in a format for entry into, for example, an Informix database.

Not every date entry validation must be divided in this way. For example, an intranet application can be more demanding in the way users are to enter data. Therefore, you can have a single field for date entry, but the parsing required for such a validation is quite different from that shown in Listing 36-5. See Chapter 43 for an example of such a one-field date validation routine.

✦ ✦ ✦

37
CHAPTER

The Array Object

✦ ✦ ✦ ✦

In This Chapter

Working with ordered collections of data

Simulating multidimensional arrays

Manipulating information stored in an array

✦ ✦ ✦ ✦

An array is the sole JavaScript data structure provided for storing and manipulating ordered collections of data. But unlike some other programming languages, JavaScript's arrays are very forgiving as to the kind of data you store in each cell or entry of the array. This allows, for example, an array of arrays, providing the equivalent of multidimensional arrays customized to the kind of data your application needs.

If you have not done a lot of programming in the past, the notion of arrays may seem like an advanced topic. But if you ignore their capabilities, you set yourself up for a harder job when implementing many kinds of tasks. Whenever I approach a script, one of my first thoughts is about the data being controlled by the application and whether handling it as an array will offer some shortcuts for creating the document and handling interactivity with the user.

I hope that by the end of this chapter, you will not only be familiar with the properties and methods of JavaScript arrays, but you will begin to look for ways to make arrays work for you.

Structured Data

In programming, an *array* is defined as an ordered collection of data. You can best visualize an array as a table, not much different from a spreadsheet. In JavaScript, arrays are limited to a table holding one column of data, with as many rows as needed to hold your data. As you have seen in many chapters in Part III, a JavaScript-enabled browser creates a number of internal arrays for the objects in your HTML documents and browser properties. For example, if your document contains five links, the browser maintains a table of those links. You access them by number (with 0 being the first link) in the array syntax: the array name is followed by the index number in square brackets, as in `document.links[0]`, which represents the first link in the document.

For many JavaScript applications, you will want to use an array as an organized warehouse for data that users of your page access, depending on their interaction with form elements. In the application shown in Chapter 50, for example, I demonstrate an extended version of this usage in a page that lets users search a small table of data for a match between the first three digits of their U.S. Social Security numbers and the state in which they registered with the agency. Arrays are the way JavaScript-enhanced pages can recreate the behavior of more sophisticated CGI programs on servers. When the collection of data you embed in the script is no larger than a typical `.gif` image file, the user won't experience significant delays in loading your page; yet he or she has the full power of your small database collection for instant searching without any calls back to the server. Such database-oriented arrays are important applications of JavaScript for what I call *serverless CGIs*.

As you design an application, look for clues as to potential application of arrays. If you have a number of objects or data points that interact with scripts the same way, you have a good candidate for array structures. For example, in every browser, with the exception of Internet Explorer 3, you can assign like names to every text field in a column of an order form. In that sequence, like-named objects are treated as elements of an array. To perform repetitive row calculations down an order form, your scripts can use array syntax to perform all the extensions within a handful of JavaScript statements, rather than perhaps dozens of statements hard-coded to each field name. Chapter 51 shows an example of this application.

You can also create arrays that behave like the Java hash table: a lookup table that gets you to the desired data point instantaneously if you know the name associated with the entry. If you can conceive your data in a table format, an array is in your future.

Creating an Empty Array

Arrays are treated in JavaScript like objects, but the extent to which your scripts can treat them as objects depends on whether you're using the first version of JavaScript (in Navigator 2 and Internet Explorer 3 with the Version 1 JScript DLL) or more recent versions (in Navigator 3 or later and Internet Explorer with JScript DLL Version 2 or later). For the sake of compatibility, I begin by showing you how to create arrays that work in all scriptable browsers.

You begin by defining an object *constructor* function that assigns a passed parameter integer value to the `length` property of the object:

```
function makeArray(n) {
    this.length = n
    return this
}
```

Then, to actually initialize an array for your script, use the `new` keyword to construct the object for you while assigning the array object to a variable of your choice:

```
var myArray = new makeArray(n)
```

where *n* is the number of entries you anticipate for the array. This initialization does not make any array entries or create any placeholders. Such preconditioning of arrays is not necessary in JavaScript.

In one important aspect, an array created in this "old" manner does not exhibit an important characteristic of standard arrays. The `length` property here is artificial in that it does not change with the size of the array (true JavaScript arrays are completely dynamic, letting you add items at any time). The length value here is hardwired by assignment. You can always change the value manually, but it takes a great deal of scripted bookkeeping to manage that task.

Another point to remember about this property scheme is that the value assigned to `this.length` in the constructor actually occupies the first entry (index 0) of the array. Any data you want to add to an array should not overwrite that position in the array if you expect to use the length to help a repeat loop look through an array's contents.

What a full-fledged array object gains you is behavior more like that of the arrays you work with elsewhere in JavaScript. You don't need to define a constructor function, because it's built into the JavaScript object mechanism. Instead, you create a new array object, such as this:

```
var myArray = new Array()
```

An array object automatically has a `length` property (`0` for an empty array). Most importantly, this length value does not occupy one of the array entries; the array is entirely for data.

Should you want to presize the array (for example, preload entries with `null` values), you can specify an initial size as a parameter to the constructor. For example, here is how to create a new array to hold information about a 500-item compact disc collection:

```
var myCDCollection = new Array(500)
```

Presizing an array does not give you any particular advantage, because you can assign a value to any slot in an array at any time: The `length` property adjusts itself accordingly. For instance, if you assign a value to `myCDCollection[700]`, the array object adjusts its length upward to meet that slot (with the count starting at 0):

```
myCDCollection [700] = "Gloria Estefan/Destiny"
collectionSize = myCDCollection.length    // result = 701
```

A true array object also features a number of methods and the capability to add prototype properties, described later in this chapter.

Populating an Array

Entering data into an array is as simple as creating a series of assignment statements, one for each element of the array. Listing 37-1 (not on the CD-ROM) assumes that you're using the newer style array object and that your goal is to generate an array containing a list of the nine planets of the solar system.

Listing 37-1: **Generating and Populating a New Array**

```
solarSys = new Array(9)
solarSys[0] = "Mercury"
solarSys[1] = "Venus"
solarSys[2] = "Earth"
solarSys[3] = "Mars"
solarSys[4] = "Jupiter"
solarSys[5] = "Saturn"
solarSys[6] = "Uranus"
solarSys[7] = "Neptune"
solarSys[8] = "Pluto"
```

This way of populating a single array is a bit tedious when you're writing the code, but after the array is set, it makes accessing information collections as easy as any array reference:

```
onePlanet = solarSys[4]     // result = "Jupiter"
```

A more compact way to create an array is available if you know that the data will be in the desired order (as the preceding `solarSys` array). Instead of writing a series of assignment statements (as in Listing 37-1), you can create what is called a *dense array* by supplying the data as parameters to the `Array()` constructor:

```
solarSys = new Array("Mercury","Venus","Earth","Mars","Jupiter","Saturn",
"Uranus","Neptune","Pluto")
```

The term "dense array" means that data is packed into the array, without gaps, starting at index position 0.

The example in Listing 37-1 shows what you may call a vertical collection of data. Each data point contains the same type of data as the other data points — the name of a planet — and the data points appear in the relative order of the planets from the Sun.

But not all data collections are vertical. You may, for instance, just want to create an array that holds various pieces of information about one planet. Earth is handy, so use some of its astronomical data to build a completely separate array of earthly info in Listing 37-2 (not on the CD-ROM).

Listing 37-2: **Creating a "Horizontal" Array**

```
earth = new Array()
earth.diameter = "7920 miles"
earth.distance = "93 million miles"
earth.year = "365.25 days"
earth.day = "24 hours"
earth.length     // result = 4
```

What you see in Listing 37-2 is an alternative way to populate an array. In a sense, you saw a preview of this approach for the creation of an array in the old style, where the `length` property name was assigned to its first entry. If you assign a value to a property name that has not yet been assigned for the array, JavaScript is smart enough to append a new property entry for that value.

In an important change from the old style of array construction, the way you define an array entry affects how you access that information later. For example, when you populate an array based on numeric index values (Listing 37-1), you can retrieve those array entries only via references that include the index values. Conversely, if you define array entries by property name (as in Listing 37-2), you cannot access those values via the numeric index way. In Navigator 2, for instance, the array assignments of Listing 37-2 can be retrieved by their corresponding index values:

```
earth.diameter          // result = "7920 miles"
earth["diameter"]       // result = "7920 miles"
earth[0]                // result = "7920 miles"
```

In Navigator 3 or 4, however, because these entries are defined as named properties, they must be retrieved as properties, not as numeric index values:

```
earth.diameter          // result = "7920 miles"
earth["diameter"]       // result = "7920 miles"
earth[0]                // result = null
```

The impact here on your scripts is that you need to anticipate how you expect to retrieve data from your array. If an indexed repeat loop is in the forecast, populate the array with index values (as in Listing 37-1); if the property names are more important to you, then populate the array that way (as in Listing 37-2). Your choice of index value type for a single-column array is driven by the application, but you will want to focus on the named array entry style for creating what appear to be two-dimensional arrays.

JavaScript 1.2 Array Creation Enhancements

The JavaScript version in NN4+ and IE4+ provides one more way to create a dense array and also clears up a bug in the old way. A new, simpler way to create a dense array does not require the `Array` object constructor. Instead, JavaScript 1.2 (and later) accepts what is called *literal notation* to generate an array. To demonstrate the difference, the following statement is the regular dense array constructor that works with Navigator 3:

```
solarSys = new Array("Mercury","Venus","Earth","Mars","Jupiter","Saturn",
"Uranus","Neptune","Pluto")
```

While JavaScript 1.2+ fully accepts the preceding syntax, it also accepts the new literal notation:

```
solarSys = ["Mercury","Venus","Earth","Mars","Jupiter","Saturn",
"Uranus","Neptune","Pluto"]
```

The square brackets stand in for the call to the `Array` constructor. You have to judge which browser types your audience will be using before deploying this streamlined approach to array creation.

The bug fix has to do with how to treat the earlier dense array constructor if the scripter enters only the numeric value `1` as the parameter — `new Array(1)`. In NN3 and IE4, JavaScript erroneously creates an array of length 1, but that element is `undefined`. For NN4 (and inside a `<SCRIPT LANGUAGE="JavaScript1.2">` tag) and all later browsers (IE5+, NN6), the same statement creates that one-element array and places the value in that element.

Deleting Array Entries

You can always set the value of an array entry to `null` or an empty string to wipe out any data that used to occupy that space. But until the `delete` operator in NN4 and IE4, you could not completely remove the element.

Deleting an array element eliminates the index from the list of accessible index values but does not reduce the array's length, as in the following sequence of statements:

```
myArray.length    // result: 5
delete myArray[2]
```

```
myArray.length    // result: 5
myArray[2]        // result: undefined
```

The process of deleting an array entry does not necessarily release memory occupied by that data. The JavaScript interpreter's internal garbage collection mechanism (beyond the reach of scripters) is supposed to take care of such activity. See the `delete` operator in Chapter 40 for further details.

Parallel Arrays

Using an array to hold data is frequently desirable so that a script can do a lookup to see if a particular value is in the array (perhaps verifying that a value typed into a text box by the user is permissible); however, even more valuable is if, upon finding a match, a script can look up some related information in another array. One way to accomplish this is with two or more parallel arrays: the same indexed slot of each array contains related information.

Consider the following three arrays:

```
var regionalOffices = new Array("New York", "Chicago", "Houston", "Portland")
var regionalManagers = new Array("Shirley Smith", "Todd Gaston", "Leslie Jones",
"Harold Zoot")
var regOfficeQuotas = new Array(300000, 250000, 350000, 225000)
```

The assumption for these statements is that Shirley Smith is the regional manager out of the New York office, and her office's quota is 300,000. This represents the data that is included with the document, perhaps retrieved by a CGI program on the server that gets the latest data from a SQL database and embeds the data in the form of array constructors. Listing 37-3 shows how this data appears in a simple page that looks up the manager name and quota values for whichever office is chosen in the SELECT element. The order of the items in the list of SELECT is not accidental: The order is identical to the order of the array for the convenience of the lookup script.

Lookup action in Listing 37-3 is performed by the `getData()` function. Because the index values of the options inside the SELECT element match those of the parallel arrays index values, the `selectedIndex` property of the SELECT element makes a convenient way to get directly at the corresponding data in other arrays.

Listing 37-3: A Simple Parallel Array Lookup

```
<HTML>
<HEAD>
<TITLE>Parallel Array Lookup</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// the data
var regionalOffices = new Array("New York", "Chicago", "Houston", "Portland")
var regionalManagers = new Array("Shirley Smith", "Todd Gaston", "Leslie Jones",
"Harold Zoot")
var regOfficeQuotas = new Array(300000, 250000, 350000, 225000)
// do the lookup into parallel arrays
function getData(form) {
   var i = form.offices.selectedIndex
   form.manager.value = regionalManagers[i]
   form.quota.value = regOfficeQuotas[i]
```

```
}
</SCRIPT>
</HEAD>

<BODY onLoad="getData(document.officeData)">
<H1>Parallel Array Lookup</H1>
<HR>
<FORM NAME="officeData">
<P>
Select a regional office:
<SELECT NAME="offices" onChange="getData(this.form)">
   <OPTION>New York
   <OPTION>Chicago
   <OPTION>Houston
   <OPTION>Portland
</SELECT>
</P><P>
The manager is:
<INPUT TYPE="text" NAME="manager" SIZE=35>
<BR>
The office quota is:
<INPUT TYPE="text" NAME="quota" SIZE=8>
</P>
</FORM>
</BODY>
</HTML>
```

On the other hand, if the content to be looked up is typed into a text box by the user, you have to loop through one of the arrays to get the matching index. Listing 37-4 is a variation of Listing 37-3, but instead of the SELECT element, a text field asks users to type in the name of the region. Assuming that users will always spell the input correctly (an outrageous assumption), the version of `getData()` in Listing 37-4 performs actions that more closely resemble what you may think a "lookup" should be doing: looking for a match in one array, and displaying corresponding results from the parallel arrays. The `for` loop iterates through items in the `regionalOffices` array. An `if` condition compares all uppercase versions of both the input and each array entry. If there is a match, the `for` loop breaks, with the value of `i` still pointing to the matching index value. Outside the `for` loop, another `if` condition makes sure that the index value has not reached the length of the array, which means that no match is found. Only when the value of `i` points to one of the array entries does the script retrieve corresponding entries from the other two arrays.

Listing 37-4: **A Looping Array Lookup**

```
<HTML>
<HEAD>
<TITLE>Parallel Array Lookup II</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// the data
```

Continued

Listing 37-4 *(continued)*

```
var regionalOffices = new Array("New York", "Chicago", "Houston", "Portland")
var regionalManagers = new Array("Shirley Smith", "Todd Gaston", "Leslie Jones",
"Harold Zoot")
var regOfficeQuotas = new Array(300000, 250000, 350000, 225000)
// do the lookup into parallel arrays
function getData(form) {
    // make a copy of the text box contents
    var inputText = form.officeInp.value
    // loop through all entries of regionalOffices array
    for (var i = 0; i < regionalOffices.length; i++) {
        // compare uppercase versions of entered text against one entry
        // of regionalOffices
        if (inputText.toUpperCase() == regionalOffices[i].toUpperCase()) {
            // if they're the same, then break out of the for loop
            break
        }
    }
    // make sure the i counter hasn't exceeded the max index value
    if (i < regionalOffices.length) {
        // display corresponding entries from parallel arrays
        form.manager.value = regionalManagers[i]
        form.quota.value = regOfficeQuotas[i]
    } else {  // loop went all the way with no matches
        // empty any previous values
        form.manager.value = ""
        form.quota.value = ""
        // advise user
        alert("No match found for " + inputText + ".")
    }
}
</SCRIPT>
</HEAD>

<BODY>
<H1>Parallel Array Lookup II</H1>
<HR>
<FORM NAME="officeData">
<P>
Enter a regional office:
<INPUT TYPE="text" NAME="officeInp" SIZE=35>
<INPUT TYPE="button" VALUE="Search" onClick="getData(this.form)">
</P><P>
The manager is:
<INPUT TYPE="text" NAME="manager" SIZE=35>
<BR>
The office quota is:
<INPUT TYPE="text" NAME="quota" SIZE=8>
</P>
</FORM>
</BODY>
</HTML>
```

Multidimensional Arrays

An alternate to parallel arrays is the simulation of a multidimensional array. While it's true that JavaScript arrays are one-dimensional, you can create a one-dimensional array of other arrays or objects. A logical approach is to make an array of custom objects, because the objects easily allow for naming of object properties, making references to multidimensional array data more readable (custom objects are discussed at length in Chapter 41).

Using the same data from the examples of parallel arrays, the following statements define an object constructor for each "data record." A new object is then assigned to each of four entries in the main array.

```
// custom object constructor
function officeRecord(city, manager, quota) {
    this.city = city
    this.manager = manager
    this.quota = quota
}

// create new main array
var regionalOffices = new Array()
// stuff main array entries with objects
regionalOffices[0] = new officeRecord("New York", "Shirley Smith", 300000)
regionalOffices[1] = new officeRecord("Chicago", "Todd Gaston", 250000)
regionalOffices[2] = new officeRecord("Houston", "Leslie Jones", 350000)
regionalOffices[3] = new officeRecord("Portland", "Harold Zoot", 225000)
```

The object constructor function (`officeRecord()`) assigns incoming parameter values to properties of the object. Therefore, to access one of the data points in the array, you use both array notations to get to the desired entry in the array and the name of the property for that entry's object:

```
var eastOfficeManager = regionalOffices[0].manager
```

You can also assign string index values for this kind of array, as in

```
regionalOffices["east"] = new officeRecord("New York", "Shirley Smith", 300000)
```

and access the data via the same index:

```
var eastOfficeManager = regionalOffices["east"].manager
```

But if you're more comfortable with the traditional multidimensional array (from your experience in other programming languages), you can also implement the above as an array of arrays with less code:

```
// create new main array
var regionalOffices = new Array()
// stuff main array entries with arrays
regionalOffices[0] = new Array("New York", "Shirley Smith", 300000)
regionalOffices[1] = new Array("Chicago", "Todd Gaston", 250000)
regionalOffices[2] = new Array("Houston", "Leslie Jones", 350000)
regionalOffices[3] = new Array("Portland", "Harold Zoot", 225000)
```

or, for the extreme of unreadable brevity with literal notation:

```
// create new main array
var regionalOffices = [ ["New York", "Shirley Smith", 300000],
                      ["Chicago", "Todd Gaston", 250000],
                      ["Houston", "Leslie Jones", 350000],
                      ["Portland", "Harold Zoot", 225000] ]
```

Accessing a single data point of an array of arrays requires a double array reference. For example, retrieving the manager's name for the Houston office requires the following syntax:

```
var HoustonMgr = regionalOffices[2][1]
```

The first index in brackets is for the outermost array (`regionalOffices`); the second index in brackets points to the item of the array returned by

`regionalOffices[2]`.

Array Object Properties

constructor

See `string.constructor` (Chapter 34).

length

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

A true array object's `length` property reflects the number of entries in the array. An entry can be any kind of JavaScript value, including `null`. If an entry is in the 10th cell and the rest are `null`, the length of that array is `10`. Note that because array index values are zero-based, the index of the last cell of an array is one less than the length. This characteristic makes it convenient to use the property as an automatic counter to append a new item to an array:

```
myArray[myArray.length] = valueOfAppendedItem
```

Thus, a generic function does not have to know which specific index value to apply to an additional item in the array.

prototype

Value: Variable or Function Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Inside JavaScript, an array object has its dictionary definition of methods and `length` property — items that all array objects have in common. The `prototype` property enables your scripts to ascribe additional properties or methods that apply to all the arrays you create in the currently loaded documents. You can override this prototype, however, for any individual objects as you want.

To demonstrate how the `prototype` property works, Listing 37-5 creates a `prototype` property for all array objects generated from the static `Array` object. As the script generates new arrays (instances of the `Array` object, just as a date object is an instance of the `Date` object), the property automatically becomes a part of those arrays. In one array, `c`, you override the value of the prototype `sponsor` property. By changing the value for that one object, you don't alter the value of the prototype for the `Array` object. Therefore, another array created afterward, `d`, still gets the original `sponsor` property value.

Listing 37-5: **Adding a prototype Property**

```
<HTML>
<HEAD>
<TITLE>Array prototypes</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
// add prototype to all Array objects
Array.prototype.sponsor = "DG"
a = new Array(5)
b = new Array(5)
c = new Array(5)
// override prototype property for one 'instance'
c.sponsor = "JS"
// this one picks up the original prototype
d = new Array(5)
</SCRIPT>
<BODY><H2>
<SCRIPT LANGUAGE="JavaScript">
document.write("Array a is brought to you by: " + a.sponsor + "<P>")
document.write("Array b is brought to you by: " + b.sponsor + "<P>")
document.write("Array c is brought to you by: " + c.sponsor + "<P>")
document.write("Array d is brought to you by: " + d.sponsor + "<P>")
</SCRIPT>
</H2>
</BODY>
</HTML>
```

You can assign properties and functions to a prototype. To assign a function, define the function as you normally would in JavaScript. Then assign the function to the `prototype` by name:

```
function newFunc(param1) {
    // statements
}
Array.prototype.newMethod = newFunc  // omit parentheses in this reference
```

When you need to call upon that function (which has essentially become a new temporary method for the `Array` object), invoke it as you would any object method. Therefore, if an array named `CDCollection` has been created and a prototype method `showCoverImage()` has been attached to the array, the call to invoke the method for a tenth listing in the array is

```
CDCollection.showCoverImage(9)
```

where the parameter of the function uses the index value to perhaps retrieve an image whose URL is a property of an object assigned to the 10th item of the array.

Array Object Methods

After you have information stored in an array, JavaScript provides several methods to help you manage that data. These methods, all of which belong to array objects you create, have evolved over time, so observe carefully which browser versions a desired method works with.

array.concat(*array2*)

Returns: array Object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The *`array`*`.concat()` method allows you to join two array objects into a new, third array object. The action of concatenating the arrays does not alter the contents or behavior of the two original arrays. To join the arrays, you refer to the first array object to the left of the period before the method; a reference to the second array is the parameter to the method. For example:

```
var array1 = new Array(1,2,3)
var array2 = new Array("a","b","c")
var array3 = array1.concat(array2)
   // result: array with values 1,2,3,"a","b","c"
```

If an array element is a string or number value (not a string or number object), the values are copied from the original arrays into the new one. All connection with the original arrays ceases for those items. But if an original array element is a reference to an object of any kind, JavaScript copies a reference from the original array's entry into the new array. So if you make a change to either array's entry, the change occurs to the object, and both array entries reflect the change to the object.

On the CD-ROM

Example (with Figure 37-1 and Listing 37-6) on the CD-ROM

Related Items: `array.join()` method.

array.join(*separatorString*)

Returns: String of entries from the array delimited by the *separatorString* value.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

You cannot view data in an array when it's in that form. Nor can you put an array into a form element for transmittal to a server CGI program. To make the transition from discrete array elements to string, the `array.join()` method handles what would otherwise be a nasty string manipulation exercise.

The sole parameter for this method is a string of one or more characters that you want to act as a delimiter between entries. For example, if you want commas between array items in their text version, the statement is

```
var arrayText = myArray.join(",")
```

Invoking this method does not change the original array in any way. Therefore, you need to assign the results of this method to another variable or a value property of a form element.

On the CD-ROM

Example (with Listing 37-7) on the CD-ROM

Related Items: `string.split()` method.

array.pop()
array.push(*valueOrObject*)
array.shift()
array.unshift(*valueOrObject*)

Returns: One array entry value.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

The notion of a *stack* is well known to experienced programmers, especially those who know about the inner workings of assembly language at the CPU level. Even if you've never programmed a stack before, you have encountered the concept in real life many times. The classic analogy is the spring-loaded pile of cafeteria trays. If the pile were created one tray at a time, each tray would be pushed into the stack of trays. When a customer comes along, the topmost tray (the last one to be pushed onto the stack) gets popped off. The last one to be put on the stack is the first one to be taken off.

JavaScript in NN4+ and IE5.5 lets you turn an array into one of these spring-loaded stacks. But instead of placing trays on the pile, you can place any kind of data at either end of the stack, depending on which method you use to do the stacking. Similarly, you can extract an item from either end.

Perhaps the most familiar terminology for this is *push* and *pop*. When you `push()` a value onto an array, the value is appended as the last entry in the array. When you issue the *array*`.pop()` method, the last item in the array is removed from the stack and is returned, and the array shrinks in length by one. In the following sequence of statements, watch what happens to the value of the array used as a stack:

```
var source = new Array("Homer","Marge","Bart","Lisa","Maggie")
var stack = new Array()
    // stack = <empty>
stack.push(source[0])
    // stack = "Homer"
stack.push(source[2])
    // stack = "Homer","Bart"
var Simpson1 = stack.pop()
    // stack = "Homer" ; Simpson1 = "Bart"
var Simpson2 = stack.pop()
    // stack = <empty> ; Simpson2 = "Homer"
```

While `push()` and `pop()` work at the end of an array, another pair of methods works at the front. Their names are not as picturesque as `push()` and `pop()`. To insert a value at the front of an array, use the *array*`.unshift()` method; to grab the first element and remove it from the array, use *array*`.shift()`. Of course, you are not required to use these methods in matching pairs. If you `push()` a series of values onto the back end of an array, you can `shift()` them off from the front end without complaint. It all depends on how you need to process the data.

Related Items: `array.concat()`, `array.slice()` method.

array.reverse()

Returns: Array of entries in the opposite order of the original.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Occasionally, you may find it more convenient to work with an array of data in reverse order. Although you can concoct repeat loops to count backward through index values, a CGI program on the server may prefer the data in a sequence opposite to the way it was most convenient for you to script it.

You can have JavaScript switch the contents of an array for you: Whatever element was last in the array becomes the 0 index item in the array. Bear in mind that if you do this, you're restructuring the original array, not copying it, even though the method also returns a copy of the reversed version. A reload of the document restores the order as written in the HTML document.

On the CD-ROM

Example (with Listing 37-8) on the CD-ROM

Related Items: `array.sort()` method.

array.slice(*startIndex* [, *endIndex*])

Returns: Array.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Behaving as its like-named string method, *array*.`slice()` lets you extract a contiguous series of items from an array. The extracted segment becomes an entirely new array object. Values and objects from the original array have the same kind of behavior as arrays created with the *array*.`concat()` method.

One parameter is required — the starting index point for the extraction. If you don't specify a second parameter, the extraction goes all the way to the end of the array; otherwise the extraction goes to, *but does not include,* the index value supplied as the second parameter. For example, extracting Earth's neighbors from an array of planet names looks as the following.

```
var solarSys = new Array("Mercury","Venus","Earth","Mars","Jupiter","Saturn",
               "Uranus","Neptune","Pluto")
var nearby = solarSys.slice(1,4)
    // result: new array of "Venus", "Earth", "Mars"
```

Related Items: `array.splice()`, `string.slice()` methods.

array.sort([*compareFunction*])

Returns: Array of entries in the order as determined by the *compareFunction* algorithm.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

JavaScript array sorting is both powerful and a bit complex to script if you haven't had experience with this kind of sorting methodology. The purpose, obviously, is to let your scripts sort entries of an array by almost any kind of criterion that you can associate with an entry. For entries consisting of strings, the criterion may be their alphabetical order or their length; for numeric entries, the criterion may be their numerical order.

Look first at the kind of sorting you can do with the *array*.sort() method by itself (for example, without calling a comparison function). When no parameter is specified, JavaScript takes a snapshot of the contents of the array and converts items to strings. From there, it performs a string sort of the values. ASCII values of characters govern the sort, which means that numbers are sorted by their string values, not their numeric values. This fact has strong implications if your array consists of numeric data: The value 201 sorts before 88, because the sorting mechanism compares the first characters of the strings ("2" versus "8") to determine the sort order. For simple alphabetical sorting of string values in arrays, the plain *array*.sort() method does the trick.

Fortunately, additional intelligence is available that you can add to array sorting. The key tactic is to define a function that helps the sort() method compare items in the array. A comparison function is passed two values from the array (what you don't see is that the *array*.sort() method rapidly sends numerous pairs of values from the array to help it sort through all entries). The comparison function lets the sort() method know which of the two items comes before the other, based on the value the function returns. Assuming that the function compares two values, a and b, the returned value reveals information to the sort() method, as shown in Table 37-1.

Table 37-1 Comparison Function Return Values

Return Value Range	*Meaning*
< 0	Value b should sort later than a
0	The order of a and b should not change
> 0	Value a should sort later than b

Consider the following example:

```
myArray = new Array(12, 5, 200, 80)
function compare(a,b) {
    return a - b
}
myArray.sort(compare)
```

The array has four numeric values in it. To sort the items in numerical order, you define a comparison function (arbitrarily named compare()), which is called from the sort() method. Note that unlike invoking other functions, the parameter of the sort() method uses a reference to the function, which lacks parentheses.

When the compare() function is called, JavaScript automatically sends two parameters to the function in rapid succession until each element has been compared with the others. Every time compare() is called, JavaScript assigns two of the array's values to the parameter variables (a and b). In the preceding example, the returned value is the difference between a and b. If a is larger than b, then a positive value goes back to the sort() method, telling it to sort a later than b (that is, position a at a higher value index position than b). Therefore, b may end up at myArray[0], whereas a ends up at a higher index-valued location. On the other hand, if a is smaller than b, then the returned negative value tells sort() to put a in a lower index value spot than b.

Evaluations within the comparison function can go to great lengths, as long as some data connected with array values can be compared. For example, instead of numerical comparisons, as just shown, you can perform string comparisons. The following function sorts alphabetically by the last character of each array string entry:

```
function compare(a,b) {
    // last character of array strings
    var aComp = a.charAt(a.length - 1)
    var bComp = b.charAt(b.length - 1)
    if (aComp < bComp) {return -1}
    if (aComp > bComp) {return 1}
    return 0
}
```

First, this function extracts the final character from each of the two values passed to it. Then, because strings cannot be added or subtracted like numbers, you compare the ASCII values of the two characters, returning the corresponding values to the sort() method to let it know how to treat the two values being checked at that instant.

When an array's entries happen to be objects, you can even sort by properties of those objects. If you bear in mind that the a and b parameters of the sort function are references to two array entries, then by extension you can refer to properties of those objects. For example, if an array contains objects whose properties define information about employees, one of the properties of those objects can be the employee's age as a string. You can then sort the array based on the numeric equivalent of age property of the objects by way of the following comparison function:

```
function compare(a,b) {
    return parseInt(a.age) - parseInt(b.age)
}
```

Array sorting, unlike sorting routines you may find in other scripting languages, is not a stable sort. Not being stable means that succeeding sort routines on the same array are not cumulative. Also, remember that sorting changes the sort order of the original array. If you don't want the original array harmed, make a copy of it before sorting or reload the document to restore an array to its original order.

Should an array element be null, the method sorts such elements at the end of the sorted array starting with Navigator 4 (instead of leaving them in their original places as in Navigator 3).

Note

Unfortunately, this powerful method does not work in the Macintosh version of Navigator 3. Starting with Navigator 4, all platforms have the feature.

JavaScript array sorting is extremely powerful stuff. Array sorting is one reason why it's not uncommon to take the time during the loading of a page containing an IE XML data island to make a JavaScript copy of the data as an array of objects (see Chapter 57). Converting the XML to JavaScript arrays makes the job of sorting the data much easier and faster than cobbling together your own sorting routines on the XML elements.

On the CD-ROM

Example (with Listing 37-9) on the CD-ROM

Related Items: `array.reverse()` method.

Note

As I show you in Chapter 38, many regular expression object methods generate arrays as their result (for example, an array of matching values in a string). These special arrays have a custom set of named properties that assist your script in analyzing the findings of the method. Beyond that, these regular expression result arrays behave like all others.

array.splice(*startIndex* , *deleteCount*[, *item1*[, *item2*[,...*itemN*]]])

Returns: Array.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

If you need to remove items from the middle of an array, the *array*.`splice()` method (not implemented in IE5/Mac) simplifies a task that would otherwise require assembling a new array from selected items of the original array. The first of two required parameters is a zero-based index integer that points to the first item to be removed from the current array. The second parameter is another integer that indicates how many sequential items are to be removed from the array. Removing array items affects the length of the array, and those items that are removed are returned by the `splice()` method as their own array.

You can also use the `splice()` method to replace array items. Optional parameters beginning with the third let you provide data elements that are to be inserted into the array in place of the items being removed. Each added item can be any JavaScript data type, and the number of new items does not have to be equal to the number of items removed. In fact, by specifying a second parameter of zero, you can use `splice()` to insert one or more items into any position of the array.

On the CD-ROM

Example on the CD-ROM

Related Items: `array.slice()` method.

array.toLocaleString()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

array.toString()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

The `array.toLocaleString()` and the older, more compatible `array.toString()` are methods to retrieve the contents of an array in string form. Browsers use the `toString()` method on their own whenever you attempt to display an array in text boxes, in which case the array items are comma-delimited.

The precise string conversion of the `toLocaleString()` is left up to the specific browser implementation. That IE5.5 and NN6 differ in some details is not surprising, even in the U.S. English versions of operating systems and browsers. For example, if the array contains integer values, IE5.5's `toLocaleString()` method returns the numbers comma-and-space-delimited, formatted with two digits to the right of the decimal (as if dollars and cents). NN6, on the other hand, returns just the integers, but these are also comma-and-space-delimited.

If you need to convert an array to a string for purposes of passing array data to other venues (for example, as data in a hidden text box submitted to a server or as search string data conveyed to another page), use the `array.join()` method instead. `Array.join()` gives you more reliable and flexible control over the item delimiters, and you are assured of the same results regardless of locale.

Related Items: `array.join()` method.

✦ ✦ ✦

CHAPTER 38

The Regular Expression and RegExp Objects

In This Chapter

What regular expressions are

How to use regular expressions for text search-and-replace

How to apply regular expressions to string object methods

Web programmers who have worked in Perl (and other Web application programming languages) know the power of regular expressions for processing incoming data and formatting data for readability in an HTML page or for accurate storage in a server database. Any task that requires extensive search and replacement of text can greatly benefit from the flexibility and conciseness of regular expressions. Navigator 4 and Internet Explorer 4 (more fully fleshed out in IE5.5) bring that power to JavaScript.

Most of the benefit of JavaScript regular expressions accrues to those who script their CGI programs on servers that support a JavaScript version that contains regular expressions. But that's not to exclude the client-side from application of this "language within a language." If your scripts perform client-side data validations or any other extensive text entry parsing, then consider using regular expressions, rather than cobbling together comparatively complex JavaScript functions to perform the same tasks.

Regular Expressions and Patterns

In several chapters earlier in this book, I describe expressions as any sequence of identifiers, keywords, and/or operators that evaluate to some value. A regular expression follows that description, but has much more power behind it. In essence, a regular expression uses a sequence of characters and symbols to define a pattern of text. Such a pattern is used to locate a chunk of text in a string by matching up the pattern against the characters in the string.

An experienced JavaScript writer may point out the availability of the `string.indexOf()` and `string.lastIndexOf()` methods that can instantly reveal whether a string contains a substring and even where in the string that substring begins. These methods work perfectly well when the match is exact, character for character. But if you want to do more sophisticated matching (for example, does the string contain a five-digit ZIP code?), you'd have to cast aside those handy string methods and write some parsing functions. That's the beauty of a regular expression: It lets you define a matching substring that has some intelligence about it and can follow guidelines you set as to what should or should not match.

The simplest kind of regular expression pattern is the same kind you use in the `string.indexOf()` method. Such a pattern is nothing more than the text that you want to match. In JavaScript, one way to create a regular expression is to surround the expression by forward slashes. For example, consider the string

```
Oh, hello, do you want to play Othello in the school play?
```

This string and others may be examined by a script whose job it is to turn formal terms into informal ones. Therefore, one of its tasks is to replace the word "hello" with "hi." A typical brute force search-and-replace function starts with a simple pattern of the search string. In JavaScript, you define a pattern (a regular expression) by surrounding it with forward slashes. For convenience and readability, I usually assign the regular expression to a variable, as in the following example:

```
var myRegExpression = /hello/
```

In concert with some regular expression or string object methods, this pattern matches the string "hello" wherever that series of letters appears. The problem is that this simple pattern causes problems during the loop that searches and replaces the strings in the example string: It finds not only the standalone word "hello," but also the "hello" in "Othello."

Trying to write another brute force routine for this search-and-replace operation that looks only for standalone words would be a nightmare. You can't merely extend the simple pattern to include spaces on either or both sides of "hello," because there could be punctuation — a comma, a dash, a colon, or whatever — before or after the letters. Fortunately, regular expressions provide a shortcut way to specify general characteristics, including a feature known as a word boundary. The symbol for a word boundary is \b (backslash, lowercase b). If you redefine the pattern to include these specifications on both ends of the text to match, the regular expression creation statement looks like

```
var myRegExpression = /\bhello\b/
```

When JavaScript uses this regular expression as a parameter in a special string object method that performs search-and-replace operations, it changes only the standalone word "hello" to "hi," and passes over "Othello" entirely.

If you are still learning JavaScript and don't have experience with regular expressions in other languages, you have a price to pay for this power: Learning the regular expression lingo filled with so many symbols means that expressions sometimes look like cartoon substitutions for swear words. The goal of this chapter is to introduce you to regular expression syntax as implemented in JavaScript rather than engage in lengthy tutorials for this language. Of more importance in the long run is understanding how JavaScript treats regular expressions as objects and distinctions between instances of regular expression objects and the `RegExp` static object. I hope the examples in the following sections begin to reveal the powers of regular expressions. An in-depth treatment of the possibilities and idiosyncrasies of regular expressions can be found in *Mastering Regular Expressions* by Jeffrey E.F. Friedl (1997, O'Reilly & Associates, Inc.).

Language Basics

To cover the depth of the regular expression syntax, I divide the subject into three sections. The first covers simple expressions (some of which you've already seen). Then I get into the wide range of special characters used to define specifications for search strings. Last comes an introduction to the usage of parentheses in the language, and how they not only help in grouping expressions for influencing calculation precedence (as they do for regular math expressions), but also how they temporarily store intermediate results of more complex expressions for use in reconstructing strings after their dissection by the regular expression.

Simple patterns

A simple regular expression uses no special characters for defining the string to be used in a search. Therefore, if you wanted to replace every space in a string with an underscore character, the simple pattern to match the space character is

```
var re = / /
```

A space appears between the regular expression start-end forward slashes. The problem with this expression, however, is that it knows only how to find a single instance of a space in a long string. Regular expressions can be instructed to apply the matching string on a global basis by appending the `g` modifier:

```
var re = / /g
```

When this `re` value is supplied as a parameter to the `replace()` method that uses regular expressions (described later in this chapter), the replacement is performed throughout the entire string, rather than just once on the first match found. Notice that the modifier appears after the final forward slash of the regular expression creation statement.

Regular expression matching — like a lot of other aspects of JavaScript — is case-sensitive. But you can override this behavior by using one other modifier that lets you specify a case-insensitive match. Therefore, the following expression

```
var re = /web/i
```

finds a match for "web," "Web," or any combination of uppercase and lowercase letters in the word. You can combine the two modifiers together at the end of a regular expression. For example, the following expression is both case-insensitive and global in scope:

```
var re = /web/gi
```

In compliance with the ECMA-262 Edition 3 standard, IE5.5 and NN6 also allow a flag to force the regular expression to operate across multiple lines (meaning a carriage-return-delimited string) of a larger string. That modifier is the letter `m`.

Special characters

The regular expression in JavaScript borrows most of its vocabulary from the Perl regular expression. In a few instances, JavaScript offers alternatives to simplify the syntax, but also accepts the Perl version for those with experience in that arena.

Significant programming power comes from the way regular expressions allow you to include terse specifications about such facets as types of characters to accept in a match, how the characters are surrounded within a string, and how often a type of character can appear in the matching string. A series of escaped one-character commands (that is, letters preceded by the backslash) handle most of the character issues; punctuation and grouping symbols help define issues of frequency and range.

You saw an example earlier how `\b` specified a word boundary on one side of a search string. Table 38-1 lists the escaped character specifiers in JavaScript regular expressions. The vocabulary forms part of what are known as metacharacters — characters in expressions that are not matchable characters themselves, but act more as commands or guidelines of the regular expression language.

Table 38-1 JavaScript Regular Expression Matching Metacharacters

Character	*Matches*	*Example*
`\b`	Word boundary	`/\bor/` matches "origami" and "or" but not "normal"
		`/or\b/` matches "traitor" and "or" but not "perform"
		`/\bor\b/` matches full word "or" and nothing else
`\B`	Word non-boundary	`/\Bor/` matches "normal" but not "origami"
		`/or\B/` matches "normal" and "origami" but not "traitor"
		`/\Bor\B/` matches "normal" but not "origami" or "traitor"
`\d`	Numeral 0 through 9	`/\d\d\d/` matches "212" and "415" but not "B17"
`\D`	Non-numeral	`/\D\D\D/` matches "ABC" but not "212" or "B17"
`\s`	Single white space	`/over\sbite/` matches "over bite" but not "overbite" or "over bite"
`\S`	Single non-white space	`/over\Sbite/` matches "over-bite" but not "overbite" or "over bite"
`\w`	Letter, numeral, or underscore	`/A\w/` matches "A1" and "AA" but not "A+"
`\W`	Not letter, numeral, or underscore	`/A\W/` matches "A+" but not "A1" and "AA"
`.`	Any character except newline	`/.../` matches "ABC", "1+3", "A 3", or any three characters

Character	Matches	Example
`[...]`	Character set	`/[AN]BC/` matches "ABC" and "NBC" but not "BBC"
`[^...]`	Negated character set	`/[^AN]BC/` matches "BBC" and "CBC" but not "ABC" or "NBC"

Not to be confused with the metacharacters listed in Table 38-1 are the escaped string characters for tab (`\t`), newline (`\n`), carriage return (`\r`), formfeed (`\f`), and vertical tab (`\v`).

Let me further clarify about the `[...]` and `[^...]` metacharacters. You can specify either individual characters between the brackets (as shown in Table 38-1) or a contiguous range of characters or both. For example, the `\d` metacharacter can also be defined by `[0-9]`, meaning any numeral from zero through nine. If you only want to accept a value of 2 and a range from 6 through 8, the specification would be `[26-8]`. Similarly, the accommodating `\w` metacharacter is defined as `[A-Za-z0-9_]`, reminding you of the case-sensitivity of regular expression matches not otherwise modified.

All but the bracketed character set items listed in Table 38-1 apply to a single character in the regular expression. In most cases, however, you cannot predict how incoming data will be formatted—the length of a word or the number of digits in a number. A batch of extra metacharacters lets you set the frequency of the occurrence of either a specific character or a type of character (specified like the ones in Table 38-1). If you have experience in command-line operating systems, you can see some of the same ideas that apply to wildcards also apply to regular expressions. Table 38-2 lists the counting metacharacters in JavaScript regular expressions.

Table 38-2 JavaScript Regular Expression Counting Metacharacters

Character	Matches Last Character	Example
`*`	Zero or more times	`/Ja*vaScript/` matches "JvaScript", "JavaScript", and "JaaavaScript" but not "JovaScript"
`?`	Zero or one time	`/Ja?vaScript/` matches "JvaScript" or "JavaScript" but not "JaaavaScript"
`+`	One or more times	`/Ja+vaScript/` matches "JavaScript" or "JaavaScript" but not "JvaScript"
`{n}`	Exactly n times	`/Ja{2}vaScript/` matches "JaavaScript" but not "JvaScript" or "JavaScript"
`{n,}`	n or more times	`/Ja{2,}vaScript/` matches "JaavaScript" or "JaaavaScript" but not "JavaScript"
`{n,m}`	At least n, at most m times	`/Ja{2,3}vaScript/` matches "JaavaScript" or "JaaavaScript" but not "JavaScript"

Every metacharacter in Table 38-2 applies to the character immediately preceding it in the regular expression. Preceding characters may also be matching metacharacters from Table 38-1. For example, a match occurs for the following expression if the string contains two digits separated by one or more vowels:

```
/\d[aeiouy]+\d/
```

The last major contribution of metacharacters is helping the regular expression search a particular position in a string. By position, I don't mean something such as an offset — the matching functionality of regular expressions can tell me that. But, rather, whether the string to look for should be at the beginning or end of a line (if that is important) or whatever string is offered as the main string to search. Table 38-3 shows the positional metacharacters for JavaScript's regular expressions.

Table 38-3 JavaScript Regular Expression Positional Metacharacters

Character	*Matches Located*	*Example*
`^`	At beginning of a string or line	`/^Fred/` matches "Fred is OK" but not "I'm with Fred" or "Is Fred here?"
`$`	At end of a string or line	`/Fred$/` matches "I'm with Fred" but not "Fred is OK" or "Is Fred here?"

For example, you may want to make sure that a match for a roman numeral is found only when it is at the start of a line, rather than when it is used inline somewhere else. If the document contains roman numerals in an outline, you can match all the top-level items that are flush left with the document with a regular expression, such as the following:

```
/^[IVXMDCL]+\./
```

This expression matches any combination of roman numeral characters followed by a period (the period is a special character in regular expressions, as shown in Table 38-1, so that you have to escape the period to offer it as a character), provided the roman numeral is at the beginning of a line and has no tabs or spaces before it. There would also not be a match in a line that contains, for example, the phrase "see Part IV" because the roman numeral is not at the beginning of a line.

Speaking of lines, a line of text is a contiguous string of characters delimited by a newline and/or carriage return (depending on the operating system platform). Word wrapping in TEXTAREA elements does not affect the starts and ends of true lines of text.

Grouping and backreferencing

Regular expressions obey most of the JavaScript operator precedence laws with regard to grouping by parentheses and the logical Or operator. One difference is that the regular expression Or operator is a single pipe character (`|`) rather than JavaScript's double pipe.

Parentheses have additional powers that go beyond influencing the precedence of calculation. Any set of parentheses (that is, a matched pair of left and right) stores the results of a found match of the expression within those parentheses. Parentheses can be nested inside one another. Storage is accomplished automatically, with the data stored in an indexed array accessible to your scripts and to your regular expressions (although through different syntax). Access to these storage bins is known as *backreferencing*, because a regular expression can point backward to the result of an expression component earlier in the overall expression. These stored subcomponents come in handy for replace operations, as demonstrated later in this chapter.

Object Relationships

JavaScript has a lot going on behind the scenes when you create a regular expression and perform the simplest operation with it. As important as the regular expression language described earlier in this chapter is to applying regular expressions in your scripts, the JavaScript object interrelationships are perhaps even more important if you want to exploit regular expressions to the fullest.

The first concept to master is that two entities are involved: a regular expression instance object and the `RegExp` static object. Both objects are core objects of JavaScript and are not part of the document object model. Both objects work together, but have entirely different sets of properties that may be useful to your application.

When you create a regular expression (even via the `/.../` syntax), JavaScript invokes the `new RegExp()` constructor, much the way a `new Date()` constructor creates a date object around one specific date. The regular expression instance object returned by the constructor is endowed with several properties containing details of its data. At the same time, the single, static `RegExp` object maintains its own properties that monitor regular expression activity in the current window (or frame).

To help you see the typically unseen operations, I step you through the creation and application of a regular expression. In the process, I show you what happens to all of the related object properties when you use one of the regular expression methods to search for a match.

Note

Several properties of both the regular expression instance object and the static `RegExp` object shown in the following "walk-through" are not available in IE until version 5.5. All are available in NN4+. See the individual property listings later in this chapter for compatibility ratings.

The starting text that I use to search through is the beginning of Hamlet's soliloquy (assigned to an arbitrary variable named `mainString`):

```
var mainString = "To be, or not to be: That is the question:"
```

If my ultimate goal is to locate each instance of the word "be," I must first create a regular expression that matches the word "be." I set the regular expression up to perform a global search when eventually called upon to replace itself (assigning the expression to an arbitrary variable named `re`):

```
var re = /\bbe\b/g
```

To guarantee that only complete words "be" are matched, I surround the letters with the word boundary metacharacters. The final "g" is the global modifier. The variable to which the expression is assigned, `re`, represents a regular expression object whose properties and values are as follows:

Object.PropertyName	*Value*
`re.source`	`"\bbe\bg"`
`re.global`	`true`
`re.ignoreCase`	`false`
`re.lastIndex`	`0`

A regular expression's `source` property is the string consisting of the regular expression syntax (less the literal forward slashes). Each of the two possible modifiers, `g` and `i`, have their own properties, `global` and `ignoreCase`, whose values are Booleans indicating whether the modifiers are part of the source expression. The final property, `lastIndex`, indicates the index value within the main string at which the next search for a match should start. The default value for this property in a newly hatched regular expression is zero so that the search starts with the first character of the string. This property is read/write, so your scripts may want to adjust the value if they must have special control over the search process. As you see in a moment, JavaScript modifies this value over time if a global search is indicated for the object.

The `RegExp` constructor does more than just create regular expression objects. Like the `Math` object, the `RegExp` object is always "around"—one `RegExp` per window or frame—and tracks regular expression activity in a script. Its properties reveal what, if any, regular expression pattern matching has just taken place in the window. At this stage of the regular expression creation process, the `RegExp` object has only one of its properties set:

Object.PropertyName	*Value*
`RegExp.input`	
`RegExp.multiline`	`false`
`RegExp.lastMatch`	
`RegExp.lastParen`	
`RegExp.leftContext`	
`RegExp.rightContext`	
`RegExp.$1`	
`...`	
`RegExp.$9`	

The last group of properties (`$1` through `$9`) is for storage of backreferences. But because the regular expression I define above doesn't have any parentheses in it, these properties are empty for the duration of this examination and omitted from future listings in this "walk-through" section.

With the regular expression object ready to go, I invoke the `exec()` regular expression method, which looks through a string for a match defined by the regular expression. If the method is successful in finding a match, it returns a third object whose properties reveal a great deal about the item it found (I arbitrarily assign the variable `foundArray` to this returned object):

```
var foundArray = re.exec(mainString)
```

JavaScript includes a shortcut for the `exec()` method if you turn the regular expression object into a method:

```
var foundArray = re(mainString)
```

Normally, a script would check whether `foundArray` is `null` (meaning that there was no match) before proceeding to inspect the rest of the related objects. Because this is a controlled experiment, I know at least one match exists, so I first look into some other results. Running this simple method has not only generated the `foundArray` data, but also altered several properties of the `RegExp` and regular expression objects. The following shows you the current stage of the regular expression object:

Object.PropertyName	*Value*
`re.source`	`"\bbe\bg"`
`re.global`	`true`
`re.ignoreCase`	`false`
`re.lastIndex`	`5`

The only change is an important one: The `lastIndex` value has bumped up to `5`. In other words, this one invocation of the `exec()` method must have found a match whose offset plus length of matching string shifts the starting point of any successive searches with this regular expression to character index 5. That's exactly where the comma after the first "be" word is in the main string. If the global (`g`) modifier had not been appended to the regular expression, the `lastIndex` value would have remained at zero, because no subsequent search would be anticipated.

As the result of the `exec()` method, the `RegExp` object has had a number of its properties filled with results of the search:

Object.PropertyName	*Value*
`RegExp.input`	
`RegExp.multiline`	`false`
`RegExp.lastMatch`	`"be"`
`RegExp.lastParen`	
`RegExp.leftContext`	`"To "`
`RegExp.rightContext`	`", or not to be: That is the question:"`

From this object you can extract the string segment that was found to match the regular expression definition. The main string segments before and after the matching text are also available individually (in this example, the `leftContext` property has a space after “To”). Finally, looking into the array returned from the `exec()` method, some additional data is readily accessible:

Object.PropertyName	*Value*
`foundArray[0]`	`"be"`
`foundArray.index`	`3`
`foundArray.input`	`"To be, or not to be: That is the question:"`

The first element in the array, indexed as the zeroth element, is the string segment found to match the regular expression, which is the same as the `RegExp.lastMatch` value. The complete main string value is available as the input property. A potentially valuable piece of information to a script is the index for the start of the matched string found in the main string. From this last bit of data, you can extract from the found data array the same values as `RegExp.leftContext` (with `foundArray.input.substring(0, foundArray.index)`) and `RegExp.rightContext` (with `foundArray.input.substring(foundArray.index, foundArray[0].length)`).

Because the regular expression suggested a multiple execution sequence to fulfill the global flag, I can run the `exec()` method again without any change. While the JavaScript statement may not be any different, the search starts from the new `re.lastIndex` value. The effects of this second time through ripple through the resulting values of all three objects associated with this method:

```
var foundArray = re.exec(mainString)
```

Results of this execution are as follows (changes are in boldface).

Object.PropertyName	*Value*
`re.source`	`"\bbe\bg"`
`re.global`	`true`
`re.ignoreCase`	`false`
`re.lastIndex`	**`19`**
`RegExp.input`	
`RegExp.multiline`	`false`
`RegExp.lastMatch`	`"be"`
`RegExp.lastParen`	
`RegExp.leftContext`	**`", or not to "`**
`RegExp.rightContext`	**`": That is the question:"`**

Object.PropertyName	*Value*
`foundArray[0]`	`"be"`
`foundArray.index`	17
`foundArray.input`	`"To be, or not to be: That is the question:"`

Because there was a second match, `foundArray` comes back again with data. Its index property now points to the location of the second instance of the string matching the regular expression definition. The regular expression object's `lastIndex` value points to where the next search would begin (after the second "be"). And the `RegExp` properties that store the left and right contexts have adjusted accordingly.

If the regular expression were looking for something less stringent than a hard-coded word, some other properties may also be different. For example, if the regular expression defined a format for a ZIP code, the `RegExp.lastMatch` and `foundArray[0]` values would contain the actual found ZIP codes, which would likely be different from one match to the next.

Running the same `exec()` method once more does not find a third match in my original `mainString` value, but the impact of that lack of a match is worth noting. First of all, the `foundArray` value is `null`—a signal to our script that no more matches are available. The regular expression object's `lastIndex` property reverts to zero, ready to start its search from the beginning of another string. Most importantly, however, the `RegExp` object's properties maintain the same values from the last successful match. Therefore, if you put the `exec()` method invocations in a repeat loop that exits after no more matches are found, the `RegExp` object still has the data from the last successful match, ready for further processing by your scripts.

Using Regular Expressions

Despite the seemingly complex hidden workings of regular expressions, JavaScript provides a series of methods that make common tasks involving regular expressions quite simple to use (assuming you figure out the regular expression syntax to create good specifications). In this section, I present examples of syntax for specific kinds of tasks for which regular expressions can be beneficial in your pages.

Is there a match?

I said earlier that you can use `string.indexOf()` or `string.lastIndexOf()` to look for the presence of simple substrings within larger strings. But if you need the matching power of regular expression, you have two other methods to choose from:

```
regexObject.test(string)
string.search(regexObject)
```

The first is a regular expression object method, the second a string object method. Both perform the same task and influence the same related objects, but they return different values: a Boolean value for `test()` and a character offset value for `search()` (or `-1` if no match is found). Which method you choose depends on whether you need only a true/false verdict on a match or the location within the main string of the start of the substring.

Listing 38-1 demonstrates the `search()` method on a page that lets you get the Boolean and offset values for a match. Some default text and regular expression is provided (it looks for a five-digit number). You can experiment with other strings and regular expressions. Because this script creates a regular expression object with the new `RegExp()` constructor method, you do not include the literal forward slashes around the regular expression.

Listing 38-1: Looking for a Match

```
<HTML>
<HEAD>
<TITLE>Got a Match?</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function findIt(form) {
    var re = new RegExp(form.regexp.value)
    var input = form.main.value
    if (input.search(re) != -1) {
        form.output[0].checked = true
    } else {
        form.output[1].checked = true
    }
}
function locateIt(form) {
    var re = new RegExp(form.regexp.value)
    var input = form.main.value
    form.offset.value = input.search(re)
}
</SCRIPT>
</HEAD>
<BODY>
<B>Use a regular expression to test for the existence of a string:</B>
<HR>
<FORM>
Enter some text to be searched:<BR>
<TEXTAREA NAME="main" COLS=40 ROWS=4 WRAP="virtual">
The most famous ZIP code on Earth may be 90210.
</TEXTAREA><BR>
Enter a regular expression to search:<BR>
<INPUT TYPE="text" NAME="regexp" SIZE=30 VALUE="\b\d\d\d\d\d\b"><P>
<INPUT TYPE="button" VALUE="Is There a Match?" onClick="findIt(this.form)">
<INPUT TYPE="radio" NAME="output">Yes
<INPUT TYPE="radio" NAME="output">No <P>
<INPUT TYPE="button" VALUE="Where is it?" onClick="locateIt(this.form)">
<INPUT TYPE="text" NAME="offset" SIZE=4><P>
<INPUT TYPE="reset">
</FORM>
</BODY>
</HTML>
```

Getting information about a match

For the next application example, the task is not only to verify that a one-field date entry is in the desired format, but also to extract match components of the entry and use those values to perform further calculations in determining the day of the week. The regular expression in the example that follows is a fairly complex one, because it performs some rudimentary range checking to make sure the user doesn't enter a month over 12 or a date over 31. What it does not take into account is the variety of lengths of each month. But the regular expression and method invoked with it extract each date object component in such a way that you can perform additional validation on the range to make sure the user doesn't try to give September 31 days. Also be aware that this is not the only way to perform date validations in forms. Chapter 43 offers additional thoughts on the matter that work without regular expressions for backward compatibility.

Listing 38-2 contains a page that has a field for date entry, a button to process the date, and an output field for display of a long version of the date, including the day of the week. At the start of the function that does all the work, I create two arrays (using the JavaScript 1.2 literal array creation syntax) to hold the plain language names of the months and days. These arrays are used only if the user enters a valid date.

Next comes the regular expression to be matched against the user entry. If you can decipher all the symbols, you see that three components are separated by potential hyphen or forward slash entries (`[\-\/]`). These symbols must be escaped in the regular expression. Importantly, each of the three component definitions is surrounded by parentheses, which are essential for the various objects created with the regular expression to remember their values for extraction later.

Here is a brief rundown of what the regular expression is looking for:

- ✦ A string beginning after a word break
- ✦ A string value for the month that contains a 1 plus a 0 through 2; or an optional 0 plus a 1 through 9
- ✦ A hyphen or forward slash
- ✦ A string value for the date that starts with a 0 plus a 1 through 9; or starts with a 1 or 2 and ends with a 0 through 9; or starts with a 3 and ends with 0 or 1
- ✦ Another hyphen or forward slash
- ✦ A string value for the year that begins with 19 or 20, followed by two digits

An extra pair of parentheses must surround the `19|20` segment to make sure that either one of the matching values is attached to the two succeeding digits. Without the parentheses, the logic of the expression attaches the digits only to 20.

For invoking the regular expression action, I select the `exec()` method, assigning the returned object to the variable `matchArray`. I can also use the *`string`*`.match()` method here. Only if the match is successful (that is, all conditions of the regular expression specification are met) does the major processing continue in the script.

The parentheses around the segments of the regular expression instruct JavaScript to assign each found value to a slot in the matchArray object. The month segment is assigned to matchArray[1], the date to matchArray[2], and the year to matchArray[3] (matchArray[0] contains the entire matched string). Therefore, the script can extract each component to build a plain-language date string with the help of the arrays defined at the start of the function. I even use the values to create a new date object that calculates the day of the week for me. After I have all pieces, I concatenate them and assign the result to the value of the output field. If the regular expression exec() method doesn't match the typed entry with the expression, the script provides an error message in the field.

Listing 38-2: **Extracting Data from a Match**

```
<HTML>
<HEAD>
<TITLE>Got a Match?</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function extractIt(form) {
    var months = ["January","February","March","April","May","June","July",
                 "August","September","October","November","December"]
    var days = ["Sunday","Monday","Tuesday","Wednesday","Thursday","Friday",
               "Saturday"]
    var re = /\b(1[0-2]|0?[1-9])[\-\/](0?[1-9]|[12][0-9]|3[01])[\-
\/]((19|20)\d{2})/
    var input = form.entry.value
    var matchArray = re.exec(input)
    if (matchArray) {
        var theMonth = months[matchArray[1] - 1] + " "
        var theDate = matchArray[2] + ", "
        var theYear = matchArray[3]
        var dateObj = new Date(matchArray[3],matchArray[1]-1,matchArray[2])
        var theDay = days[dateObj.getDay()] + " "
        form.output.value = theDay + theMonth + theDate + theYear
    } else {
        form.output.value = "An invalid date."
    }
}
</SCRIPT>
</HEAD>
<BODY>
<B>Use a regular expression to extract data from a string:</B>
<HR>
<FORM>
Enter a date in the format mm/dd/yyyy or mm-dd-yyyy:<BR>
<INPUT TYPE="text" NAME="entry" SIZE=12><P>
<INPUT TYPE="button" VALUE="Extract Date Components"
onClick="extractIt(this.form)"><P>
The date you entered was:<BR>
<INPUT TYPE="text" NAME="output" SIZE=40><P>
<INPUT TYPE="reset">
</FORM>
</BODY>
</HTML>
```

String replacement

To demonstrate using regular expressions for performing search-and-replace operations, I choose an application that may be of value to many page authors who have to display and format large numbers. Databases typically store large integers without commas. After five or six digits, however, such numbers are difficult for users to read. Conversely, if the user needs to enter a large number, commas help ensure accuracy.

Helping the procedure in JavaScript regular expressions is the `string.replace()` method (see Chapter 34). The method requires two parameters, a regular expression to search the string and a string to replace any match found in the string. The replacement string can be properties of the `RegExp` object as it stands after the most recent `exec()` method.

Listing 38-3 demonstrates how only a handful of script lines can do a lot of work when regular expressions handle the dirty work. The page contains three fields. Enter any number you want in the first one. A click of the Insert Commas button invokes the `commafy()` function in the page. The result is displayed in the second field. You can also enter a comma-filled number in the second field and click the Remove Commas button to see the inverse operation executed through the `decommafy()` function.

Specifications for the regular expression accept any positive or negative string of numbers. The keys to the action of this script are the parentheses around two segments of the regular expression. One set encompasses all characters not included in the second group: a required set of three digits. In other words, the regular expression is essentially working from the rear of the string, chomping off three-character segments and inserting a comma each time a set is found.

A `while` repeat loop cycles through the string and modifies the string (in truth, the string object is not being modified, but, rather, a new string is generated and assigned to the old variable name). I use the `test()` method because I don't need the returned value of the `exec()` method. The `test()` method impacts the regular expression and `RegExp` object properties the same way as the `exec()` method, but more efficiently. The first time the `test()` method runs, the part of the string that meets the first segment is assigned to the `RegExp.$1` property; the second segment, if any, is assigned to the `RegExp.$2` property. Notice that I'm not assigning the results of the `exec()` method to any variable, because for this application I don't need the array object generated by that method.

Next comes the tricky part. I invoke the `string.replace()` method, using the current value of the string (`num`) as the starting string. The pattern to search for is the regular expression defined at the head of the function. But the replacement string may look strange to you. The replacement string is replacing whatever the regular expression matches with the value of `RegExp.$1`, a comma, and the value of `RegExp.$2`. The `RegExp` object should not be part of the references used in the `replace()` method parameter. Because the regular expression matches the entire `num` string, the `replace()` method is essentially rebuilding the string from its components, plus adding a comma before the second component (the last free-standing three-digit section). Each `replace()` method invocation sets the value of `num` for the next time through the `while` loop and the `test()` method.

Looping continues until no matches occur — meaning that no more freestanding sets of three digits appear in the string. Then the results are written to the second field on the page.

Listing 38-3: Replacing Strings via Regular Expressions

```
<HTML>
<HEAD>
<TITLE>Got a Match?</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function commafy(form) {
    var re = /(-?\d+)(\d{3})/
    var num = form.entry.value
    while (re.test(num)) {
        num = num.replace(re, "$1,$2")
    }
    form.commaOutput.value = num
}
function decommafy(form) {
    var re = /,/g
    form.plainOutput.value = form.commaOutput.value.replace(re,"")
}
</SCRIPT>
</HEAD>
<BODY>
<B>Use a regular expression to add/delete commas from numbers:</B>
<HR>
<FORM>
Enter a large number without any commas:<BR>
<INPUT TYPE="text" NAME="entry" SIZE=15><P>
<INPUT TYPE="button" VALUE="Insert commas" onClick="commafy(this.form)"><P>
The comma version is:<BR>
<INPUT TYPE="text" NAME="commaOutput" SIZE=20><P>
<INPUT TYPE="button" VALUE="Remove commas" onClick="decommafy(this.form)"><P>
The un-comma version is:<BR>
<INPUT TYPE="text" NAME="plainOutput" SIZE=15><P>
<INPUT TYPE="reset">
</FORM>
</BODY>
</HTML>
```

Removing the commas is an even easier process. The regular expression is a comma with the global flag set. The `replace()` method reacts to the global flag by repeating the process until all matches are replaced. In this case, the replacement string is an empty string. For further examples of using regular expressions with string objects, see the discussions of the *`string`*`.match()`, *`string`*`.replace()`, and *`string`*`.split()` methods in Chapter 34.

Regular Expression Object

Properties	*Methods*
`constructor`	`compile()`
`global`	`exec()`
`ignoreCase`	`test()`
`lastIndex`	
`multilane`	
`source`	

Syntax

Accessing regular expression properties or methods:

`regularExpressionObject.property | method([parameters])`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

About this object

The regular expression object is created on the fly by your scripts. Each regular expression object contains its own pattern and other properties. Deciding which object creation style to use depends on the way the regular expression will be used in your scripts.

When you create a regular expression with the literal notation (that is, with the two forward slashes), the expression is automatically compiled for efficient processing as the assignment statement executes. The same is true when you use the new `RegExp()` constructor and specify a pattern (and optional modifier flags) as a parameter. Whenever the regular expression is fixed in the script, use the literal notation; when some or all of the regular expression is derived from an external source (for example, user input from a text field), assemble the expression as a parameter to the new `RegExp()` constructor. A compiled regular expression should be used at whatever stage the expression is ready to be applied and reused within the script. Compiled regular expressions are not saved to disk or given any more permanence beyond the life of a document's script (that is, it dies when the page unloads).

However, there may be times in which the specification for the regular expression changes with each iteration through a loop construction. For example, if statements in a `while` loop modify the content of a regular expression, compile the expression inside the `while` loop, as shown in the following skeletal script fragment:

```
var srchText = form.search.value
var re = new RegExp()  // empty constructor
while (someCondition) {
    re.compile("\\s+" + srchText + "\\s+", "gi")
    statements that change srchText
}
```

Each time through the loop, the regular expression object is both given a new expression (concatenated with metacharacters for one or more white spaces on both sides of some search text whose content changes constantly) and compiled into an efficient object for use with any associated methods.

Properties

constructor

See `string.constructor` (Chapter 34).

global
ignoreCase

Value: Booleans Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

These two properties reflect the regular expression `g` and `i` modifier flags, if any, associated with a regular expression. Settings are read-only and are determined as the object is created. Each property is independent of the other.

Related Items: None.

lastIndex

Value: Integer Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

The `lastIndex` property indicates the index counter of the main string to be searched against the current regular expression object. When a regular expression object is created, this value is zero, meaning that there have been no searches with this object, and the default behavior of the first search is to start at the beginning of the string.

If the regular expression has the global modifier specified, the `lastIndex` property value advances to some higher value after the object is used in a method to match within a main string. The value is the position in the main string immediately after the previous matched string (and not including any character of the matched string). After locating the final match in a string, the method resets the `lastIndex` property to zero for the next time. You can also influence the behavior of matches by setting this value on the fly. For example, if you want the expression to begin its search at the fourth character of a target string, you change the setting immediately after creating the object, as follows:

```
var re = /somePattern/
re.lastIndex = 3  // fourth character in zero-based index system
```

Related Items: Match result object `index` property.

multiline

Value: Boolean Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The multiline property reveals whether searches extend across multiple lines of a target string, as directed by the optional `m` modifier flag for a regular expression. NN4+ also includes the same-named property for the `RegExp` object (see the following section).

Related Items: `RegExp.multiline` property.

source

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `source` property is simply the string representation of the regular expression used to define the object. This property is read-only.

Related Items: None.

Methods

compile("*pattern*", ["g" | "i" | "m"])

Returns: Regular expression object.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Use the `compile()` method to compile on the fly a regular expression whose content changes continually during the execution of a script. See the discussion earlier about this object for an example. Other regular expression creation statements (the literal notation and the new `RegExp()` constructor that passes a regular expression) automatically compile their expressions. The `m` pattern modifier is available in IE5.5+ and NN6+.

Related Items: None.

exec("*string*")

Returns: Match array object or `null`.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The `exec()` method examines the string passed as its parameter for at least one match of the specification defined for the regular expression object. The behavior of this method is similar to that of the *string*`.match()` method (although the `match()` method is more powerful in completing global matches). Typically, a call to the `exec()` method is made immediately after the creation of a regular expression object, as in the following example.

```
var re = /somePattern/
var matchArray = re.exec("someString")
```

Much happens as a result of the `exec()` method. Properties of both the regular expression object and window's `RegExp` object are updated based on the success of the match. The method also returns an object that conveys additional data about the operation. Table 38-4 shows the properties of this returned object.

Table 38-4 Match Found Array Object Properties

Property	*Description*
`index`	Zero-based index counter of the start of the match inside the string
`input`	Entire text of original string
`[0]`	String of most recent matched characters
`[1],...[n]`	Parenthesized component matches

Some of the properties in this returned object echo properties in the `RegExp` object. The value of having them in the regular expression object is that their contents are safely stowed in the object while the `RegExp` object and its properties may be modified soon by another call to a regular expression method. Items the two objects have in common are the `[0]` property (mapped to the `RegExp.lastMatch` property) and the `[1],. . .[n]` properties (the first nine of which map to `RegExp.$1. . .RegExp.$9`). While the `RegExp` object stores only nine parenthesized subcomponents, the returned array object stores as many as are needed to accommodate parenthesis pairs in the regular expression.

If no match turns up between the regular expression specification and the string, the returned value is `null`. See Listing 38-2 for an example of how this method can be applied. An alternate shortcut syntax may be used for the `exec()` method. Turn the regular expression into a function, as in

```
var re = /somePattern/
var matchArray = re("someString")
```

Related Items: `string.match()` method.

test("*string*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

The most efficient way to find out if a regular expression has a match in a string is to use the `test()` method. Returned values are `true` if a match exists and `false` if not. In case you need more information, a companion method, *`string`*`.search()`, returns the starting index value of the matching string. See Listing 38-1 for an example of this method in action.

Related Items: `string.search()` method.

RegExp Object

Properties	*Methods*
`input`	
`lastMatch`	
`lastParen`	
`leftContext`	
`multilane`	
`prototype`	
`rightContext`	
`$1, ... $9`	

Syntax

Accessing `RegExp` properties:

```
RegExp.property
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

About this object

Beginning with Navigator 4 and Internet Explorer 4, the browser maintains a single instance of a `RegExp` object for each window or frame. The object oversees the action of all methods that involve regular expressions (including the few related string object methods). Properties of this object are exposed not only to JavaScript in the traditional manner, but also to a parameter of the method *`string`*`.replace()` for some shortcut access (see Listing 38-3).

With one `RegExp` object serving all regular expression-related methods in your document's scripts, you must exercise care in accessing or modifying this object's properties. You must make sure that the `RegExp` object has not been affected by another method. Most properties are subject to change as the result of any method involving a regular expression. This may be reason enough to use the properties of the array object returned by most regular expression methods instead of the `RegExp` properties. The former stick with a specific regular expression object even after other regular expression objects are used in the same script. The `RegExp` properties reflect the most recent activity, irrespective of the regular expression object involved.

In the following listings, I supply the long, JavaScript-like property names. But each property also has an abbreviated, Perl-like manner to refer to the same properties. You can use these shortcut property names in the *`string`*`.replace()` method if you need the values.

Properties

input

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

The `RegExp.input` property is the main string against which a regular expression is compared in search of a match. In all of the example listings earlier in this chapter, the property was `null`. Such is the case when the main string is supplied as a parameter to the regular expression-related method.

But many text-related document objects have an unseen relationship with the RegExp object. If a text, TEXTAREA, SELECT, or link object contains an event handler that invokes a function containing a regular expression, the RegExp.input property is set to the relevant textual data from the object. You don't have to specify any parameters for the event handler call or in the function called by the event handler. For text and TEXTAREA objects, the input property value becomes the content of the object; for the SELECT object, it is the text (not the value) of the selected option; and for a link, it is the text highlighted in the browser associated with the link (and reflected in the link's text property).

Having JavaScript set the RegExp.input property for you may simplify your script. You can invoke either of the regular expression methods without having to specify the main string parameter. When that parameter is empty, JavaScript applies the RegExp.input property to the task. You can also set this property on the fly if you want. The short version of this property is $_ (dollar sign underscore).

Related Items: Matching array object input property.

multiline

Value: Boolean Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

The RegExp.multiline property determines whether searches extend across multiple lines of a target string. This property is automatically set to true as an event handler of a TEXTAREA triggers a function containing a regular expression. You can also set this property on the fly if you want. The short version of this property is $*. This version of the property (as distinct from the multiline property of an instance of a regular expression) is not defined in the ECMA-262 specification and is supported only in NN4+.

Related Items: Regular expression instance object multiline property.

lastMatch

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

After execution of a regular expression-related method, any text in the main string that matches the regular expression specification is automatically assigned to the RegExp.lastMatch property. This value is also assigned to the [0] property of the object array returned after the exec() and string.match() methods find a match. The short version of this property is $&.

Related Items: Matching array object [0] property.

lastParen

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

When a regular expression contains many parenthesized subcomponents, the `RegExp` object maintains a list of the resulting strings in the `$1,...$9` properties. You can also extract the value of the last matching parenthesized subcomponent with the `RegExp.lastParen` property, which is a read-only property. The short version of this property is `$+`.

Related Items: `RegExp.$1,...$9` properties.

leftContext
rightContext

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

After a match is found in the course of one of the regular expression methods, the `RegExp` object is informed of some key contextual information about the match. The `leftContext` property contains the part of the main string to the left of (up to but not including) the matched string. Be aware that the `leftContext` starts its string from the point at which the most recent search began. Therefore, for second or subsequent times through the same string with the same regular expression, the `leftContext` substring varies widely from the first time through.

The `rightContext` consists of a string starting immediately after the current match and extending to the end of the main string. As subsequent method calls work on the same string and regular expression, this value obviously shrinks in length until no more matches are found. At this point, both properties revert to `null`. The short versions of these properties are `` $` `` and `$'` for `leftContext` and `rightContext`, respectively.

Related Items: None.

prototype

See `String.prototype` (Chapter 34).

$1...$9

Value: String Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

As a regular expression method executes, any parenthesized result is stored in RegExp's nine properties reserved for just that purpose (called backreferences). The same values (and any beyond the nine that RegExp has space for) are stored in the array object returned with the exec() and *string*.match() methods. Values are stored in the order in which the left parenthesis of a pair appears in the regular expression, regardless of nesting of other components.

You can use these backreferences directly in the second parameter of the *string*.replace() method, without using the RegExp part of their address. The ideal situation is to encapsulate components that need to be rearranged or recombined with replacement characters. For example, the following script function turns a name that is last name first into first name last:

```
function swapEm() {
    var re = /(\w+),\s*(\w+)/
    var input = "Lincoln, Abraham"
    return input.replace(re,"$2 $1")
}
```

In the replace() method, the second parenthesized component (just the first name) is placed first, followed by a space and the first component. The original comma is discarded. You are free to combine these shortcut references as you like, including multiple times per replacement, if it makes sense to your application.

Related Items: Matching array object [1]. . .[n] properties.

✦ ✦ ✦

CHAPTER 39

Control Structures and Exception Handling

✦ ✦ ✦ ✦

In This Chapter

Branching script execution down multiple paths

Looping through ordered collections of data

Applying exception handling techniques

✦ ✦ ✦ ✦

You get up in the morning, go about your day's business, and then turn out the lights at night. That's not much different from what a program does from the time it starts to the time it ends. But along the way, both you and a program take lots of tiny steps, not all of which advance the "processing" in a straight line. At times, you have to control what's going on by making a decision or repeating tasks until the whole job is finished. Control structures are the facilities that make these tasks possible in JavaScript.

JavaScript control structures follow along the same lines of many programming languages, particularly with additions made in Navigator 4 and Internet Explorer 4. Basic decision-making and looping constructions satisfy the needs of just about all programming tasks.

Another vital program control mechanism — error (or exception) handling — is formally addressed in Edition 3 of the ECMA-262 language standard. The concept of exception handling is new to the JavaScript version that comes in IE5.5 and NN6, but it is well known to programmers in many other environments. Adopting exception handling techniques in your code can greatly enhance recovery from processing errors caused by errant user input or network glitches.

If and If. . .Else Decisions

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

JavaScript programs frequently have to make decisions based on the current values of variables or object properties. Such decisions can have only two possible outcomes at a time. The factor that determines the path that the program takes at these decision points is the truth of some statement. For example, when you enter a room of your home at night, the statement under test is something such as "It is too dark to see without a light." If that statement is true, you switch on the light; if that statement is false, you carry on with your primary task.

Simple decisions

JavaScript syntax for this kind of simple decision always begins with the keyword `if`, followed by the condition to test, and then the statements that execute if the condition yields a true result. JavaScript uses no "then" keyword (as some other languages do); the keyword is implied by the way parentheses and braces surround the various components of this construction. The formal syntax is

```
if (condition) {
    statementsIfTrue
}
```

This construction means that if the condition is true, program execution takes a detour to execute statements inside the braces. No matter what happens, the program continues executing statements beyond the closing brace (`}`). If household navigation were part of the scripting language, the code would look as this:

```
if (tooDark == true) {
    feel for light switch
    turn on light switch
}
```

If you're not used to C/C++, the double equals sign may have caught your eye. You learn more about this type of operator in the next chapter, but for now, know that this operator compares the equality of items on either side of it. In other words, the `condition` statement of an `if` construction must always yield a Boolean (`true` or `false`) value. Some object properties, you may recall, are Booleans, so you can stick a reference to that property into the `condition` statement by itself. Otherwise, the `condition` statement consists of two values separated by a comparison operator, such as `==` (equals) or `!=` (does not equal).

Next, look at some real JavaScript. The following function receives a form object containing a text object called `entry`:

```
function notTooHigh(form) {
    if (parseInt(form.entry.value) > 100) {
        alert("Sorry, the value you entered is too high. Try again.")
```

```
        return false
    }
    return true
}
```

The condition (in parentheses) tests the contents of the field against a hard-wired value of 100. If the entered value is larger than that, the function alerts you and returns a false value to the calling statement elsewhere in the script. But if the value is less than 100, all intervening code is skipped and the function returns true.

About (*condition*) expressions

A lot of condition testing for control structures compares a value against some very specific condition, such as a string's being empty or a value's being null. You can use a couple of shortcuts to take care of many circumstances. Table 39-1 details the values that evaluate to a true or false (or equivalent) to satisfy a control structure's *condition* expression.

Table 39-1 Condition Value Equivalents

True	***False***
Nonempty string	Empty string
Nonzero number	0
Nonnull value	Null
Object exists	Object doesn't exist
Property is defined	Undefined property

Instead of having to spell out an equivalency expression for a condition involving these kinds of values, you can simply supply the value to be tested. For example, if a variable named myVal may reach an if construction with a value of null, an empty string, or a string value for further processing, you can use the following shortcut:

```
if (myVal) {
    // do processing on myVal
}
```

All null or empty string conditions evaluate to false, so that only the cases of myVal's being a processable value get inside the if construction. This mechanism is the same that you have seen elsewhere in this book to employ object detection for browser branching. For example, the code nested inside the following code segment executes only if the document object has an images array property:

```
if (document.images) {
    // do processing on image objects
}
```

What's with the Formatting?

Indentation of the `if` construction and the further indentation of the statements executed on a true condition are not required by JavaScript. What you see here, however, is a convention that most JavaScript scripters follow. As you write the code in your text editor, you can use the Tab key to make each indentation level. The browser ignores these tab characters when loading the HTML documents containing your scripts.

Complex decisions

The simple type of `if` construction described earlier is fine when the decision is to take a small detour before returning to the main path. But not all decisions — in programming or in life — are like that. To present two alternate paths in a JavaScript decision, you can add a component to the construction. The syntax is

```
if (condition) {
    statementsIfTrue
} else {
    statementsIfFalse
}
```

By appending the `else` keyword, you give the `if` construction a path to follow in case the condition evaluates to false. The *`statementsIfTrue`* and *`statementsIfFalse`* do not have to be balanced in any way: One statement can be one line of code, the other one hundred lines. But when either one of those branches completes, execution continues after the last closing brace. To demonstrate how this construction can come in handy, the following example is a script fragment that assigns the number of days in February based on whether or not the year is a leap year (using modulo arithmetic, explained in Chapter 40, to determine if the year is evenly divisible by four, and setting aside all other leap year calculation details for the moment):

```
var howMany = 0
var theYear = 2002
if (theYear % 4 == 0) {
    howMany = 29
} else {
    howMany = 28
}
```

Here is a case where execution has to follow only one of two possible paths to assign the number of days to the `howMany` variable. Had I not used the `else` portion, as in

```
var howMany = 0
var theYear = 2002
if (theYear % 4 == 0) {
    howMany = 29
}
howMany = 28
```

then the variable would always be set to 28, occasionally after momentarily being set to 29. The `else` construction is essential in this case.

Nesting if. . .else statements

Designing a complex decision process requires painstaking attention to the logic of the decisions your script must process and the statements that must execute for any given set of conditions. The need for many complex constructions disappears with the advent of `switch` construction in NN4+ and IE4+ (described later in this chapter), but there may still be times when you must fashion complex decision behavior out of a series of nested `if. . .else` constructions. Without a JavaScript-aware text editor to help keep everything properly indented and properly terminated (with closing braces), you have to monitor the authoring process very carefully. Moreover, the error messages that JavaScript provides when a mistake occurs (see Chapter 45) may not point directly to the problem line but only to the region of difficulty.

Note

Another important point to remember about nesting `if. . .else` statements in JavaScript before Version 1.2 is that the language does not provide a mechanism for script execution to break out of a nested part of the construction. For that reason, you have to construct complex assemblies with extreme care to make sure only the desired statement executes for each set of conditions. Extensive testing, of course, is also required (see Chapter 45).

To demonstrate a deeply nested set of `if. . .else` constructions, Listing 39-1 presents a simple user interface to a complex problem. A single text object asks the user to enter one of three letters — A, B, or C. The script behind that field processes a different message for each of the following conditions:

- ✦ The user enters no value.
- ✦ The user enters A.
- ✦ The user enters B.
- ✦ The user enters C.
- ✦ The user enters something entirely different.

Listing 39-1: **Deeply Nested if. . .else Constructions**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function testLetter(form){
    inpVal = form.entry.value  // assign to shorter variable name
    if (inpVal != "") {  // if entry is not empty then dive in...
        if (inpVal == "A") {  // Is it an "A"?
            alert("Thanks for the A.")
        } else if (inpVal == "B") {  // No.  Is it a "B"?
```

Continued

Listing 39-1 *(continued)*

```
            alert("Thanks for the B.")
        } else if (inpVal == "C") {  // No.  Is it a "C"?
            alert("Thanks for the C.")
        } else {          // Nope.  None of the above
            alert("Sorry, wrong letter or case.")
        }
    } else {   // value was empty, so skipped all other stuff above
        alert("You did not enter anything.")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
Please enter A, B, or C:
<INPUT TYPE="text" NAME="entry" onChange="testLetter(this.form)">
</FORM>
</BODY>
</HTML>
```

Each condition executes only the statements that apply to that particular condition, even if it takes several queries to find out what the entry is. You do not need to break out of the nested construction because when a true response is found, the relevant statement executes, and no other statements occur in the execution path to run.

Even if you understand how to construct a hair-raising nested construction, such as the one in Listing 39-1, the trickiest part is making sure that each left brace has a corresponding right brace. My technique for ensuring this pairing is to enter the right brace immediately after I type the left brace. I typically type the left brace, press Enter twice (once to open a free line for the next statement, once for the line that is to receive the right brace); tab, if necessary, to the same indentation as the line containing the left brace; and then type the right brace. Later, if I have to insert something indented, I just push down the right braces that I entered earlier. If I keep up this methodology throughout the process, the right braces appear at the desired indentation after I'm finished, even if the braces end up being dozens of lines below their original spot.

Conditional Expressions

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

While I'm showing you decision-making constructions in JavaScript, now is a good time to introduce a special type of expression that you can use in place of an `if. . .else` control structure for a common type of decision — the instance where you want to assign one of two values to a variable, depending on the outcome of some condition. The formal definition for the conditional expression is as follows:

```
variable = (condition) ? val1 : val2
```

This expression means that if the Boolean result of the `condition` statement is true, JavaScript assigns `val1` to the variable; otherwise, it assigns `val2` to the variable. Like other instances of condition expressions, this one must also be written inside parentheses. The question mark is key here, as is the colon separating the two possible values.

A conditional expression, though not particularly intuitive or easy to read inside code, is very compact. Compare an `if. . .else` version of an assignment decision that follows

```
var collectorStatus
if (CDCount > 500) {
    collectorStatus = "fanatic"
} else {
    collectorStatus = "normal"
}
```

with the conditional expression version:

```
var collectorStatus = (CDCount > 500) ? "fanatic" : "normal"
```

The latter saves a lot of code lines (although the internal processing is the same as that of an `if. . .else` construction). Of course, if your decision path contains more statements than just one setting the value of a variable, the `if. . .else` or `switch` construction is preferable. This shortcut, however, is a handy one to remember if you need to perform very binary actions, such as setting a true-or-false flag in a script.

Repeat (for) Loops

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

As you have seen in numerous examples throughout other chapters, the capability to cycle through every entry in an array or through every item of a form element is vital to many JavaScript scripts. Perhaps the most typical operation is inspecting a property of many similar items in search of a specific value, such as to determine which radio button in a group is selected. One JavaScript structure that allows for these repetitious excursions is the `for` loop, so named after the keyword that begins the structure. Two other structures, called the `while` loop and `do-while` loop, are covered in following sections.

The JavaScript for loop lets a script repeat a series of statements any number of times and includes an optional loop counter that can be used in the execution of the statements. The following is the formal syntax definition:

```
for ( [initial expression]; [condition]; [update expression]) {
    statements
}
```

The three statements inside the parentheses (parameters to the for statement) play a key role in the way a for loop executes.

An initial expression in a for loop is executed one time, the first time the for loop begins to run. The most common application of the initial expression is to assign a name and starting value to a loop counter variable. Thus, seeing a var statement that both declares a variable name and assigns an initial value (generally 0 or 1) to it is not uncommon. An example is

```
var i = 0
```

You can use any variable name, but conventional usage calls for the letter i, which is short for *index*. If you prefer the word counter or another word that reminds you of what the variable represents, that's fine, too. In any case, the important point to remember about this statement is that it executes once at the outset of the for loop.

The second statement is a *condition*, precisely like the condition statement you saw in if constructions earlier in this chapter. When a loop-counting variable is established in the initial expression, the condition statement usually defines how high the loop counter should go before the looping stops. Therefore, the most common statement here is one that compares the loop counter variable against some fixed value — is the loop counter less than the maximum allowed value? If the condition is false at the start, the body of the loop is not executed. But if the loop does execute, then every time execution comes back around to the top of the loop, JavaScript reevaluates the condition to determine the current result of the expression. If the loop counter increases with each loop, eventually the counter value goes beyond the value in the condition statement, causing the condition statement to yield a Boolean value of false. The instant that happens, execution drops out of the for loop entirely.

The final statement, the *update expression*, is executed at the end of each loop execution — after all statements nested inside the for construction have run. Again, the loop counter variable can be a factor here. If you want the counter value to increase by one the next time through the loop (called incrementing the value), you can use the JavaScript operator that makes that happen: the ++ operator appended to the variable name. That task is the reason for the appearance of all those i++ symbols in the for loops that you've seen already in this book. You're not limited to incrementing by one. You can increment by any multiplier you want or even drive a loop counter backward by decrementing the value (i--).

Now, take this knowledge and beef up the formal syntax definition with one that takes into account a typical loop-counting variable, i, and the common ways to use it:

```
// incrementing loop counter
for (var i = minValue; i <= maxValue; i++) {
    statements
```

```
}
// decrementing loop counter
for (var i = maxValue; i >= minValue; i--) {
    statements
}
```

In the top format, the variable, `i`, is initialized at the outset to a value equal to that of `minValue`. Variable `i` is immediately compared against `maxValue`. If `i` is less than or equal to `maxValue`, processing continues into the body of the loop. At the end of the loop, the update expression executes. In the top example, the value of `i` is incremented by `1`. Therefore, if `i` is initialized as `0`, then the first time through the loop, the `i` variable maintains that `0` value during the first execution of statements in the loop. The next time around, the variable has the value of `1`.

As you may have noticed in the formal syntax definition, each of the parameters to the `for` statement is optional. For example, the statements that execute inside the loop may control the value of the loop counter based on data that gets manipulated in the process. Therefore, the `update` statement would probably interfere with the intended running of the loop. But I suggest that you use all three parameters until such time as you feel absolutely comfortable with their roles in the `for` loop. If you omit the `condition` statement, for instance, and you don't program a way for the loop to exit on its own, your script may end up in an infinite loop— which does your users no good.

Putting the loop counter to work

Despite its diminutive appearance, the `i` loop counter (or whatever name you want to give it) can be a powerful tool for working with data inside a repeat loop. For example, examine a version of the classic JavaScript function that creates a Navigator 2–compatible array while initializing entries to a value of `0`:

```
// initialize array with n entries
function MakeArray(n) {
    this.length = n
    for (var i = 1; i <= n; i++) {
        this[i] = 0
    }
    return this
}
```

The loop counter, `i`, is initialized to a value of `1`, because you want to create an array of empty entries (with value `0`) starting with the one whose index value is `1` (the zeroth entry is assigned to the `length` property) in the previous line. In the `condition` statement, the loop continues to execute as long as the value of the counter is less than or equal to the number of entries being created (`n`). After each loop, the counter increments by `1`. In the nested statement that executes within the loop, you use the value of the `i` variable to substitute for the index value of the `assignment` statement:

```
this[i] = 0
```

The first time the loop executes, the value expression evaluates to

```
this[1] = 0
```

The next time, the expression evaluates to

```
this[2] = 0
```

and so on, until all entries are created and stuffed with 0.

Recall the HTML page in Listing 37-3, where a user chooses a regional office from a SELECT list (triggering a script to look up the manager's name and sales quota for that region). Because the regional office names are stored in an array, the page could be altered so that a script populates the SELECT element's options from the array. That way, if there is ever a change to the alignment of regional offices, there need be only one change to the array of offices, and the HTML doesn't have to be modified. As a reminder, here is the definition of the regional offices array, created while the page loads:

```
var regionalOffices = new Array("New York", "Chicago", "Houston", "Portland")
```

A script inside the HTML form can be used to dynamically generate the SELECT list as follows:

```
<SCRIPT LANGUAGE="JavaScript">
var elem = "" // start assembling next part of page and form
elem += "<P>Select a regional office: "
elem += "<SELECT NAME='offices' onChange='getData(this.form)'>"
// build options list from array office names
for (var i = 0; i < regionalOffices.length; i++) {
    elem += "<OPTION"    // OPTION tags
    if (i == 0) {        // pre-select first item in list
        elem += " SELECTED"
    }
    elem += ">" + regionalOffices[i]
}
elem += "</SELECT></P>"  // close SELECT item tag
document.write(elem)     // write element to the page
</SCRIPT>
```

Notice one important point about the `condition` statement of the `for` loop: JavaScript extracts the `length` property from the array to be used as the loop counter boundary. From a code maintenance and stylistic point of view, this method is preferable to hard-wiring a value there. If the company added a new regional office, you would make the addition to the array "database," whereas everything else in the code would adjust automatically to those changes, including creating a longer pop-up menu in this case.

Notice, too, that the operator for the `condition` statement is less-than (<): The zero-based index values of arrays mean that the maximum index value we can use is one less than the actual count of items in the array. This is vital information, because the index counter variable (`i`) is used as the index to the `regionalOffices` array each time through the loop to read the string for each item's entry. You also use the counter to determine which is the first option, so that you can take a short detour (via the `if` construction) to add the `SELECTED` attribute to the first option's definition.

The utility of the loop counter in `for` loops often influences the way you design data structures, such as two-dimensional arrays (see Chapter 37) for use as databases. Always keep the loop-counter mechanism in the back of your mind when you begin writing JavaScript script that relies on collections of data that you embed in your documents.

Breaking out of a loop

Some loop constructions perform their job as soon as a certain condition is met, at which point they have no further need to continue looping through the rest of the values in the loop counter's range. A common scenario for this is the cycling of a loop through an entire array in search of a single entry that matches some criterion. That criterion test is set up as an `if` construction inside the loop. If that criterion is met, you break out of the loop and let the script continue with the more meaningful processing of succeeding statements in the main flow. To accomplish that exit from the loop, use the `break` statement. The following schematic shows how the `break` statement may appear in a `for` loop:

```
for (var i = 0; i < array.length; i++) {
    if (array[i].property == magicValue) {
        statements that act on entry array[i]
        break
    }
}
```

The `break` statement tells JavaScript to bail out of the nearest `for` loop (in case you have nested `for` loops). Script execution then picks up immediately after the closing brace of the `for` statement. The variable value of `i` remains whatever it was at the time of the break, so that you can use that variable later in the same script to access, say, that same array entry.

I use a construction similar to this in Chapter 24. There, the discussion of radio buttons demonstrates this construction, where, in Listing 24-8, you see a set of radio buttons whose `VALUE` attributes contain the full names of four members of the Three Stooges. A function uses a `for` loop to find out which button was selected and then uses that item's index value—after the for loop breaks out of the loop—to alert the user. Listing 39-2 (not on the CD-ROM) shows the relevant function.

Listing 39-2: **Breaking Out of a for Loop**

```
function fullName(form) {
    for (var i = 0; i < form.stooges.length; i++) {
        if (form.stooges[i].checked) {
            break
        }
    }
    alert("You chose " + form.stooges[i].value + ".")
}
```

In this case, breaking out of the `for` loop was for more than mere efficiency; the value of the loop counter (frozen at the break point) is used to summon a different property outside of the `for` loop. In NN4+ and IE4+, the `break` statement assumes additional powers in cooperation with the new `label` feature of control structures. This subject is covered later in this chapter.

Directing loop traffic with continue

One other possibility in a `for` loop is that you may want to skip execution of the nested statements for just one condition. In other words, as the loop goes merrily on its way round and round, executing statements for each value of the loop counter, one value of that loop counter may exist for which you don't want those statements to execute. To accomplish this task, the nested statements need to include an `if` construction to test for the presence of the value to skip. When that value is reached, the `continue` command tells JavaScript to immediately skip the rest of the body, execute the `update` statement, and loop back around to the top of the loop (also skipping the `condition` statement part of the `for` loop's parameters).

To illustrate this construction, you create an artificial example that skips over execution when the counter variable is the superstitious person's unlucky `13`:

```
for (var i = 0; i <= 20; i++) {
    if (i == 13) {
        continue
    }
    statements
}
```

In this example, the *`statements`* part of the loop executes for all values of `i` except `13`. The `continue` statement forces execution to jump to the `i++` part of the loop structure, incrementing the value of `i` for the next time through the loop. In the case of nested `for` loops, a `continue` statement affects the `for` loop in whose immediate scope the `if` construction falls. The `continue` statement is enhanced in NN4+ and IE4+ in cooperation with the new `label` feature of control structures. This subject is covered later in this chapter.

The while Loop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The `for` loop is not the only kind of repeat loop you can construct in JavaScript. Another statement, called a `while` statement, sets up a loop in a slightly different format. Rather than providing a mechanism for modifying a loop counter, a `while` repeat loop assumes that your script statements will reach a condition that forcibly exits the repeat loop.

The basic syntax for a `while` loop is

```
while (condition) {
    statements
}
```

The *`condition`* expression is the same kind that you saw in `if` constructions and in the middle parameter of the `for` loop. You introduce this kind of loop if some condition exists in your code (evaluates to `true`) before reaching this loop. The loop then performs some action, which affects that condition repeatedly until that condition becomes false. At that point, the loop exits, and script execution continues with statements after the closing brace. If the statements inside the while loop do not affect the values being tested in *condition*, your script never exits, and it becomes stuck in an infinite loop.

Many loops can be rendered with either the for or while loops. In fact, Listing 39-3 (not on the CD-ROM) shows a while loop version of the for loop from Listing 39-2.

Listing 39-3: **A while Loop Version of Listing 39-2**

```
function fullName(form) {
    var i = 0
    while (!form.stooges[i].checked) {
        i++
    }
    alert("You chose " + form.stooges[i].value + ".")
}
```

One point you may notice is that if the condition of a while loop depends on the value of a loop counter, the scripter is responsible for initializing the counter prior to the while loop construction and managing its value within the while loop.

Should you need their powers, the break and continue control statements work inside while loops as they do in for loops. But because the two loop styles treat their loop counters and conditions differently, be extra careful (do lots of testing) when applying break and continue statements to both kinds of loops.

No hard-and-fast rules exist for which type of loop construction to use in a script. I generally use while loops only when the data or object I want to loop through is already a part of my script before the loop. In other words, by virtue of previous statements in the script, the values for any condition or loop counting (if needed) are already initialized. But if I need to cycle through an object's properties or an array's entries to extract some piece of data for use later in the script, I favor the for loop.

Another point of style, particularly with the for loop, is where a scripter should declare the i variable. Some programmers prefer to declare (or initialize if initial values are known) all variables in the opening statements of a script or function. That is why you tend to see a lot of var statements in those positions in scripts. If you have only one for loop in a function, for example, nothing is wrong with declaring and initializing the i loop counter in the initial expression part of the for loop (as demonstrated frequently in the previous sections). But if your function utilizes multiple for loops that reuse the i counter variable (that is, the loops run completely independently of one another), then you can declare the i variable once at the start of the function and simply assign a new initial value to i in each for construction.

The do-while Loop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

JavaScript in NN4+ and IE4+ brings you one more looping construction, called the `do-while` loop. The formal syntax for this construction is as follows:

```
do {
    statements
} while  (condition)
```

An important difference distinguishes the `do-while` loop from the `while` loop. In the `do-while` loop, the statements in the construction always execute at least one time before the condition can be tested; in a `while` loop, the statements may never execute if the condition tested at the outset evaluates to `false`.

Use a `do-while` loop when you know for certain that the looped statements are free to run at least one time. If the condition may not be met the first time, use the `while` loop. For many instances, the two constructions are interchangeable, although only the `while` loop is compatible with all scriptable browsers.

Looping through Properties (for-in)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

JavaScript includes a variation of the `for` loop, called a `for-in` loop, which has special powers of extracting the names and values of any object property currently in the browser's memory. The syntax looks like this:

```
for (var in object) {
    statements
}
```

The *`object`* parameter is not the string name of an object but a reference to the object itself. JavaScript delivers an object reference if you provide the name of the object as an unquoted string, such as `window` or `document`. Using the `var` variable, you can create a script that extracts and displays the range of properties for any given object.

Listing 39-4 shows a page containing a utility function that you can insert into your HTML documents during the authoring and debugging stages of designing a JavaScript-enhanced page. In the example, the current `window` object is examined and its properties are presented in the page.

Listing 39-4: **Property Inspector Function**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function showProps(obj,objName) {
    var result = ""
```

```
    for (var i in obj) {
        result += objName + "." + i + " = " + obj[i] + "<BR>"
    }
    return result
}
</SCRIPT>
</HEAD>
<BODY>
<B>Here are the properties of the current window:</B><P>
<SCRIPT LANGUAGE="JavaScript">
document.write(showProps(window, "window"))
</SCRIPT>
</BODY>
</HTML>
```

For debugging purposes, you can revise the function slightly to display the results in an alert dialog box. Replace the `<BR>` HTML tag with the `\n` carriage return character for a nicely formatted display in the alert dialog box. You can call this function from anywhere in your script, passing both the object reference and a string to it to help you identify the object after the results appear in an alert dialog box. If the `showProps()` function looks familiar to you, it is because it closely resembles the property inspector routines of The Evaluator (see Chapter 13). In Chapter 45, you can see how to embed functionality of The Evaluator into a page under construction so that you can view property values while debugging your scripts.

The with Statement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

A `with` statement enables you to preface any number of statements by advising JavaScript on precisely which object your scripts will be talking about, so that you don't have to use full, formal addresses to access properties or invoke methods of the same object. The formal syntax definition of the `with` statement is as follows:

```
with (object) {
    statements
}
```

The object reference is a reference to any valid object currently in the browser's memory. An example of this appears in Chapter 35's discussion of the `Math` object. By embracing several Math-encrusted statements inside a `with` construction, your scripts can call the properties and methods without having to make the object part of every reference to those properties and methods.

An advantage of the `with` structure is that it can make heavily object-dependent statements easier to read and understand. Consider this long version of a function that requires multiple calls to the same object (but different properties):

```
function seeColor(form) {
    newColor = (form.colorsList.options[form.colorsList.selectedIndex].text)
    return newColor
}
```

Using the `with` structure, you can shorten the long statement:

```
function seeColor(form) {
    with (form.colorsList) {
        newColor = (options[selectedIndex].text)
    }
    return newColor
}
```

When JavaScript encounters an otherwise unknown identifier inside a `with` statement, it tries to build a reference out of the object specified as its parameter and that unknown identifier. You cannot, however, nest `with` statements that build on one another. For instance, in the preceding example, you cannot have a `with (colorsList)` nested inside a `with (form)` statement and expect JavaScript to create a reference to options out of the two object names.

As clever as the `with` statement may seem, be aware that it introduces some inherent performance penalties in your script (because of the way the JavaScript interpreter must artificially generate references). You probably won't notice degradation with occasional use of this construction, but if it's used inside a loop that must iterate many times, processing speed will almost certainly be affected negatively.

Labeled Statements

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Crafting multiple nested loops can sometimes be difficult when the final condition your script is looking for is met deep inside the nests. The problem is that the `break` or `continue` statement by itself has scope only to the nearest loop level. Therefore, even if you break out of the inner loop, the outer loop(s) continue to execute. If all you want to do is exit the function after the condition is met, a simple `return` statement performs the same job as some other languages' exit command. But if you also need some further processing within that function after the condition is met, you need the NN4+ and IE4+ facility that lets you assign labels to blocks of JavaScript statements. Your `break` and `continue` statements can then alter their scope to apply to a labeled block other than the one containing the statement.

A *label* is any identifier (that is, name starting with a letter and containing no spaces or odd punctuation other than an underscore) followed by a colon preceding a logical block of executing statements, such as an `if. . .then` or loop construction. The formal syntax looks like the following:

```
labelID:
    statements
```

For a `break` or `continue` statement to apply itself to a labeled group, the label is added as a kind of parameter to each statement, as in

```
break labelID
continue labelID
```

To demonstrate how valuable this can be in the right situation, Listing 39-5 contains two versions of the same nested loop construction. The goal of each version is to loop through two different index variables until both values equal the target values set outside the loop. When those targets are met, the entire nested loop construction should break off and continue processing afterward. To help you visualize the processing that goes on during the execution of the loops, the scripts output intermediate and final results to a textarea.

In the version without labels, when the targets are met, only the simple `break` statement is issued. This breaks the inner loop at that point, but the outer loop picks up on the next iteration. By the time the entire construction has ended, a lot of wasted processing has gone on. Moreover, the values of the counting variables max themselves out, because the loops execute in their entirety several times after the targets are met.

But in the labeled version, the inner loop breaks out of the labeled outer loop as soon as the targets are met. Far fewer lines of code are executed, and the loop counting variables are equal to the targets, as desired. Experiment with Listing 39-5 by changing the `break` statements to `continue` statements. Then closely analyze the two results in the Results textarea to see how the two versions behave.

Listing 39-5: **Labeled Statements**

```
<HTML>
<HEAD>
<TITLE>Breaking Out of Nested Labeled Loops</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var targetA = 2
var targetB = 2
var range = 5
function run1() {
    var out = document.forms[0].output
    out.value = "Running WITHOUT labeled break\n"
    for (var i = 0; i <= range; i++) {
        out.value += "Outer loop #" + i + "\n"
        for (var j = 0; j <= range; j++) {
            out.value += "  Inner loop #" + j + "\n"
            if (i == targetA && j == targetB) {
                out.value += "**BREAKING OUT OF INNER LOOP**\n"
                break
            }
```

Continued

Listing 39-5 *(continued)*

```
        }
    }
    out.value += "After looping, i = " + i + ", j = " + j + "\n"
}
function run2() {
    var out = document.forms[0].output
    out.value = "Running WITH labeled break\n"
    outerLoop:
    for (var i = 0; i <= range; i++) {
        out.value += "Outer loop #" + i + "\n"
        innerLoop:
        for (var j = 0; j <= range; j++) {
            out.value += "  Inner loop #" + j + "\n"
            if (i == targetA && j == targetB) {
                out.value += "**BREAKING OUT OF OUTER LOOP**\n"
                break outerLoop
            }
        }
    }
    out.value += "After looping, i = " + i + ", j = " + j + "\n"
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Breaking Out of Nested Labeled Loops</H1>
<HR>
<P>Look in the Results field for traces of these button scripts:</P>
<FORM>
<P><INPUT TYPE="button" VALUE="Execute WITHOUT Label" onClick="run1()"></P>
<P><INPUT TYPE="button" VALUE="Execute WITH Label" onClick="run2()"></P>
<P>Results:</P>
<TEXTAREA NAME="output" ROWS=43 COLS=60> </TEXTAREA>
</FORM>
</BODY>
</HTML>
```

The switch Statement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

In some circumstances, a binary — true or false — decision path is not enough to handle the processing in your script. An `object` property or `variable` value may contain any one of several values, and a separate execution path is required for each one. In the past, the way to accommodate this was with a series of `if. . .else` constructions. The more conditions you must test, the less efficient the processing is, because each condition must be tested. Moreover, the sequence of clauses and braces can get very confusing.

In NN4+ and IE4+, a control structure in use by many languages comes to JavaScript. The implementation is similar to that of Java and C, using the switch and case keywords. The basic premise is that you can create any number of execution paths based on the value of some expression. At the beginning of the structure, you identify what that expression is and then, for each execution path, assign a label matching a particular value.

The formal syntax for the `switch` statement is

```
switch (expression) {
    case label1:
        statements
        [break]
    case label2:
        statements
        [break]
    ...
    [default:
        statements]
}
```

The *`expression`* parameter of the `switch` statement can evaluate to any string or number value. Labels are not surrounded by quotes, even if the labels represent string values of the expression. Notice that the `break` statements are optional. A `break` statement forces the switch expression to bypass all other checks of succeeding labels against the expression value. Another option is the `default` statement, which provides a catchall execution path when the expression value does not match any of the `case` statement labels. If you'd rather not have any execution take place with a non-matching expression value, omit the default part of the construction.

To demonstrate the syntax of a working `switch` statement, Listing 39-6 provides the skeleton of a larger application of this control structure. The page contains two separate arrays of different product categories. Each product has its name and price stored in its respective array. A SELECT list displays the product names. After a user chooses a product, the script looks up the product name in the appropriate array and displays the price.

The trick behind this application is the values assigned to each product in the select list. While the displayed text is the product name, the VALUE attribute of each `<OPTION>` tag is the array category for the product. That value is the expression used to decide which branch to follow. Notice, too, that I assign a label to the entire switch construction. The purpose of that is to let the deeply nested repeat loops for each case completely bail out of the switch construction (via a labeled `break` statement) whenever a match is made. You can extend this example to any number of product category arrays with additional `case` statements to match.

Listing 39-6: The switch Construction in Action

```
<HTML>
<HEAD>
<TITLE>Switch Statement and Labeled Break</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
// build two product arrays, simulating two database tables
function product(name, price) {
    this.name = name
    this.price = price
}
var ICs = new Array()
ICs[0] = new product("Septium 900MHz","$149")
ICs[1] = new product("Septium Pro 1.0GHz","$249")
ICs[2] = new product("Octium BFD 750MHz","$329")
var snacks = new Array
snacks[0] = new product("Rays Potato Chips","$1.79")
snacks[1] = new product("Cheezey-ettes","$1.59")
snacks[2] = new product("Tortilla Flats","$2.29")

// lookup in the 'table' associated with the product
function getPrice(selector) {
    var chipName = selector.options[selector.selectedIndex].text
    var outField = document.forms[0].cost
    master:
        switch(selector.options[selector.selectedIndex].value) {
            case "ICs":
                for (var i = 0; i < ICs.length; i++) {
                    if (ICs[i].name == chipName) {
                        outField.value = ICs[i].price
                        break master
                    }
                }
                break
            case "snacks":
                for (var i = 0; i < snacks.length; i++) {
                    if (snacks[i].name == chipName) {
                        outField.value = snacks[i].price
                        break master
                    }
                }
                break
            default:
                outField.value = "Not Found"
        }
}
</SCRIPT>
</HEAD>
<BODY>
<B>Branching with the switch Statement</B>
<HR>
Select a chip for lookup in the chip price tables:<P>
<FORM>
```

```
Chip:<SELECT NAME="chips" onChange="getPrice(this)">
    <OPTION>
    <OPTION VALUE="ICs">Septium 900MHz
    <OPTION VALUE="ICs">Septium Pro 1.0GHz
    <OPTION VALUE="ICs">Octium BFD 750MHz
    <OPTION VALUE="snacks">Rays Potato Chips
    <OPTION VALUE="snacks">Cheezey-ettes
    <OPTION VALUE="snacks">Tortilla Flats
    <OPTION>Poker Chipset
</SELECT> 
Price:<INPUT TYPE="text" NAME="cost" SIZE=10>
</FORM>
</BODY>
</HTML>
```

If you need this kind of functionality in your script but your audience is not all running level 4 or later browsers, see Listing 39-1 for ways to simulate the `switch` statement with `if. . .else` constructions.

Exception Handling

The subject of exception handling is relatively new to JavaScript. Formalized in Edition 3 of ECMA-262, parts of the official mechanism are implemented in IE5, with a more complete implementation in NN6. As you see in the rest of this chapter, both IE5+ and NN6 follow many of the same rules with respect to controlling execution paths (the primary subject of this chapter). But IE's departure from the ECMA-262 specification on some of the details can force scripters to take some extra steps to make exception handling work smoothly across browsers. More on that later. First, an overview of exception handling.

Exceptions and errors

If you've done any scripting, you are certainly aware of JavaScript errors, whether they be from syntax errors in your code, or what are known as *runtime* errors—errors that occur while scripts are processing information. Ideally, a program should be aware of when an error occurs and handle it as gracefully as possible. This self-healing can prevent lost data (usually not a big problem in Web applications) and prevent users from seeing the ugliness of error messages. In Chapter 16, you learn about the `onError` event handler (and `window.onerror` property), which were early attempts at letting scripts gain a level of control over runtime errors. This event-driven mechanism works on a global level (that is, in the `window` object) and processes every error that occurs throughout the page. This event handler ends up being used primarily as a last-ditch defense against displaying any error message to the user and is a long way from what programmers consider to be exception handling.

In the English language, the term "exception" can mean the same as something out of the ordinary, or something abnormal. This definition seems quite distant from the word "error," which usually means a mistake. In the realm of programming languages, however, the two words tend to be used interchangeably, and the difference between the two depends primarily on one's point of view.

Consider, for example, a simple script whose job is to multiply numbers that the user enters into two text fields on the page. The script is supposed to display the results in a third text box. If the script contains no data entry validation, JavaScript will attempt to multiply whatever values are entered into the text boxes. If the user enters two numbers, JavaScript is smart enough to recognize that even though the `value` properties of the two input text fields are strings, the strings contain numbers that can be converted to number types for the proper multiplication. Without complaint, the product of the two numbers gets calculated and displayed into the results.

But what if the user types a letter into one of the text boxes? Again, without any entry validation in the script, JavaScript has a fixed way of responding to such a request: The result of the multiplication operation is the `NaN` (not a number) constant. If you are an untrained user, you have no idea what `NaN` means, but your experience with computers tells you that some kind of error has occurred. You may blame the computer or you may blame yourself.

To shift the point of view to the programmer, however, the script was designed to be run by a user who never makes a typing mistake, intentional or not. That, of course, is not very good programming practice. Users make mistakes. Therefore, anticipating user input that is not what would be expected is the programmer's job—input that is an exception to the rules your program wants to operate by. You must include some additional code that handles the exceptions gracefully so as to not confuse the user with unintelligible output and perhaps even help the user repair the input to get a result. This extra programming code handles the undesirable and erroneous input.

As it turns out, JavaScript and the W3C Document Object Model liberally mix terms of exception and error within the vocabulary used to handle exceptions. As you see shortly, an exception creates an *error object*, which contains information about the exception. It is safe to say that you can think of exceptions and errors as the same things.

The exception mechanism

Newcomers to JavaScript (or any programming environment, for that matter) may have a difficult time at first creating a mental model of how all this stuff runs within the context of the browser. It may be easy enough to understand how pages load and create object models, and how event handlers (or listeners in the W3C DOM terminology) cause script functions to run. But a lot of action also seems to be going on in the background. For example, the event object that is generated automatically with each event action (see Chapter 29) seems to sit "somewhere" while event handler functions run so that they can retrieve details about the event. After the functions finish their processing, the event object disappears, without even leaving behind a Cheshire Cat smile. Mysterious.

Browsers equipped for exception handling have more of this "stuff" running in the background, ready for your scripts when you need it. Because you have certainly viewed the details of at least one scripting error, you have already seen some of the exception handling mechanism that is built into browsers. If a script error occurs, the browser creates in its memory an error object, whose properties contain details about the error. The precise details (described later in this chapter) vary from one browser brand to the next, but what you see in the error details readout is the default way the browser handles exceptions/errors. As browsers have matured, their makers have gone to great lengths to tone down the intrusion of script errors. For example in NN4+, errors appear in a separate JavaScript Console window (which must be invoked in NN4 by typing `javascript:` into the Location field; or opened directly via the Tools menu in NN6), while users see only a message about the existence of an error in the statusbar. In IE4+ for Windows, the statusbar comes into play again, as the icon at the bottom-left corner turns into an alert icon: Double-clicking the icon displays more information about the error. IE/Mac users can turn off scripting error alerts altogether.

True exception handling, however, goes further than just displaying error messages. It also provides a uniform way to let scripts guard against unusual occurrences. Ideally, the mechanism makes sure that *all* runtime errors get funneled through the same mechanism to help simplify the scripting of exception handling. The mechanism is also designed to be used intentionally as a way for your own code to generate errors in a uniform way so that other parts of your scripts can handle them quietly and intelligently. In other words, you can use the exception handling mechanism as a kind of "back channel" to communicate from one part of your scripts to another.

The JavaScript exception handling mechanism is built around two groups of program execution statements. The first group consists of the `try-catch-finally` statement triumvirate; the second group is the single `throw` statement.

Using try-catch-finally constructions

The purpose of the `try-catch-finally` group of related statements is to provide a controlled environment in which script statements that may encounter runtime errors can run, such that if an exception occurs, your scripts can act upon the exception without alarming the rest of the browser's error mechanisms. Each of the three statements precedes a block of code in the following syntax:

```
try {
    statements to run
}
catch (errorInfo) {
    statements to run if exception occurs in try block
}
finally {
    statements to run whether or not an exception occurred [optional]
}
```

Each `try` block must be mated with a `catch` and/or `finally` block at the same nesting level, with no intervening statements. For example, a function can have a one-level `try-catch` construction inside it as follows:

```
function myFunc() {
    try {
        statements
    }
    catch (e) {
        statements
    }
}
```

But if there were another `try` block nested one level deeper, a balancing `catch` or `finally` block would also have to be present at that deeper level:

```
function myFunc() {
    try {
        statements
        try {
            statements
        }
        catch (e) {
            statements
        }
    }
    catch (e) {
        statements
    }
}
```

The statements inside the `try` block include statements that you believe are capable of generating a runtime error because of user input errors, the failure of some page component to load, or a similar error. The presence of the `catch` block prevents errors from appearing in the browser's regular script error reporting system (for example, the JavaScript Console of NN6).

An important term to know about exception handling of this type is *throw*. The convention is that when an operation or method call triggers an exception, it is said to "throw an exception." For example, if a script statement attempts to invoke a method of a string object, but that method does not exist for the object (perhaps you mistyped the method name), JavaScript throws an exception. Exceptions have names associated with them — a name that sometimes, but not always, reveals important information about the exception. In the mistyped method example just cited, the name of that exception is a `TypeError` (yet more evidence of how "exception" and "error" become intertwined).

The JavaScript language (in IE5+ and NN6+) is not the only entity that can throw exceptions. The W3C DOM also defines categories of exceptions for DOM objects. For example, according to the Level 2 specification, the `appendChild()` method (see Chapter 15) can throw (or *raise*, in the W3C terminology) one of three exceptions:

Exception Name	***When Thrown***
`HIERARCHY_REQUEST_ERR`	If the current node is of a type that does not allow children of the type of the *`newChild`* node, or if the node to append is one of this node's ancestors
`WRONG_DOCUMENT_ERR`	If *`newChild`* was created from a different document than the one that created the current node
`NO_MODIFICATION_ALLOWED_ERR`	If the current node is read-only

Because the `appendChild()` method is capable of throwing exceptions, a JavaScript statement that invokes this method should ideally be inside a `try` block.

If an exception is thrown, then script execution immediately jumps to the `catch` or `finally` block associated with the `try` block. Execution does not come back to the `try` block.

A `catch` block has special behavior. Its format looks similar to a function in a way, because the `catch` keyword is followed by a pair of parentheses and an arbitrary variable that is assigned a reference to the error object whose properties are filled by the browser when the exception occurs. One of the properties of that error object is the name of the error. Therefore, the code inside the `catch` block can examine the name of the error and perhaps include some branching code to take care of a variety of different errors that are caught.

To see how this construction may look in code, look at a hypothetical generic function whose job is to create a new element and append it to some other node. Both the type of element to be created and a reference to the parent node are passed as parameters. To take care of potential misuses of this function through the passage of improper parameter values, it includes extra error handling to treat all possible exceptions from the two DOM methods: `createElement()` and `appendChild()`. Such a function looks like Listing 39-7.

Listing 39-7: **A Hypothetical try-catch Routine**

```
// generic appender
function attachToEnd(theNode, newTag) {
    try {
        var newElem = document.createElement(newTag)
        theNode.appendChild(newElem)
    }
    catch (e) {
        switch (e.name) {
            case "INVALID_CHARACTER_ERR" :
                statements to handle this createElement() error
                break
            case "HIERARCHY_REQUEST_ERR" :
                statements to handle this appendChild() error
                break
            case "WRONG_DOCUMENT_ERR" :
                statements to handle this appendChild() error
                break
            case "NO_MODIFICATION_ALLOWED_ERR" :
                statements to handle this appendChild() error
                break
            default:
                statements to handle any other error
        }
        return false
    }
    return true
}
```

The single catch block in Listing 39-7 executes only if one of the statements in the try block throws an exception. The exceptions may be not only one of the four specific ones named in the catch block but also syntax or other errors that could occur inside the try block. That's why you have a last-ditch case to handle truly unexpected errors. Your job as scripter is to not only anticipate errors but also to provide clean ways for the exceptions to be handled, whether they be through judiciously worded alert dialog boxes or perhaps even some self-repair. For example, in the case of the invalid character error for createElement(), your script may attempt to salvage the data passed to the attachToEnd() function and reinvoke the method passing theNode value as-is and the repaired value originally passed to newTag. If your repairs were successful, the try block would execute without error and carry on with the user's being completely unaware that a nasty problem had been averted.

A finally block contains code that always executes after a try block, whether or not the try block succeeds without throwing an error. Unlike the catch block, a finally block does not receive an error object as a parameter, so it operates very much in the dark about what transpires inside the try block. If you include both catch and finally blocks after a try block, the execution path depends on whether an exception is thrown. If no exception is thrown, the finally block executes after the last statement of the try block runs. But if the try block throws an exception, program execution runs first to the catch block. After all processing within the catch block finishes, the finally block executes. In development environments that give programmers complete control over resources, such as memory allocation, a finally block may be used to delete some temporary items generated in the try block, whether or not an exception occurs in the try block. Currently, JavaScript has less need for that kind of maintenance, but you should be aware of the program execution possibilities of the finally block in the try-catch-finally context.

Real-life exceptions

The example shown in Listing 39-6 is a bit idealized. The listing assumes that the browser dutifully reports every W3C DOM exception precisely as defined in the formal specification. Unfortunately, that's not how it is (yet) in browsers through IE5.5 and NN6. Both browsers implement additional error naming conventions and layers between actual DOM exceptions and what gets reported with the error object at the time of the exception.

If you think these discrepancies make cross-browser exception handling difficult, you're right. Even simple errors are reported differently among the two major browser brands and the W3C DOM specification. Until the browsers exhibit a greater unanimity in exception reporting, the smoothest development road will be for those scripters who have the luxury of writing for one of the browser platforms, such as IE5 for Windows or NN6.

That said, however, one aspect of exception handling can still be used in both IE5+ and NN6. You can take advantage of try-catch constructions to throw your own exceptions — a practice that is quite common in advanced programming environments.

Throwing Exceptions

The last exception handling keyword not covered yet — `throw` — makes it possible to utilize exception handling facilities for your own management of processes, such as data entry validation. At any point inside a `try` block, you can manually throw an exception that gets picked up by the associated `catch` block. The details of the specific exception are up to you.

Syntax for the `throw` statement is as follows:

```
throw value
```

The value you throw can be of any type, but good practice suggests that the value be an error object (described more fully later in this chapter). Whatever value you throw is assigned to the parameter of the `catch` block. Look at the following two examples. In the first, the value is a string message; in the second, the value is an error object.

Listing 39-8 presents one input text box for a number between 1 and 5. Clicking a button looks up a corresponding letter in an array and displays the letter in a second text box. The lookup script has two simple data validation routines to make sure the entry is a number and is in the desired range. Error checking here is done manually by script. If either of the error conditions occurs, `throw` statements force execution to jump to the `catch` block. The `catch` block assigns the incoming `string` parameter to the variable `e`. The design here assumes that the message being passed is text for an alert dialog box. Not only does a single `catch` block take care of both error conditions (and conceivably any others to be added later), but the `catch` block runs within the same variable scope as the function, so that it can use the reference to the input text box to focus and select the input text if there is an error.

Listing 39-8: **Throwing String Exceptions**

```
<HTML>
<HEAD>
<TITLE>Throwing a String Exception</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var letters = new Array("A","B","C","D","E")
function getLetter(fld) {
    try {
        var inp = parseInt(fld.value, 10)
        if (isNaN(inp)) {
            throw "Entry was not a number."
        }
        if (inp < 1 || inp > 5) {
            throw "Enter only 1 through 5."
        }
        fld.form.output.value = letters[inp]
    }
    catch (e)  {
        alert(e)
        fld.form.output.value = ""
```

Continued

Listing 39-8 *(continued)*

```
        fld.focus()
        fld.select()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Throwing a String Exception</H1>
<HR>
<FORM>
Enter a number from 1 to 5:
<INPUT TYPE="text" NAME="input" SIZE=5>
<INPUT TYPE="button" VALUE="Get Letter" onClick=getLetter(this.form.input)>
Matching Letter is:<INPUT TYPE="text" NAME="output" SIZE=5>
</FORM>
</BODY>
</HTML>
```

The flaw with Listing 39-8 is that if some other kind of exception were thrown inside the `try` block, the value passed to the `catch` block would be an error object, not a string. The alert dialog box displayed to the user would be meaningless. Therefore, it is better to be uniform in your `throw`-`catch` constructions and pass an error object.

Listing 39-9 is an updated version of Listing 39-8, demonstrating how to create an error object that gets sent to the `catch` block via `throw` statements. The one glitch in generating an error object comes in IE5 and IE5.5. The ECMA-262 standard allows a script statement to set the `message` property of an error object to directly by passing a string as the parameter to the `new Error()` constructor. This is how NN6 works. But the error object in IE5 does not have the `message` property at all, and in IE5.5, the parameter is not assigned to the `message` property. Therefore, Listing 39-9 contains a separate utility function (`getErrorObj()`) that fills the gap when an error object does not have the `message` property to begin with or doesn't have the property set automatically. If a future version of IE adopts the ECMA standard way, then the extra branch is avoided, just as it is for NN6.

Listing 39-9: **Throwing an Error Object Exception**

```
<HTML>
<HEAD>
<TITLE>Throwing an Error Object Exception</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var letters = new Array("A","B","C","D","E")
function getErrorObj(msg) {
    var err = new Error(msg)
    // take care of IE5/5.5
    if (!err.message) {
```

```
        err.message = msg
    }
    return err
}
function getLetter(fld) {
    try {
        var inp = parseInt(fld.value, 10)
        if (isNaN(inp)) {
            throw getErrorObj("Entry was not a number.")
        }
        if (inp < 1 || inp > 5) {
            throw getErrorObj("Enter only 1 through 5.")
        }
        fld.form.output.value = letters[inp]
    }
    catch (e)  {
        alert(e.message)
        fld.form.output.value = ""
        fld.focus()
        fld.select()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Throwing an Error Object Exception</H1>
<HR>
<FORM>
Enter a number from 1 to 5:
<INPUT TYPE="text" NAME="input" SIZE=5>
<INPUT TYPE="button" VALUE="Get Letter" onClick=getLetter(this.form.input)>
Matching Letter is:<INPUT TYPE="text" NAME="output" SIZE=5>
</FORM>
</BODY>
</HTML>
```

The only difference to the `catch` block is that it now reads the `message` property of the incoming error object. This means that if some other exception is thrown inside the `try` block, the browser-generated message will be displayed in the alert dialog box.

In truth, however, the job really isn't complete. In all likelihood, if a browser-generated exception is thrown, the message in the alert dialog box won't mean much to the user. The error message will probably be some kind of syntax or type error — the kind of meaningless error message you often get from your favorite operating system. A better design is to branch the `catch` block so that "intentional" exceptions thrown by your code are handled through the alert dialog box messages you've put there, but other types are treated differently. To accomplish this, you can take over one of the other properties of the error object — `name` — so that your `catch` block treats your custom messages separately.

In Listing 39-10, the `getErrorObj()` function adds a custom value to the `name` property of the newly created error object. The name you assign can be any name, but you want to avoid exception names used by JavaScript or the DOM. Even if you don't know what all of those are, you can probably conjure up a suitably unique name for your error. Down in the `catch` block, a `switch` construction branches to treat the two classes of errors differently. Notice that because IE5's error object does not have a `name` property, the `switch` expression (`e.name`) evaluates to `undefined`, which forces the `default` case to execute whenever a native exception is thrown (and you have to be careful about which error object properties you use in the `default` case statements). In this simplified example, about the only possible problem other than the ones being trapped for explicitly in the `try` block would be some corruption to the page during downloading. Therefore, for this example, the branch for all other errors simply asks that the user reload the page and try again. The point is, however, that you can have as many classifications of custom and system errors as you want and handle them in a single catch block accordingly.

Listing 39-10: **A Custom Object Exception**

```
<HTML>
<HEAD>
<TITLE>Throwing a Custom Error Object Exception</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var letters = new Array("A","B","C","D","E")
function getErrorObj(msg) {
    var err = new Error(msg)
    // take care of IE5/5.5
    if (!err.message) {
        err.message = msg
    }
    err.name = "MY_ERROR"
    return err
}
function getLetter(fld) {
    try {
        var inp = parseInt(fld.value, 10)
        if (isNaN(inp)) {
            throw getErrorObj("Entry was not a number.")
        }
        if (inp < 1 || inp > 5) {
            throw getErrorObj("Enter only 1 through 5.")
        }
        fld.form.output.value = letters[inp]
    }
    catch (e)  {
        switch (e.name) {
            case "MY_ERROR" :
                alert(e.message)
                fld.form.output.value = ""
                fld.focus()
                fld.select()
```

```
                break
            default :
                alert("Reload the page and try again.")
        }
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Throwing a Custom Error Object Exception</H1>
<HR>
<FORM>
Enter a number from 1 to 5:
<INPUT TYPE="text" NAME="input" SIZE=5>
<INPUT TYPE="button" VALUE="Get Letter" onClick=getLetter(this.form.input)>
Matching Letter is:<INPUT TYPE="text" NAME="output" SIZE=5>
</FORM>
</BODY>
</HTML>
```

If you want to see how the alternative branch of Listing 39-10 looks, copy the listing file from the CD-ROM to your hard disk and modify the last line of the `try` block so that one of the letters is dropped from the name of the array:

```
fld.form.output.value = letter[inp]
```

This may simulate the faulty loading of the page. If you enter one of the allowable values, the reload alert appears, rather than the actual message of the error object: letter is undefined. Your users will thank you.

All that's left now on this subject are the details on the error object.

Error Object

Properties	***Methods***
`Error.prototype`	*`errorObject`*`.toString()`
`errorObject``.constructor`	
`errorObject``.description`	
`errorObject``.filename`	
`errorObject``.lineNumber`	
`errorObject``.message`	
`errorObject``.name`	
`errorObject``.number`	

Syntax

Creating an error object:

```
var myError = new Error("message")
var myError = Error("message")
```

Accessing static `Error` object property:

```
Error.property
```

Accessing error object properties and methods:

```
errorObject.property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

About this object

An error object instance is created whenever an exception is thrown or when you invoke either of the constructor formats for creating an error object. Properties of the error object instance contain information about the nature of the error so that `catch` blocks can inspect the error and process error handling accordingly.

IE5 implemented an error object in advance of the ECMA-262 formal error object, and the IE5 version ends up having its own set of properties that are not part of the ECMA standard. Those proprietary properties are still part of IE5.5, which includes the ECMA properties as well. NN6, on the other hand, starts with the ECMA properties and adds two proprietary properties of its own. The browser uses these additional properties in its own script error reporting. The unfortunate bottom line for cross-browser developers is that no properties in common among all browsers support the error object. However, two common denominators (`name` and `message`) are between IE5.5 and NN6.

As described earlier in this chapter, you are encouraged to create an error object whenever you use the `throw` statement for your own error control. See the discussion surrounding Listing 39-9 about handling missing properties in IE.

Properties

constructor

See `string.constructor` (Chapter 34).

description

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

The `description` property contains a descriptive string that provides some level of detail about the error. For errors thrown by the browser, the description is the same text that appears in the script error dialog box in IE. Although this property continues to be supported, the `message` property in IE5.5 and NN6 is preferred.

Related Items: `message` property.

fileName
lineNumber

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The NN6 browser uses the `fileName` and `lineNumber` properties of an error object for its own internal script error processing — these values appear as part of the error messages that are listed in the JavaScript Console. The `fileName` is the URL of the document causing the error; the `lineNumber` is the source code line number of the statement that threw the exception. These properties are exposed to JavaScript, as well, so that your error processing may use this information if it is meaningful to your application.

Both of these properties (along with the `message` property) have been in the Navigator vernacular since NN3. See the discussion of the `window.error` property in Chapter 16 for further ideas on how to use this information for bug reporting from users.

Related Items: `window.error` property.

message

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `message` property contains a descriptive string that provides some level of detail about the error. For errors thrown by the browser, the message is the same text that appears in the script error dialog box in IE and the JavaScript Console in NN6. By and large, these messages are more meaningful to scripters than to users. Unfortunately, there are no standards for the wording of a message for a given error. Therefore, it is hazardous at best to use the message content in a `catch` block as a means of branching to handle particular kinds of errors. You may get by with this approach if you are developing for a single browser platform, but you have no assurances that the text of a message for a particular exception may not change in future browser versions.

Custom messages for errors that your code explicitly throws can be in user-friendly language if you intend to display such messages to users. See Listings 39-8 through 39-10 for examples of this usage.

Related Items: description property.

name

Value: String Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `name` property generally contains a word that identifies the type of error that has been thrown. The most general kind of error (and the one that is created via the `new Error()` constructor) has a name `Error`. But JavaScript errors can be of several varieties: `EvalError`, `RangeError`, `ReferenceError`, `SyntaxError`, `TypeError`, and `URIError`. Some of these error types are not necessarily intended for exposure to scripters (they're used primarily in the inner workings of the JavaScript engine), but some browsers do expose them. Unfortunately, there are some discrepancies as to the specific name supplied to this property for script errors.

When JavaScript is being used in a browser environment that employs the W3C DOM, some DOM exception types are returned via the `name` property. But browsers frequently insert their own error types for this property, and, as is common in this department, little uniformity exists among browser brands.

For custom exceptions that your code explicitly throws, you can assign names as you want. As shown in Listings 39-9 and 39-10, this information can assist a `catch` block in handling multiple categories of errors.

Related Items: `message` property.

number

Value: Number Read/Write

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

IE5+ assigns unique numbers to each error description or message. The `number` property, however, is problematical. While Microsoft documents a sequence of syntax and runtime errors and their numbers, in practice, IE browsers do not report the numbers shown in Microsoft's own documentation. This is unfortunate, because the number can be a language-independent way of branching `catch` block code based on the error number, rather than the description or message. And, because the `number` property was born at the same time as the `description` property (now superseded by the `message` property), it is unknown how reliable the number values (if you can figure them out) will be going forward.

Related Items: `description` property.

Methods

toString()

Returns: String (see text).

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `toString()` method for an error object should return a string description of the error. In IE5 and 5.5, however, the method returns a reference to the very same error object. In NN6, the method returns the `message` property string, preceded by the string `Error:` (with a space after the colon). Most typically, if you want to retrieve a human-readable expression of an error object, read its `message` (or, in IE5, `description`) property.

Related Items: `message` property.

✦ ✦ ✦

CHAPTER 40

JavaScript Operators

✦ ✦ ✦ ✦

In This Chapter

Understanding operator categories

Exploring the role of operators in script statements

Recognizing operator precedence

✦ ✦ ✦ ✦

JavaScript is rich in *operators*: words and symbols in expressions that perform operations on one or two values to arrive at another value. Any value on which an operator performs some action is called an *operand*. An expression may contain one operand and one operator (called a *unary operator*) or two operands separated by one operator (called a *binary operator*). Many of the same symbols are used in a variety of operators. The combination and order of those symbols are what distinguish their powers.

Note

The vast majority of JavaScript operators have been in the language since the very beginning. But, as you may expect from an evolving language, some new entries have been added to the lexicon. In the rest of this chapter, compatibility charts typically govern an entire category of operator. If there are version anomalies for a particular operator within a category, they are covered in the text.

Operator Categories

To help you grasp the range of JavaScript operators, I group them into seven categories. I assign a wholly untraditional name to the second group — but a name that I believe better identifies its purpose in the language. Table 40-1 shows the operator types.

Table 40-1: JavaScript Operator Categories

Type	*What It Does*
Comparison	Compares the values of two operands, deriving a result of either true or false (used extensively in condition statements for `if...else` and `for` loop constructions)

Continued

Table 40-1 *(continued)*

Type	*What It Does*
Connubial	Joins together two operands to produce a single value that is a result of an arithmetical or other operation on the two
Assignment	Stuffs the value of the expression of the right-hand operand into a variable name on the left-hand side, sometimes with minor modification, as determined by the operator symbol
Boolean	Performs Boolean arithmetic on one or two Boolean operands
Bitwise	Performs arithmetic or column-shifting actions on the binary (base-2) representations of two operands
Object	Helps scripts examine the heritage and capabilities of a particular object before they need to invoke the object and its properties or methods
Miscellaneous	A handful of operators that have special behaviors

Any expression that contains an operator evaluates to a value of some kind. Sometimes the operator changes the value of one of the operands; other times the result is a new value. Even this simple expression

```
5 + 5
```

shows two integer operands joined by the addition operator. This expression evaluates to `10`. The operator is what provides the instruction for JavaScript to follow in its never-ending drive to evaluate every expression in a script.

Doing an equality comparison on two operands that, on the surface, look very different is not at all uncommon. JavaScript doesn't care what the operands look like — only how they evaluate. Two very dissimilar-looking values can, in fact, be identical when they are evaluated. Thus, an expression that compares the equality of two values, such as

```
fred == 25
```

does, in fact, evaluate to `true` if the variable `fred` has the number `25` stored in it from an earlier statement.

Comparison Operators

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Any time you compare two values in JavaScript, the result is a Boolean `true` or `false` value. You have a wide selection of comparison operators to choose from, depending on the kind of test you want to apply to the two operands. Table 40-2 lists all comparison operators.

Table 40-2: JavaScript Comparison Operators

Syntax	*Name*	*Operand Types*	*Results*
`==`	Equals	All	Boolean
`!=`	Does not equal	All	Boolean
`===`	Strictly equals	All	Boolean (IE4+, NN4+)
`!==`	Strictly does not equal	All	Boolean (IE4+, NN4+)
`>`	Is greater than	All	Boolean
`>=`	Is greater than or equal to	All	Boolean
`<`	Is less than	All	Boolean
`<=`	Is less than or equal to	All	Boolean

For numeric values, the results are the same as those you'd expect from your high school algebra class. Some examples follow, including some that may not be obvious.

```
10 == 10            // true
10 == 10.0          // true
9 != 10             // true
9 > 10              // false
9.99 <= 9.98        // false
```

Strings can also be compared on all of these levels:

```
"Fred" == "Fred"    // true
"Fred" == "fred"    // false
"Fred" > "fred"     // false
"Fran" < "Fred"     // true
```

To calculate string comparisons, JavaScript converts each character of a string to its ASCII value. Each letter, beginning with the first of the left-hand operator, is compared to the corresponding letter in the right-hand operator. With ASCII values for uppercase letters being less than those of their lowercase counterparts, an uppercase letter evaluates to being less than its lowercase equivalent. JavaScript takes case-sensitivity very seriously.

Values for comparison can also come from object properties or values passed to functions from event handlers or other functions. A common string comparison used in data-entry validation is the one that sees if the string has anything in it:

```
form.entry.value != ""    // true if something is in the field
```

Equality of Disparate Data Types

For all versions of JavaScript before 1.2, when your script tries to compare string values consisting of numerals and real numbers (for example, `"123" == 123` or `"123" != 123`), JavaScript anticipates that you want to compare apples to apples. Internally it does some data type conversion that does not affect the data type of the original values (for example, if the values are in variables). But the entire situation is more complex, because other data types, such as objects, need to be dealt with. Therefore, prior to JavaScript 1.2, the rules of comparison are as shown in Table 40-3.

Table 40-3: Equality Comparisons for JavaScript 1.0 and 1.1

Operand A	*Operand B*	*Internal Comparison Treatment*
Object reference	Object reference	Compare object reference evaluations
Any data type	Null	Convert nonnull to its object type and compare against null
Object reference	String	Convert object to string and compare strings
String	Number	Convert string to number and compare numbers

The logic to what goes on in equality comparisons from Table 40-3 requires a lot of forethought on the scripter's part, because you have to be very conscious of the particular way data types may or may not be converted for equality evaluation (even though the values themselves are not converted). In this situation, supplying the proper conversion where necessary in the comparison statement is best. This ensures that what you want to compare — for example, the string versions of two values or the number versions of two values — is compared, rather than leaving the conversion up to JavaScript.

Backward compatible conversion from a number to string entails concatenating an empty string to a number:

```
var a = "09"
var b = 9
a == "" + b  // result: false, because "09" does not equal "9"
```

For converting strings to numbers, you have numerous possibilities. The simplest is subtracting zero from a numeric string:

```
var a = "09"
var b = 9
a-0 == b  // result: true because number 9 equals number 9
```

You can also use the parseInt() and parseFloat() functions to convert strings to numbers:

```
var a = "09"
var b = 9
parseInt(a, 10) == b  // result: true because number 9 equals number 9
```

To clear up the ambiguity of JavaScript's equality internal conversions, JavaScript 1.2 in NN4 and IE4 adds two more operators to force the equality comparison to be extremely literal in its comparison. The strictly equals (===) and strictly does not equal (!==) operators compare both the data type and value. The only time the === operator returns true is if the two operands are of the same data type (for example, both are numbers) and the same value. Therefore, no number is ever automatically equal to a string version of that same number. Data and object types must match before their values are compared.

JavaScript 1.2 also provides some convenient global functions for converting strings to numbers and vice versa: String() and Number(). To demonstrate these methods, the following examples use the typeof operator to show the data type of expressions using these functions:

```
typeof 9              // result: number
typeof String(9)      // result: string
typeof "9"            // result: string
typeof Number("9")    // result: number
```

None of these functions alters the data type of the value being converted. But the value of the function is what gets compared in an equality comparison:

```
var a = "09"
var b = 9
a == String(b)   // result: false, because "09" does not equal "9"
typeof b         // result: still a number
Number(a) == b   // result: true, because 9 equals 9
typeof a         // result: still a string
```

This discussion should impress upon you the importance of considering data types when testing the equality of two values.

Connubial Operators

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Connubial operators is my terminology for those operators that join two operands to yield a value related to the operands. Table 40-4 lists the connubial operators in JavaScript.

Table 40-4: JavaScript Connubial Operators

Syntax	*Name*	*Operand Types*	*Results*
+	Plus	Integer, float, string	Integer, float, string
-	Minus	Integer, float	Integer, float
*	Multiply	Integer, float	Integer, float
/	Divide	Integer, float	Integer, float
%	Modulo	Integer, float	Integer, float
++	Increment	Integer, float	Integer, float
--	Decrement	Integer, float	Integer, float
+*val*	Positive	Integer, float, string	Integer, float
-*val*	Negation	Integer, float, string	Integer, float

The four basic arithmetic operators for numbers are straightforward. The plus operator also works on strings to join them together, as in

```
"Howdy " + "Doody" // result = "Howdy Doody"
```

In object-oriented programming terminology, the plus sign is considered *overloaded*, meaning that it performs a different action depending on its context. Remember, too, that string concatenation does not do anything on its own to monitor or insert spaces between words. In the preceding example, the space between the names is part of the first string.

Modulo arithmetic is helpful for those times when you want to know if one number divides evenly into another. You used it in an example in Chapter 39 to figure out if a particular year was a leap year. Although some other leap year considerations exist for the turn of each century, the math in the example simply checked whether the year was evenly divisible by four. The result of the modulo math is the remainder of division of the two values: When the remainder is `0`, one divides evenly into the other. Here are some samples of years evenly divisible by four:

```
2002 % 4    // result = 2
2003 % 4    // result = 3
2004 % 4    // result = 0 (Bingo! Leap year!)
```

Thus, I used this modulo operator in a condition statement of an `if. . .else` structure:

```
var howMany = 0
today = new Date()
var theYear = today.getYear()
if (theYear % 4 == 0) {
    howMany = 29
} else {
    howMany = 28
}
```

Some other languages offer an operator that results in the integer part of a division problem solution: integral division, or `div`. Although JavaScript does not have an explicit operator for this behavior, you can recreate it reliably if you know that your operands are always positive numbers. Use the `Math.floor()` or `Math.ceil()` methods with the division operator, as in

```
Math.floor(4/3)    // result = 1
```

In this example, `Math.floor()` works only with values greater than or equal to `0`; `Math.ceil()` works with values less than `0`.

The increment operator (++) is a *unary* operator (only one operand) and displays two different behaviors, depending on the side of the operand on which the symbols lie. Both the increment and decrement (`--`) operators can be used in conjunction with assignment operators, which I cover next.

As its name implies, the increment operator increases the value of its operand by one. But in an assignment statement, you have to pay close attention to precisely when that increase takes place. An assignment statement stuffs the value of the right operand into a variable on the left. If the ++ operator is located in front of the right operand (prefix), the right operand is incremented before the value is assigned to the variable; if the ++ operator is located after the right operand (postfix), the previous value of the operand is sent to the variable before the value is incremented. Follow this sequence to get a feel for these two behaviors:

```
var a = 10     // initialize a to 10
var z = 0      // initialize z to zero
z = a          // a = 10, so z = 10
z = ++a        // a becomes 11 before assignment, so a = 11 and z becomes 11
z = a++        // a is still 11 before assignment, so z = 11; then a becomes 12
z = a++        // a is still 12 before assignment, so z = 12; then a becomes 13
```

The decrement operator behaves the same way, except that the value of the operand decreases by one. Increment and decrement operators are used most often with loop counters in `for` and `while` loops. The simpler ++ or `--` symbology is more compact than reassigning a value by adding `1` to it (such as, `z = z + 1` or `z += 1`). Because these are unary operators, you can use the increment and decrement operators without an assignment statement to adjust the value of a counting variable within a loop:

```
function doNothing() {
    var i = 1
    while (i < 20) {
        ++i
    }
    alert(i) // breaks out at i = 20
}
```

The last pair of connubial operators are also unary operators (operating on one operand). Both the positive and negation operators can be used as shortcuts to the `Number()` global function, converting a string operand consisting of number characters to a number data type. The string operand is not changed, but the operation returns a value of the number type, as shown in the following sequence:

```
var a = "123"
var b = +a      // b is now 123
```

```
typeof a        // result: string
typeof b        // result: number
```

The negation operator (`-val`) has additional power. By placing a minus sign in front of any numeric value (no space between the symbol and the value), you instruct JavaScript to evaluate a positive value as its corresponding negative value, and vice versa. The operator does not change the operand's value, but the expression returns the modified value. The following example provides a sequence of statements to demonstrate:

```
var x = 2
var y = 8
var z = -x          // z equals -2, but x still equals 2
z = -(x + y)        // z equals -10, but x still equals 2 and y equals 8
z = -x + y          // z equals 6, but x still equals 2 and y equals 8
```

To negate a Boolean value, see the Not (`!`) operator in the discussion of Boolean operators.

Assignment Operators

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Assignment statements are among the most common statements you write in your JavaScript scripts. These statements appear everywhere you copy a value or the results of an expression into a variable for further manipulation of that value.

You assign values to variables for many reasons, even though you could probably use the original values or expressions several times throughout a script. Here is a sampling of reasons why you should assign values to variables:

✦ Variable names are usually shorter

✦ Variable names can be more descriptive

✦ You may need to preserve the original value for later in the script

✦ The original value is a property that cannot be changed

✦ Invoking the same method several times in a script is not efficient

Newcomers to scripting often overlook the last reason. For instance, if a script is writing HTML to a new document, it's more efficient to assemble the string of large chunks of the page into one variable before invoking the `document.write()` method to send that text to the document. This approach is more efficient than literally sending out one line of HTML at a time with multiple `document.writeln()` method statements. Table 40-5 shows the range of assignment operators in JavaScript.

Table 40-5: JavaScript Assignment Operators

Syntax	*Name*	*Example*	*Means*
`=`	Equals	`x = y`	`x = y`
`+=`	Add by value	`x += y`	`x = x + y`
`-=`	Subtract by value	`x -= y`	`x = x - y`
`*=`	Multiply by value	`x *= y`	`x = x * y`
`/=`	Divide by value	`x /= y`	`x = x / y`
`%=`	Modulo by value	`x %= y`	`x = x % y`
`<<=`	Left shift by value	`x <<= y`	`x = x << y`
`>=`	Right shift by value	`x >= y`	`x = x > y`
`>>=`	Zero fill by value	`x >>= y`	`x = x >> y`
`>>>=`	Right shift by value	`x >>>= y`	`x = x >>> y`
`&=`	Bitwise AND by value	`x &= y`	`x = x & y`
`|=`	Bitwise OR by value	`x |= y`	`x = x | y`
`^=`	Bitwise XOR by value	`x ^= y`	`x = x ^ y`

As clearly demonstrated in the top group (see "Bitwise Operators" later in the chapter for information on the bottom group), assignment operators beyond the simple equals sign can save some characters in your typing, especially when you have a series of values that you're trying to bring together in subsequent statements. You've seen plenty of examples in previous chapters, where you used the add-by-value operator (+=) to work wonders with strings as you assemble a long string variable that you eventually send to a `document.write()` method. Look at this variation of a segment of Listing 37-3, where you could use JavaScript to create the HTML content of a SELECT element on the fly:

```
var elem = "" // start assembling next part of page and form
elem += "<P>Select a regional office: "
elem += "<SELECT NAME='offices' onChange='getData(this.form)'>"
// build options list from array office names
for (var i = 0; i < regionalOffices.length; i++) {
    elem += "<OPTION"        // OPTION tags
    if (i == 0) {            // pre-select first item in list
        elem += " SELECTED"
    }
    elem += ">" + regionalOffices[i]
}
elem += "</SELECT></P>"    // close SELECT item tag
document.write(elem)       // write element to the page
```

The script segment starts with a plain equals assignment operator to initialize the `elem` variable as an empty string. In many of the succeeding lines, you use the add-by-value operator to tack additional string values onto whatever is in the `elem` variable at the time. Without the add-by-value operator, you are forced to use the plain equals assignment operator for each line of code to concatenate new string data to the existing string data. In that case, the first few lines of code look as shown:

```
var elem = "" // start assembling next part of page and form
elem = elem + "<P>Select a regional office: "
elem = elem + "<SELECT NAME='offices' onChange='getData(this.form)'>"
```

Within the `for` loop, the repetition of `elem +` makes the code very difficult to read, trace, and maintain. These enhanced assignment operators are excellent shortcuts that you should use at every turn.

Boolean Operators

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Because a great deal of programming involves logic, it is no accident that the arithmetic of the logic world plays an important role. You've already seen dozens of instances where programs make all kinds of decisions based on whether a statement or expression is the Boolean value `true` or `false`. What you haven't seen much of yet is how to combine multiple Boolean values and expressions — a quality that scripts with slightly above average complexity may need to have in them.

In the various condition expressions required throughout JavaScript (such as in an `if` construction), the condition that the program must test for may be more complicated than, say, whether a variable value is greater than a certain fixed value or whether a field is not empty. Look at the case of validating a text field entry for whether the entry contains all the numbers that your script may want. Without some magical JavaScript function to tell you whether or not a string consists of all numbers, you have to break apart the entry character by character and examine whether each character falls within the range of 0 through 9. But that examination actually comprises two tests: You can test for any character whose ASCII value is less than `0` or greater than `9`. Alternatively, you can test whether the character is greater than or equal to `0` and is less than or equal to `9`. What you need is the bottom-line evaluation of both tests.

Boolean math

That's where the wonder of Boolean math comes into play. With just two values — `true` and `false` — you can assemble a string of expressions that yield Boolean results and then let Boolean arithmetic figure out whether the bottom line is `true` or `false`.

But you don't add or subtract Boolean values the same way you add or subtract numbers. Instead, you use one of three JavaScript Boolean operators at your disposal. Table 40-6 shows the three operator symbols. In case you're unfamiliar with the characters in the table, the symbols for the Or operator are created by typing Shift-backslash.

Table 40-6: JavaScript Boolean Operators

Syntax	*Name*	*Operands*	*Results*
`&&`	And	Boolean	Boolean
`||`	Or	Boolean	Boolean
`!`	Not	One Boolean	Boolean

Using Boolean operators with Boolean operands gets tricky if you're not used to it, so I have you start with the simplest Boolean operator: Not. This operator requires only one operand. The Not operator precedes any Boolean value to switch it back to the opposite value (from `true` to `false`, or from `false` to `true`). For instance:

```
!true        // result = false
!(10 > 5)    // result = false
!(10 < 5)    // result = true
!(document.title == "Flintstones")    // result = true
```

As shown here, enclosing the operand of a `Not` expression inside parentheses is always a good idea. This forces JavaScript to evaluate the expression inside the parentheses before flipping it around with the Not operator.

The And (`&&`) operator joins two Boolean values to reach a `true` or `false` value based on the results of both values. This brings up something called a *truth table,* which helps you visualize all the possible outcomes for each value of an operand. Table 40-7 is a truth table for the And operator.

Table 40-7: Truth Table for the And Operator

Left Operand	*And Operator*	*Right Operand*	*Result*
True	`&&`	True	True
True	`&&`	False	False
False	`&&`	True	False
False	`&&`	False	False

Only one condition yields a `true` result: Both operands must evaluate to `true`. Which side of the operator a `true` or `false` value lives doesn't matter. Here are examples of each possibility:

```
5 > 1 && 50 > 10    // result = true
5 > 1 && 50 < 10    // result = false
5 < 1 && 50 > 10    // result = false
5 < 1 && 50 < 10    // result = false
```

In contrast, the Or (||) operator is more lenient about what it evaluates to `true`. The reason is that if one or the other (or both) operands is `true`, the operation returns `true`. The Or operator's truth table is shown in Table 40-8.

Table 40-8: Truth Table for the Or Operator

Left Operand	*Or Operator*	*Right Operand*	*Result*
True	||	True	True
True	||	False	True
False	||	True	True
False	||	False	False

Therefore, if a `true` value exists on either side of the operator, a `true` value is the result. Take the previous examples and swap the And operators with Or operators so that you can see the Or operator's impact on the results:

```
5 > 1 || 50 > 10    // result = true
5 > 1 || 50 < 10    // result = true
5 < 1 || 50 > 10    // result = true
5 < 1 || 50 < 10    // result = false
```

Only when both operands are `false` does the Or operator return `false`.

Boolean operators at work

Applying Boolean operators to JavaScript the first time just takes a little time and some sketches on a pad of paper to help you figure out the logic of the expressions. Earlier I talked about using a Boolean operator to see whether a character fell within a range of ASCII values for data-entry validation. Listing 40-1 (not on the CD-ROM) is a function discussed in more depth in Chapter 43. This function accepts any string and sees whether each character of the string has an ASCII value less than `0` or greater than `9` — meaning that the input string is not a number.

Listing 40-1: Is the Input String a Number?

```
function isNumber(inputStr) {
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.substring(i, i + 1)
        if (oneChar < "0" || oneChar > "9") {
            alert("Please make sure entries are numerals only.")
            return false
        }
    }
    return true
}
```

Combining a number of JavaScript powers to read individual characters (substrings) from a `string` object within a `for` loop, the statement that you're interested in is the condition of the `if` construction:

```
(oneChar < "0" || oneChar > "9")
```

In one condition statement, you use the Or operator to test for both possibilities. If you check the Or truth table (Table 40-8), you see that this expression returns `true` if either one or both tests returns `true`. If that happens, the rest of the function alerts the user about the problem and returns a `false` value to the calling statement. Only if both tests within this condition evaluate to `false` for all characters of the string does the function return a `true` value.

From the simple Or operator, I go to the extreme, where the function checks — in one `condition` statement — whether a number falls within several numeric ranges. The script in Listing 40-2 comes from the array lookup application in Chapter 50, in which a user enters the first three digits of a U.S. Social Security number.

Listing 40-2: **Is a Number within Discontiguous Ranges?**

```
// function to determine if value is in acceptable range for this application
function inRange(inputStr) {
    num = parseInt(inputStr)
    if (num < 1 || (num > 586 && num < 596) || (num > 599 && num < 700) ||num >
728) {
        alert("Sorry, the number you entered is not part of our database.  Try
another three-digit number.")
        return false
    }
    return true
}
```

By the time this function is called, the user's data entry has been validated enough for JavaScript to know that the entry is a number. Now the function must check whether the number falls outside of the various ranges for which the application contains matching data. The conditions that the function tests here are whether the number is

✦ Less than 1

✦ Greater than 586 and less than 596 (using the And operator)

✦ Greater than 599 and less than 700 (using the And operator)

✦ Greater than 728

Each of these tests is joined by an Or operator. Therefore, if any one of these conditions proves `true`, the whole `if` condition is `true`, and the user is alerted accordingly.

The alternative to combining so many Boolean expressions in one `condition` statement would be to nest a series of `if` constructions. But such a construction requires not only a great deal more code but also much repetition of the alert dialog box message for each condition that could possibly fail. The combined Boolean condition is, by far, the best way to go.

Bitwise Operators

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

For scripters, bitwise operations are an advanced subject. Unless you're dealing with external processes on CGIs or the connection to Java applets, it's unlikely that you will use bitwise operators. Experienced programmers who concern themselves with more specific data types (such as long integers) are quite comfortable in this arena, so I simply provide an explanation of JavaScript capabilities. Table 40-9 lists JavaScript bitwise operators.

Table 40-9: JavaScript's Bitwise Operators

Operator	*Name*	*Left Operand*	*Right Operand*
&	Bitwise And	Integer value	Integer value
|	Bitwise Or	Integer value	Integer value
^	Bitwise XOR	Integer value	Integer value
~	Bitwise Not	(None)	Integer value
<<	Left shift	Integer value	Shift amount
>>	Right shift	Integer value	Shift amount
>>>	Zero fill right shift	Integer value	Shift amount

The numeric value operands can appear in any of the JavaScript language's three numeric literal bases (decimal, octal, or hexadecimal). As soon as the operator has an operand, the value is converted to binary representation (32 bits long). For the first three bitwise operations, the individual bits of one operand are compared with their counterparts in the other operand. The resulting value for each bit depends on the operator:

- **Bitwise And:** 1 if both digits are 1
- **Bitwise Or:** 1 if either digit is 1
- **Bitwise Exclusive Or:** 1 if only one digit is a 1

Bitwise Not, a unary operator, inverts the value of every bit in the single operand. The bitwise shift operators operate on a single operand. The second operand specifies the number of positions to shift the value's binary digits in the direction of the arrows of the operator symbols. For example, the left shift (<<) operator has the following effect:

```
4 << 2 // result = 16
```

The reason for this shifting is that the binary representation for decimal 4 is 00000100 (to eight digits, anyway). The left shift operator instructs JavaScript to shift all digits two places to the left, giving the binary result 00010000, which converts to 16 in decimal format. If you're interested in experimenting with these operators, use The Evaluator (Chapter 13) to evaluate sample expressions for yourself. More advanced books on C and C++ programming are also of help.

Object Operators

The next group of operators concern themselves with objects (including native JavaScript, DOM, and custom objects) and data types. Most of these have been implemented after the earliest JavaScript browsers, so each one has its own compatibility rating.

delete

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Array objects do not contain a method to remove an element from the collection, nor do custom objects offer a method to remove a property. You can always empty the data in an array item or property by setting its value to an empty string or `null`, but the array element or property remains in the object. With the `delete` operator, you can completely remove the element or property.

There is special behavior about deleting an array item that you should bear in mind. If your array uses numeric indices, a deletion of a given index removes that index value from the total array but without collapsing the array (which would alter index values of items higher than the deleted item). For example, consider the following simple dense array:

```
var oceans = new Array("Atlantic", "Pacific", "Indian","Arctic")
```

This kind of array automatically assigns numeric indices to its entries for addressing later in constructions, such as `for` loops:

```
for (var i = 0; i < oceans.length; i++) {
    if (oceans[i] == form.destination.value) {
        statements
    }
}
```

If you then issue the statement

```
delete oceans[2]
```

the array undergoes significant changes. First, the third element is removed from the array. Note that the length of the array does not change. Even so, the index value (2) is removed from the array, such that schematically the array looks as the following:

```
oceans[0] = "Atlantic"
oceans[1] = "Pacific"
oceans[3] = "Arctic"
```

If you try to reference `oceans[2]` in this collection, the result is `undefined`.

The `delete` operator works best on arrays that have named indices. Your scripts will have more control over the remaining entries and their values, because they don't rely on what could be a missing entry of a numeric index sequence.

One aspect of this deletion action that JavaScript doesn't provide is absolute control over memory utilization. All garbage collection is managed by the JavaScript interpreter engine, which tries to recognize when items occupying memory are no longer needed, at which time the unused browser's application memory may be recovered. But you cannot force the browser to perform its garbage collection task.

in

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `in` operator lets a script statement inspect an object to see if it has a named property or method. The operand to the left of the operator is a string reference to the property or method (just the method name, without parentheses); the operand to the right of the operator is the object being inspected. If the object knows the property or method, the expression returns `true`. Thus, you can use the `in` operator in expressions used for conditional expressions.

You can experiment with this operator in The Evaluator. For example, to prove that the `write()` method is implemented for the `document` object, the expression you type into the top text box of The Evaluator is:

```
"write" in document
```

But compare the implementation of the W3C DOM `document.createAttribute()` method in IE5.5 and NN6:

```
"createAttribute" in document
```

In NN6, the result is `true`, while in IE5.5, the result is `false`.

Having this operator around for conditional expressions lets you go much beyond simple object detection for branching code. For example, if you intend to use `document.createAttribute()` in your script, you can make sure that the method is supported before invoking it (assuming your users all have browsers that know the in operator).

instanceof

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

The `instanceof` operator (not implemented in IE5/Mac) lets a script test whether an object is an instance of a particular JavaScript native object or DOM object (in NN6). The operand to the left side of the operator is the value under test; the value to the right of the operand is a reference to the root class from which the value is suspected of being constructed.

For native JavaScript classes, the kinds of object references to the right of the operator include such static objects as `Date`, `String`, `Number`, `Boolean`, `Object`, `Array`, and `RegExp`. You sometimes need to be mindful of how native JavaScript classes can sometimes be children of other native classes, which means that a value may be an instance of two different static objects. For example, consider the following sequence (which you can follow along in The Evaluator):

```
a = new Array(1,2,3)
a instanceof Array
```

The second statement yields a result of `true`, because the `Array` constructor was used to generate the object. But the JavaScript `Array` is, itself, an instance of the root `Object` object. Therefore both of the following statements evaluate to `true`:

```
a instanceof Object
Array instanceof Object
```

NN6 also supports this functionality for W3C DOM objects to some degree. For instance, you can see that the `document` node is an instance of the root `Node` object:

```
document instanceof Node
```

But NN6 also erroneously reports instances of a variety of nodes and elements outside the strict inheritance hierarchy of the W3C DOM (for instance, NN6 also reports that `document` is an instance of `HTMLElement`, which it clearly is not).

new

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Most JavaScript core objects have constructor functions built into the language. To access those functions, you use the `new` operator along with the name of the constructor. The function returns a reference to the object instance, which your scripts can then use to get and set properties or invoke object methods. For example, creating a `new` date object requires invoking the `Date` object's constructor, as follows:

```
var today = new Date()
```

Some object constructor functions require parameters to help define the object. Others, as in the case of the `Date` object, can accept a number of different parameter formats, depending on the format of date information you have to set the initial object. The `new` operator can be used with the following core language objects:

JavaScript 1.0	JavaScript 1.1	JavaScript 1.2	JavaScript 1.5
Date	Array	RegExp	Error
Object	Boolean		
(Custom object)	Function		
	Number		
	String		

this

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

JavaScript includes an operator that allows script statements to refer to the very object in which they are located. The self-referential operator is `this`.

The most common application of the `this` operator is in event handlers that pass references of themselves to functions for further processing, as in

```
<INPUT TYPE="text" NAME="entry" onChange="process(this)">
```

A function receiving the value assigns it to a variable that can be used to reference the sender, its properties, and its methods.

Because the `this` operator references an object, that object's properties can be exposed with the aid of the operator. For example, to send the `value` property of a text input object to a function, the `this` operator stands in for the current object reference and appends the proper syntax to reference the `value` property:

```
<INPUT TYPE="text" NAME="entry" onChange="process(this.value)">
```

The `this` operator also works inside other objects, such as custom objects. When you define a constructor function for a custom object, using the `this` operator to define properties of the object and assign values to those properties is common practice. Consider the following example of an object creation sequence:

```
function bottledWater(brand, ozSize, flavor) {
    this.brand = brand
    this.ozSize = ozSize
    this.flavor = flavor
}
var myWater = new bottledWater("Crystal Springs", 16, "original")
```

When the new object is created via the constructor function, the `this` operators define each property of the object and then assign the corresponding incoming value to that property. Using the same names for the properties and parameter variables is perfectly fine and makes the constructor easy to maintain.

By extension, if you assign a function as an object's property (to behave as a method for the object), the `this` operator inside that function refers to the object invoking the function, offering an avenue to the object's properties. For example, if I add the following function definition and statement to the myWater object created just above, the function can directly access the brand property of the object:

```
function adSlogan() {
    return "Drink " + this.brand + ", it's wet and wild!"
}
myWater.getSlogan = adSlogan
```

When a statement invokes the myWater.getSlogan() method, the object invokes the adSlogan() function, but all within the context of the myWater object. Thus, the this operator applies to the surrounding object, making the brand property available via the this operator (this.brand).

Miscellaneous Operators

The final group of operators doesn't fit into any of the previous categories, but they are no less important.

,

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The comma operator indicates a series of expressions that are to be evaluated in left-to-right sequence. Most typically, this operator is used to permit multiple variable initializations. For example, you can combine the declaration of several variables in a single var statement, as follows:

```
var name, address, serialNumber
```

Another situation where you could use this operator is within the expressions of a for loop construction. In the following example, two different counting variables are initialized and incremented at different rates. When the loop begins, both variables are initialized at zero (they don't have to be, but this example starts that way); for each subsequent trip through the loop, one variable is incremented by one, while the other is incremented by 10:

```
for (var i=0, j=0; i < someLength; i++, j+10) {
    ...
}
```

Don't confuse the comma operator with the semi-colon delimiter between statements.

? :

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

The conditional operator is a shortcut way of expressing an `if. . .else` conditional construction covered in Chapter 39. This operator is typically used in concert with an assignment operator to assign one of two values to a variable based on the result of a condition expression. The formal syntax for the conditional operator is:

```
condition ? expressionIfTrue : expressionIfFalse
```

If used with an assignment operator, the syntax is:

```
var = condition ? expressionIfTrue : expressionIfFalse
```

No matter how you use the operator, the important point to remember is that an expression that contains this operator evaluates to one of the two expressions following the question mark symbol. In truth, either expression could invoke any JavaScript, including calling other functions or even nesting further conditional operators within one of the expressions to achieve the equivalent of nested `if. . .else` constructions. To assure proper resolution of nested conditionals, surround inner expressions with parentheses to make sure that they evaluate before the outer expression evaluates. As an example, the following statement assigns one of three strings to a variable depending on the date within a month:

```
var monthPart = (dateNum <= 10) ? "early" : ((dateNum <= 20) ? "middle" : "late")
```

When the statement is evaluated, the inner conditional expression at the right of the first colon is evaluated, returning either `middle` or `late`; then the outer conditional expression is evaluated, returning either `early` or the result of the inner conditional expression.

typeof

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	✓	✓	✓	✓	✓

Unlike most other operators, which are predominantly concerned with arithmetic and logic, the unary `typeof` operator defines the kind of value to which a variable or expression evaluates. Typically, this operator is used to identify whether a variable value is one of the following types: `number`, `string`, `boolean`, `object`, `function`, or `undefined`.

Having this investigative capability in JavaScript is helpful because variables cannot only contain any one of those data types but can change their data type on the fly. Your scripts may need to handle a value differently based on the value's type. The most common use of the `typeof` property is as part of a condition. For example:

```
if (typeof myVal == "number") {
    myVal = parseInt(myVal)
}
```

The evaluated value of the `typeof` operation is, itself, a string.

void

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

In all scriptable browsers you can use the `javascript:` pseudo-protocol to supply the parameter for `HREF` and `SRC` attributes in HTML tags, such as links. In the process, you have to be careful that the function or statement being invoked by the URL does not return or evaluate to any values. If a value comes back from such an expression, then that value or sometimes the directory of the client's hard disk often replaces the page content. To avoid this possibility use the `void` operator in front of the function or expression being invoked by the `javascript:` URL.

The best way to use this construction is to place the operator before the expression or function and separate them by a space, as in

```
javascript: void doSomething()
```

On occasion, you may have to wrap the expression inside parentheses after the `void` operator. Using parantheses is necessary only when the expression contains operators of a lower precedence than the `void` operator (see the following section, "Operator Precedence"). But don't automatically wrap all expressions in parentheses, because some browsers can experience problems with these. Even so, it is common practice to assign the following URL to the `HREF` attribute of an A link whose `onClick` event handler does all of the work:

```
HREF="javascript: void (0)"
```

The `void` operator makes sure the function or expression returns no value that the HTML attribute can use. Such a link's `onClick` event handler should also inhibit the natural behavior of a clicked link (for example, by evaluating to `return false`).

Operator Precedence

When you start working with complex expressions that hold a number of operators (for example, Listing 40-2), knowing the order in which JavaScript evaluates those expressions is vital. JavaScript assigns different priorities or weights to types of operators in an effort to achieve uniformity in the way it evaluates complex expressions.

In the following expression

```
10 + 4 * 5 // result = 30
```

JavaScript uses its precedence scheme to perform the multiplication before the addition — regardless of where the operators appear in the statement. In other words, JavaScript first multiplies `4` by `5`, and then adds that result to `10` to get a result of `30`. That may not be the way you want this expression to evaluate. Perhaps your intention was to add the `10` and `4` first and then to multiply that sum by `5`. To make that happen, you have to override JavaScript's natural operator precedence. To do that, you must use parentheses to enclose an operator with lower precedence.

The following statement shows how you adjust the previous expression to make it behave differently:

```
(10 + 4) * 5 // result = 70
```

That one set of parentheses has a great impact on the outcome. Parentheses have the highest precedence in JavaScript, and if you nest parentheses in an expression, the innermost set evaluates first.

For help in constructing complex expressions, refer to Table 40-10 for JavaScript's operator precedence. My general practice: When in doubt about complex precedence issues, I build the expression with lots of parentheses according to the way I want the internal expressions to evaluate.

Table 40-10: JavaScript Operator Precedence

Precedence Level	*Operator*	*Notes*
1	()	From innermost to outermost
	[]	Array index value
	function()	Any remote function call
2	!	Boolean Not
	~	Bitwise Not
	-	Negation
	++	Increment
	--	Decrement
	new	
	typeof	
	void	
	delete	Delete array or object entry
3	*	Multiplication
	/	Division
	%	Modulo
4	+	Addition
	-	Subtraction
5	<<	Bitwise shifts
	>	
	>>	
6	<	Comparison operators
	<=	

Precedence Level	***Operator***	***Notes***
	`>`	
	`>=`	
7	`==`	Equality
	`!=`	
8	`&`	Bitwise And
9	`^`	Bitwise XOR
10	`|`	Bitwise Or
11	`&&`	Boolean And
12	`||`	Boolean Or
13	`?`	Conditional expression
14	`=`	Assignment operators
	`+=`	
	`-=`	
	`*=`	
	`/=`	
	`%=`	
	`<<=`	
	`>=`	
	`>>=`	
	`&=`	
	`^=`	
	`|=`	
15	`,`	Comma (parameter delimiter)

This precedence scheme is devised to help you avoid being faced with two operators from the same precedence level that often appear in the same expression. When it happens (such as with addition and subtraction), JavaScript begins evaluating the expression from left to right.

One related fact involves a string of Boolean expressions strung together for a `condition` statement (Listing 40-2). JavaScript follows what is called *short-circuit evaluation*. As the nested expressions are evaluated left to right, the fate of the entire condition can sometimes be determined before all expressions are evaluated. Any time JavaScript encounters an And operator, if the left operand evaluates to `false`, the entire expression evaluates to `false` without JavaScript's even bothering to evaluate the right operand. For an Or operator, if the left operand is `true`, JavaScript short-circuits that expression to `true`. This feature can trip you up if you don't perform enough testing on your scripts: If a syntax error or other error exists in a right operand, and you fail to test the expression in a way that forces that right operand to evaluate, you may not know that a bug exists in your code. Users of your page, of course, will find the bug quickly. Do your testing to head bugs off at the pass.

Note

Notice, too, that all math and string concatenation is performed prior to any comparison operators. This enables all expressions that act as operands for comparisons to evaluate fully before they are compared.

The key to working with complex expressions is to isolate individual expressions and to try them out by themselves, if you can. See additional debugging tips in Chapter 45.

✦ ✦ ✦

41
CHAPTER

Functions and Custom Objects

✦ ✦ ✦ ✦

In This Chapter

Creating function blocks

Passing parameters to functions

Creating your own objects

✦ ✦ ✦ ✦

By now, you've seen dozens of JavaScript functions in action and probably have a pretty good feel for the way they work. This chapter provides the `function` object specification and delves into the fun prospect of creating objects in your JavaScript code. (That includes objects that have properties and methods, just like the big boys.)

Function Object

Properties	***Methods***
`arguments`	`apply()`
`arity`	`call()`
`caller`	`toString()`
`constructor`	`valueOf()`
`length`	
`prototype`	

Syntax

Creating a function object:

```
function functionName([arg1,...[,argN]]) {
   statement(s)
}
var funcName = new Function(["argName1",...[,"argNameN"],
"statement1;...[;statementN]"])
object.eventHandlerName = function([arg1,...[,argN]])
{statement(s)}
```

Accessing function object properties and methods:

```
functionObject.property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	(✓)	✓	✓	✓	✓

About this object

JavaScript accommodates what other languages might call procedures, subroutines, and functions all in one type of structure: the *custom function*. A function may return a value (if programmed to do so with the `return` keyword), but it does not have to return any value. Except for JavaScript code that executes as the document loads, all deferred processing takes place in functions.

While you can create functions that are hundreds of lines long, I recommend you break up longer processes into shorter functions. Among the reasons for doing so: smaller chunks are easier to write and debug; building blocks make it easier to visualize the entire script; you can make functions generalizable and reusable for other scripts; and other parts of the script or other open frames can use the functions.

Learning how to write good, reusable functions takes time and experience. But the earlier you understand the importance of this concept, the more you will be on the lookout for good examples in other people's scripts on the Web.

Creating functions

The standard way of defining a function in your script means following a simple pattern and then filling in the details. The formal syntax definition for a function is:

```
function functionName( [arg1] ... [, argN]) {
    statement(s)
}
```

The task of assigning a function name helps you determine the precise scope of activity of the function. If you find that you can't reduce the planned task for the function to a simple one- to three-word name (which is then condensed into one contiguous sequence of characters for the `functionName`), perhaps you're asking the function to do too much. A better idea may be to break the job into two or more functions. As you start to design a function, be on the lookout for functions that you can call from the one you're writing. If you find yourself copying and pasting lines of code from one part of a function to another because you're performing the same operation in different spots within the function, it may be time to break that segment out into its own function.

Starting with Navigator 3 (and Internet Explorer 3 with JScript.dll version2), you can also create what is called an *anonymous function* using the `new Function()` constructor. In reality, you assign a name to this "anonymous" function as follows:

```
var funcName = new Function(["argName1",...[,"argNameN"],
"statement1;...[;statementN]"])
```

This other way of building a function is particularly helpful when your scripts need to create a function after a document loads. All the components of a function are present in this definition. Each function parameter name is supplied as a string value, separated from each other by commas. The final parameter string consists of the statements that execute whenever the function is called. Separate each JavaScript statement with a semicolon, and enclose the entire sequence of statements inside quotes, as in the following:

```
var willItFit = new Function("width","height",
"var sx = screen.availWidth; var sy = screen.availHeight; return (sx >= width &&
sy >= height)")
```

The `willItFit()` function takes two parameters; the body of the function defines two local variables (`sx` and `sy`) and then returns a Boolean value of `true` if the incoming parameters are smaller than the local variables. In traditional form, this function is defined as follows:

```
function willItFit(width, height) {
    var sx = screen.availWidth
    var sy = screen.availHeight
    return (sx >= width && sy >= height)
}
```

Once this function exists in the browser's memory, you can invoke it like any other function:

```
if (willItFit(400,500)) {
    statements to load image
}
```

One last function creation format is available in NN4+. This advanced technique, called a *lambda expression,* provides a shortcut for creating a reference to an anonymous function (truly anonymous because the function has no name that you can reference later). The common application of this technique is to assign function references to event handlers when the NN event object also must be passed. The following is an example of how to assign an anonymous function to an `onChange` event handler for a form control:

```
document.forms[0].age.onchange = function(event)
{isNumber(document.forms[0].age)}
```

Nesting functions

NN4+ and IE4+ also provide for nesting functions inside one another. In all prior scripting, each function definition is defined at the global level whereby every function is exposed and available to all other scripting. With nested functions, you can encapsulate the exposure of a function inside another and make that nested function private to the enclosing function. Of course I don't recommend reusing names in this fashion, but you can create nested functions with the same name inside multiple global level functions, as the following skeletal structure shows:

```
function outerA() {
    statements
    function innerA() {
        statements
    }
    statements
}
```

```
function outerB() {
    statements
    function innerA() {
        statements
    }
    function innerB() {
        statements
    }
    statements
}
```

A good time to apply a nested function is when a sequence of statements need to be invoked in multiple places within a large function but those statements have meaning only within the context of the larger function. In other words, rather than break out the repeated sequence as a separate global function, you keep it all within the scope of the larger function.

You can access a nested function only from statements in its containing function (and in any order). Moreover, all variables defined in the outer function (including parameter variables) are accessible to the inner function; but variables defined in an inner function are not accessible to the outer function. See the section, "Variable Scope: Globals and Locals" later in this chapter for details on how variables are visible to various components of a script.

Function parameters

The function definition requires a set of parentheses after the `functionName`. If the function does not rely on any information arriving with it when invoked, the parentheses can be empty. But when some kind of data is arriving with a call to the function, you need to assign names to each parameter. Virtually any kind of value can be a parameter: strings, numbers, Booleans, and even complete object references such as a form or form element. Choose names for these variables that help you remember the content of those values; also, avoid reusing existing object names as variable names because it's easy to get confused when objects and variables with the same name appear in the same statements. You must avoid using JavaScript keywords (including the reserved words listed in Appendix B) and any global variable name defined elsewhere in your script. (See more about global variables in the following sections.)

JavaScript is forgiving about matching the number of parameters in the function definition with the number of parameters passed along from the calling statement. If you define a function with three parameters and the calling statement specifies only two, the third parameter variable value in that function is assigned a `null` value. For example:

```
function oneFunction(a, b, c) {
    statements
}
oneFunction("George","Gracie")
```

In the preceding example, the values of `a` and `b` inside the function are `"George"` and `"Gracie"`, respectively; the value of `c` is `null`.

At the opposite end of the spectrum, JavaScript also doesn't balk if you send more parameters from the calling statement than the number of parameter variables specified in the function definition. In fact, the language includes a mechanism — the `arguments` property — that you can add to your function to gather any extraneous parameters that should read your function.

Properties

`arguments`

Value: Array of arguments Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

When a function receives parameter values from the statement that invokes the function, those parameter values are silently assigned to the `arguments` property of the function object. This property is an array of the values, with each parameter value assigned to a zero-based index entry in the array — whether or not parameters are defined for it. You can find out how many parameters are sent by extracting `functionName.arguments.length`. For example, if four parameters are passed, `functionName.arguments.length` returns `4`. Then, you can use array notation (`functionName.arguments[i]`) to extract the values of any parameter(s) you want.

Theoretically, you never have to define parameter variables for your functions by extracting the desired arguments array entry instead. Well-chosen parameter variable names, however, are much more readable, so I recommend them over the `arguments` property in most cases. But you may run into situations in which a single function definition needs to handle multiple calls to the function when each call may have a different number of parameters. The function knows how to handle any arguments over and above the ones given names as parameter variables.

See Listings 41-1 and 41-2 for a demonstration of both the `arguments` and `caller` properties.

`arity`

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

See the discussion of the `length` property later in this chapter.

caller

Value: Function Object Reference Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓			✓	✓	✓	✓

Note The `caller` property, not part of the ECMA-262 standard, was removed from NN for version 6.

When one function invokes another, a chain is established between the two primarily so that a returned value knows where to go. Therefore, a function invoked by another maintains a reference to the function that called it. Such information is automatically stored in a function object as the `caller` property. This relationship reminds me a bit of a subwindow's `opener` property, which points to the window or frame responsible for the subwindow's creation. The value is valid only while the called function is running at the request of another function; when a function isn't running, its `caller` property is `null`.

The value of the `caller` property is a reference to a function object, so you can inspect its `arguments` and `caller` properties (in case it was called by yet another function). Thus, a function can look back at a calling function to see what values it was passed.

The `functionName.caller` property reveals the contents of an entire function definition if the current function was called from another function (including an event handler). If the call for a function comes from a regular JavaScript statement not originating from inside a function, the `functionName.caller` property is `null`.

To help you grasp all that these two properties yield, study Listing 41-1.

Listing 41-1: A Function's arguments and caller Properties

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function hansel(x,y) {
    var args = hansel.arguments
    document.write("<P>hansel.caller is " + hansel.caller + "<BR>")
    document.write("hansel.arguments.length is " + hansel.arguments.length +
"<BR>")
    for (var i = 0; i < args.length; i++) {
        document.write("argument " + i + " is " + args[i] + "<BR>")
    }
    document.write("</P>")
}
```

```
function gretel(x,y,z) {
    today = new Date()
    thisYear = today.getFullYear()
    hansel(x,y,z,thisYear)
}
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
hansel(1, "two", 3);
gretel(4, "five", 6, "seven");
</SCRIPT>
</BODY>
</HTML>
```

When you load this page, the following results appear in the browser window (although the `caller` property values show `undefined` for NN6):

```
hansel.caller is null
hansel.arguments.length is 3
argument 0 is 1
argument 1 is two
argument 2 is 3

hansel.caller is function gretel(x, y, z) { today = new Date(); thisYear =
today.getFullYear(); hansel(x, y, z, thisYear); }

hansel.arguments.length is 4
argument 0 is 4
argument 1 is five
argument 2 is 6
argument 3 is 2001 (or whatever the current year is)
```

As the document loads, the `hansel()` function is called directly in the body script. It passes three arguments, even though the `hansel()` function defines only two. The `hansel.arguments` property picks up all three arguments just the same. The main body script then invokes the `gretel()` function, which, in turn, calls `hansel()` again. But when `gretel()` makes the call, it passes four parameters. The `gretel()` function picks up only three of the four arguments sent by the calling statement. It also inserts another value from its own calculations as an extra parameter to be sent to `hansel()`. The `hansel.caller` property reveals the entire content of the `gretel()` function, whereas `hansel.arguments` picks up all four parameters, including the year value introduced by the `gretel()` function.

Neither the `caller` nor `arguments` properties of a `function` object appear in the ECMA-262 Edition 3 specification. While NN6 dropped the `caller` property, it continues to support the `arguments` property probably because a lot of scripters use it.

constructor

See `string.constructor` (Chapter 34).

length

Value: Integer Read-Only

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓		✓	✓	✓	✓

As the `arguments` property of a function proves, JavaScript is very forgiving about matching the number of parameters passed to a function with the number of parameter variables defined for the function. But a script can examine the `length` property of a function object to see precisely how many parameter variables are defined for a function. A reference to the property starts with the function name representing the object. For example, consider the following function definition shell:

```
function identify(name, rank, serialNum) {
    ...
}
```

A script statement anywhere outside of the function can read the number of parameters with the reference:

```
identify.length
```

The value of the property in the preceding example is `3`. The `length` property supercedes the NN-only `arity` property.

prototype

See `Array.prototype` (Chapter 37).

Methods

apply([*thisObj*[, *argumentsArray*]])
call([*thisObj*[, *arg1*[, *arg2*[,...*argN*]]]])

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `apply()` and `call()` methods of a function object invoke the function. This may seem redundant to the normal way in which script statements invoke functions by simply naming the function, following it with parentheses, passing parameters, and so on. The difference with these methods is that you can invoke the function if your script has only a reference to the function. For example, if your script defines a function via the `new Function()` constructor (or other anonymous shortcut supported by the browser), you receive a reference to the function as a result of the constructor. To invoke the function later using only that reference (presumably preserved in a global variable), use either the `apply()` or `call()` method. Both of these methods achieve the same result, but choosing one method over the other depends on the form in which the function's parameters are conveyed (more about that in a moment).

The first parameter of both methods is a reference to the object that the function treats as the current object. For garden-variety functions defined in your script, use the keyword `this`, which means that the function's context becomes the current object (just like a regular function). In fact, if there are no parameters to be sent to the function, you can omit parameters to both methods altogether.

The object reference comes into play when the function being invoked is one that is normally defined as a method to a custom object. (I cover some of these concepts later in this chapter, so you may need to return here after you are familiar with custom objects.) Consider the following code that generates a custom object and assigns a method to the object to display an alert about properties of the object:

```
// function to be invoked as a method from a 'car' object
function showCar() {
    alert(this.make + " : " + this.color)
}
// 'car' object constructor function
function car(make, color) {
    this.make = make
    this.color = color
    this.show = showCar
}
// create instance of a 'car' object
var myCar = new car("Ford", "blue")
```

The normal way of getting the `myCar` object to display an alert about its properties is:

```
myCar.show()
```

At that point, the `showCar()` function runs, picking up the current `car` object as the context for the `this` references in the function. In other words, when the `showCar()` function runs as a method of the object, the function treats the object as the "current object."

With the `call()` or `apply()` methods, however, you don't have to bind the `showCar()` function to the `myCar` object. You can omit the statement in the `car()` constructor that assigns the `showCar` function to a method name for the object. Instead, a script can invoke the `showCar()` method and instruct it to treat `myCar` as the current object:

```
showCar.call(myCar)
```

The `showCar()` function operates just as before, and the object reference in the `call()` method's first parameter slot is treated as the current object for the `showCar()` function.

As for succeeding parameters, the `apply()` method's second parameter is an array of values to be passed as parameters to the current function. The order of the values must match the order of parameter variables defined for the function. The `call()` method, on the other hand, enables you to pass individual parameters in a comma-delimited list. Your choice depends on how the parameters are carried along in your script. If they're already in array form, then use the `apply()` method; otherwise, use the `call()` method. The (ECMA) recommended way to invoke a function through this mechanism when no parameters need to be passed is via the `call()` method.

toString()
valueOf()

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Scripts rarely, if ever, summon the `toString()` and `valueOf()` methods of a function object. They work internally to allow debugging scripts to display a string version of the function definition. For example, when you enter the name of a function defined in The Evaluator into the top text box, JavaScript automatically converts the function to a string so that its "value" can be displayed in the Results box. Using these methods or parsing the text they return has little, if any, practical application.

Function Application Notes

Understanding the ins and outs of JavaScript functions is the key to successful scripting, especially for complex applications. Additional topics covered in this chapter include the ways to invoke functions, variable scope in and around functions, recursion, and the design of reusable functions.

Invoking Functions

A function doesn't perform any work until a script calls it by name or reference. Scripts invoke functions (that is, get functions to do something) via four routes: document object event handlers; JavaScript statements; `HREF` attributes pointing to a `javascript:` URL; and the more recent `call()` and `apply()` methods of function objects. The one approach not discussed at length yet in this book is the `javascript:` URL (some say pseudo-URL).

Several HTML tags have `HREF` attributes that normally point to Internet URLs for navigating to another page or loading a MIME file that requires a helper application or plug-in. These HTML tags are usually tags for clickable objects, such as links and client-side image map areas.

A JavaScript-enabled browser has a special, built-in URL pseudo-protocol—`javascript:`—that lets the `HREF` attribute point to a JavaScript function or method rather than to a URL out on the Net. For example, it is common practice to use the `javascript:` URL to change the contents of two frames from a single link. Because the `HREF` attribute is designed to point to only a single URL, you'd be out of luck without a convenient way to put multiframe navigation into your hands. Implement multiframe navigation by writing a function that sets the `location.href` properties of the two frames; then invoke that function from the `HREF` attribute. The following example shows what the script may look like:

```
function loadPages() {
    parent.frames[1].location.href = "page2.html"
    parent.frames[2].location.href = "instrux2.html"
}
...
<A HREF="javascript:loadPages()">Next</A>
```

Note These kinds of function invocations can include parameters, and the functions can do anything you want. One potential side effect to watch out for occurs when the function returns a value (perhaps the function is also invoked from other script locations where a returned value is expected). Because the `HREF` attribute sets the TARGET window to whatever the attribute evaluates to, the returned value is assigned to the TARGET window—probably not what you want.

To prevent the assignment of a returned value to the `HREF` attribute, prefix the function call with the `void` operator:

```
<A HREF="javascript:void loadPages()">
```

If you don't want the `HREF` attribute to do anything (that is, let the `onClick` event handler do all the work), then assign a blank function after the operator:

```
<A HREF="javascript:void (0)">
```

Experienced programmers of many other languages recognize this operator as a way of indicating that no values are returned from a function or procedure. The operator has that precise functionality here, but in a nontraditional location.

Variable Scope: Globals and Locals

A variable can have two scopes in JavaScript. As you might expect, any variable initialized within the main flow of a script (not inside a function) is a *global variable* in that any statement in the same document's script can access it by name. You can, however, also initialize variables inside a function (in a `var` statement) so the variable name applies only to statements inside that function. By limiting the scope of the variable to a single function, you can reuse the same variable name in multiple functions thereby enabling the variables to carry very different information in each function. Listing 41-2 demonstrates the various possibilities.

Listing 41-2: **Variable Scope Workbench Page**

```
<HTML>
<HEAD>
<TITLE>Variable Scope Trials</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var headGlobal = "Gumby"
function doNothing() {
    var headLocal = "Pokey"
    return headLocal
}
</SCRIPT>
</HEAD>

<BODY>
<SCRIPT LANGUAGE="JavaScript">
// two global variables
var aBoy = "Charlie Brown"
var hisDog = "Snoopy"
function testValues() {
    var hisDog = "Gromit"  // initializes local version of "hisDog"
    var page = ""
    page += "headGlobal is: " + headGlobal + "<BR>"
    // page += "headLocal is: " + headLocal + "<BR>" // headLocal not defined
    page += "headLocal value returned from head function is: " + doNothing() +
"<P>"
    page += " aBoy is: " + aBoy + "<BR>" // picks up global
    page += "local version of hisDog is: " + hisDog + "<P>" // "sees" only local
    document.write(page)
}
testValues()
document.write("global version of hisDog is intact: " + hisDog)
</SCRIPT>
</BODY>
</HTML>
```

In this page, you define a number of variables — some global, others local — that are spread out in the document's Head and Body sections. When you load this page, it runs the `testValues()` function, which accounts for the current values of all the variable names. The script then follows up with one more value extraction that was masked in the function. The results of the page look like this:

```
headGlobal is: Gumby
headLocal value returned from head function is: Pokey

aBoy is: Charlie Brown
local version of hisDog is: Gromit

global version of hisDog is intact: Snoopy
```

Examine the variable initialization throughout this script. In the Head, you define the first variable (headGlobal) as a global style outside of any function definition. The var keyword for the global variable is optional but often helpful for enabling you to see at a glance where you initialize your variables. You then create a short function, which defines a variable (headLocal) that only statements in the function can use.

In the Body, you define two more global variables: aBoy and hisDog. Inside the Body's function (for purposes of demonstration), you reuse the hisDog variable name. By initializing hisDog with the var statement inside the function, you tell JavaScript to create a separate variable whose scope is only within the function. This initialization does not disturb the global variable of the same name. It can, however, make things confusing for you as the script author.

Statements in this script attempt to collect the values of variables scattered around the script. Even from within this script, JavaScript has no problem extracting global variables directly — including the one defined in the Head. But JavaScript cannot get the local variable defined in the other function — that headLocal variable is private to its own function. Trying to run a script that references that variable value will result in an error message saying that the variable name is not defined. In the eyes of everyone else outside of the doNothing() function, that's true. If you really need that value, you can have the function return the value to a calling statement as you do in the testValues() function.

Near the end of the function, the script reads the aBoy global value without a hitch. But because you initialized a separate version of hisDog inside that function, only the localized version is available to the function. If you reassign a global variable name inside a function, you cannot access the global version from inside that function.

As proof that the global variable — whose name was reused inside the testValues() function — remains untouched, the script writes that value to the end of the page for all to see. Charlie Brown and his dog are reunited.

A benefit of this variable-scoping scheme is that you can reuse "throw-away" variable names in any function you like. For instance, you can use the i loop counting variable in every function that employs loops. (In fact, you can reuse it in multiple for loops of the same function because the for loop reinitializes the value at the start of the loop.) If you pass parameters to a function, you can assign to those parameter variables the same names to aid in consistency. For example, a common practice is to pass an entire form object reference as a parameter to a function (using a this.form parameter in the event handler). For every function that catches one of these objects, you can use the variable name form in the parameter:

```
function doSomething(form) {
    statements
}
...
<INPUT TYPE="button" VALUE="Do Something" onClick="doSomething(this.form)">
```

If five buttons on your page pass their form objects as parameters to five different functions, each function can assign form (or whatever you want to use) to that parameter value.

I recommend reusing variable names only for these “throwaway” variables. In this case, the variables are all local to functions, so the possibility of a mix-up with global variables does not exist. But the thought of reusing a global variable name as, say, a special case inside a function sends shivers up my spine. Such a tactic is doomed to cause confusion and error.

Some programmers devise naming conventions to avoid reusing global variables as local variables. A popular scheme puts a lowercase “g” in front of any global variable name. In the example from Listing 41-2, you can name the global variables

```
gHeadGlobal
gABoy
gHisDog
```

Then, if you define local variables, don’t use the leading “g.” Any scheme you employ to prevent the reuse of variable names in different scopes is fine as long as it does the job.

In a multiframe or multiwindow environment, your scripts can also access global variables from any other document currently loaded into the browser. For details about this level of access, see Chapter 16.

Variable scoping rules apply equally to nested functions in NN4+ and IE4+. Any variables defined in an outer function (including parameter variables) are exposed to all functions nested inside. But if you define a new local variable inside a nested function, that variable is not available to the outer function. Instead, you can return a value from the nested function to the statement in the outer function that invokes the nested function.

Parameter variables

When a function receives data in the form of parameters, remember that the values may be copies of the data (in the case of run-of-the-mill data values) or references to real objects (such as a form object). In the latter case, you can change the object’s modifiable properties in the function when the function receives the object as a parameter, as shown in the following example:

```
function validateCountry (form) {
    if (form.country.value == "") {
        form.country.value = "USA"
    }
}
```

Therefore, whenever you pass an object reference as a function parameter, be aware that the changes you make to that object in its “passed” form affect the real object.

As a matter of style, if my function needs to extract properties or results of methods from passed data (such as object properties or string substrings), I like to do that at the start of the function. I initialize as many variables as needed for each piece of data used later in the function. This task enables me to assign meaningful names to the data chunks, rather than rely on potentially long references within the working part of the function (such as using a variable like `inputStr` instead of `form.entry.value`).

Recursion in functions

Functions can call themselves — a process known as *recursion*. The classic example of programmed recursion is the calculation of the factorial (the factorial for a value of 4 is `4 * 3 * 2 * 1`), shown in Listing 41-3 (not on the CD-ROM).

In the third line of this function, the statement calls itself, passing along a parameter of the next lower value of `n`. As this function executes, diving ever deeper into itself, JavaScript watches intermediate values and performs the final evaluations of the nested expressions. Be sure to test any recursive function carefully. In particular, make sure that the recursion is finite: that a limit exists for the number of times it can recurse. In the case of Listing 41-3, that limit is the initial value of `n`. Failure to watch out for this limit may cause the recursion to overpower the limits of the browser's memory and even lead to a crash.

Listing 41-3: **A JavaScript Function Utilizing Recursion**

```
function factorial(n) {
    if (n > 0) {
        return n * (factorial(n-1))
    } else {
        return 1
    }
}
```

Turning functions into libraries

As you start writing functions for your scripts, be on the lookout for ways to make functions generalizable (written so that you can reuse the function in other instances, regardless of the object structure of the page). The likeliest candidates for this kind of treatment are functions that perform specific kinds of validation checks (see examples in Chapter 43), data conversions, or iterative math problems.

To make a function generalizable, don't let it make any references to specific objects by name. Object names generally change from document to document. Instead, write the function so that it accepts a named object as a parameter. For example, if you write a function that accepts a `text` object as its parameter, the function can extract the object's data or invoke its methods without knowing anything about its enclosing form or name. Look again, for example, at the `factorial()` function in Listing 41-4 — but now as part of an entire document.

Listing 41-4: **Calling a Generalizable Function**

```
<HTML>
<HEAD>
<TITLE>Variable Scope Trials</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

Continued

Listing 41-4 *(continued)*

```
function factorial(n) {
    if (n > 0) {
        return n * (factorial(n - 1))
    } else {
        return 1
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
Enter an input value: <INPUT TYPE="text" NAME="input" VALUE=0>
<P><INPUT TYPE="button" VALUE="Calc Factorial"
    onClick="this.form.output.value = factorial(this.form.input.value)">
<P>Results: <INPUT TYPE="text" NAME="output">
</FORM>
</BODY>
</HTML>
```

This function is designed to be generalizable, accepting only the input value (`n`) as a parameter. In the form, the `onClick` event handler of the button sends only the input value from one of the form's fields to the `factorial()` function. The returned value is assigned to the output field of the form. The `factorial()` function is totally ignorant about forms, fields, or buttons in this document. If I need this function in another script, I can copy and paste it into that script knowing that it has been pretested. Any generalizable function is part of my personal library of scripts — from which I can borrow — and saves me time in future scripting tasks.

You cannot always generalize a function. Somewhere along the line in your scripts, you must have references to JavaScript or custom objects. But if you find that you're frequently writing functions that perform the same kind of actions, see how you can generalize the code and put the results in your library of ready-made functions. And if your audience uses browsers from Navigator 3 onward (and later versions of Internet Explorer 3 onward), consider placing these library functions in an external `.js` library file. See Chapter 13 for details on this convenient way to share utility functions among many documents.

Custom Objects

In all the previous chapters of this book, you've seen how conveniently the browser document object models organize all the information about the browser window and its document. What may not be obvious from the scripting you've done so far is that JavaScript enables you to create your own objects in memory — objects with properties and methods. These objects are not user-interface elements on the page but rather the kinds of objects that may contain data and script functions (behaving as methods) whose results the user can see displayed in the browser window.

You actually had a preview of this power in Chapter 37's discussion about arrays. An array, you recall, is an ordered collection of data. You can create a JavaScript array in which entries are labeled just like properties that you access via the now-familiar dot syntax (`arrayName[index].propertyName`). An object typically contains different kinds of data. It doesn't have to be an ordered collection of data — although your scripts can use objects in constructions that strongly resemble arrays. Moreover, you can attach any number of custom functions as methods for that object. You are in total control of the object's structure, data, and behavior.

An example — planetary objects

Building on your familiarity with the planetary data array created in Chapter 37, this chapter shows you how convenient it is to use the data when it is constructed in the form of custom objects. The application goal for the extended example in this section is to present a pop-up list of the nine planets of the solar system and display data about the selected planet. From a user-interface perspective (and for more exposure to multiframe environments), the resulting data displays in a separate frame of a two-frame window. This means your object method builds HTML on the fly and plugs it into the display frame. If you implement this application strictly for IE4+ and NN6, you can apply the same data to reconstruct the displayed table data for each user selection. The example as shown, however, is fully backward-compatible for all scriptable browsers.

In this chapter, instead of building arrays to hold the data, you build objects — one object for each planet. The design of your object has five properties and one method. The properties of each planet are: name, diameter, distance from the sun, year length, and day length. To assign more intelligence to these objects, you give each of them the capability to display their data in the lower frame of the window. You can conveniently define one function that knows how to behave with any of these planet objects, rather than having to define nine separate functions.

Listing 41-5 shows the source code for the document that creates the frameset for your planetary explorations; Listing 41-6 shows the entire HTML page for the object-oriented planet document, which appears in the top frame.

Listing 41-5: **Framesetting Document for a Two-Frame Window**

```
<HTML>
<HEAD>
<TITLE>Solar System Viewer</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function blank() {
    return "<HTML><BODY></BODY></HTML>"
}
</SCRIPT>
</HEAD>
<FRAMESET ROWS="50%,50%"
onLoad="Frame1.doDisplay(Frame1.document.forms[0].planetsList)">
    <FRAME NAME="Frame1" SRC="lst41-06.htm">
    <FRAME NAME="Frame2" SRC="javascript:parent.blank()">
</FRAMESET>
</HTML>
```

One item to point out in Listing 41-5 is that because the lower frame isn't filled until the upper frame's document loads, you need to assign some kind of URL for the SRC attribute of the second frame. Rather than add the extra transaction and file burden of a blank HTML document, here you use the javascript: URL to invoke a function. In this instance, I want the value returned from the function (a blank HTML page) to be reflected into the target frame (no void operator here). This method provides the most efficient way of creating a blank frame in a frameset.

Listing 41-6: **Object-Oriented Planetary Data Presentation**

```
<HTML>
<HEAD>
<TITLE>Our Solar System</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start script
// method definition
function showPlanet() {
    var result = "<HTML><BODY><CENTER><TABLE BORDER=2>"
    result += "<CAPTION ALIGN=TOP>Planetary data for: <B>" + this.name +
"</B></CAPTION>"
    result += "<TR><TD ALIGN=RIGHT>Diameter:</TD><TD>" + this.diameter +
"</TD></TR>"
    result += "<TR><TD ALIGN=RIGHT>Distance from Sun:</TD><TD>" + this.distance +
"</TD></TR>"
    result += "<TR><TD ALIGN=RIGHT>One Orbit Around Sun:</TD><TD>" + this.year +
"</TD></TR>"
    result += "<TR><TD ALIGN=RIGHT>One Revolution (Earth Time):</TD><TD>" +
this.day + "</TD></TR>"
    result += "</TABLE></CENTER></BODY></HTML>"
    // display results in a second frame of the window
    parent.Frame2.document.write(result)
    parent.Frame2.document.close()
}

// definition of planet object type;
// 'new' will create a new instance and stuff parameter data into object
function planet(name, diameter, distance, year, day) {
    this.name = name
    this.diameter = diameter
    this.distance = distance
    this.year = year
    this.day = day
    this.showPlanet = showPlanet  // make showPlanet() function a planet method
}

// create new planet objects, and store in a series of variables
var Mercury = new planet("Mercury","3100 miles", "36 million miles", "88 days",
"59 days")
var Venus = new planet("Venus", "7700 miles", "67 million miles", "225 days",
"244 days")
```

```
var Earth = new planet("Earth", "7920 miles", "93 million miles", "365.25
days","24 hours")
var Mars = new planet("Mars", "4200 miles", "141 million miles", "687 days",
"24 hours, 24 minutes")
var Jupiter = new planet("Jupiter","88,640 miles","483 million miles",
"11.9 years","9 hours, 50 minutes")
var Saturn = new planet("Saturn", "74,500 miles","886 million miles",
"29.5 years","10 hours, 39 minutes")
var Uranus = new planet("Uranus", "32,000 miles","1.782 billion miles",
"84 years", "23 hours")
var Neptune = new planet("Neptune","31,000 miles","2.793 billion miles",
"165 years","15 hours, 48 minutes")
var Pluto = new planet("Pluto", "1500 miles", "3.67 billion miles", "248 years",
"6 days, 7 hours")

// called from push button to invoke planet object method
function doDisplay(popup) {
    i = popup.selectedIndex
    eval(popup.options[i].text + ".showPlanet()")
}
// end script -->
</SCRIPT>
<BODY>
<H1>The Daily Planet</H1>
<HR>
<FORM>
<P>Select a planet to view its planetary data:
<SELECT NAME='planetsList' onChange='doDisplay(this)'>
    <OPTION>Mercury
    <OPTION>Venus
    <OPTION SELECTED>Earth
    <OPTION>Mars
    <OPTION>Jupiter
    <OPTION>Saturn
    <OPTION>Uranus
    <OPTION>Neptune
    <OPTION>Pluto
</SELECT></P>
</FORM>
</BODY>
</HTML>
```

The first task in the Head is to define the function that becomes a method in each of the objects. You must do this task before scripting any other code that adopts the function as its method. Failure to define the function ahead of time results in an error — the function name is not defined. If you compare the data extraction methodology with the function in the array version, notice that the parameter for the index value is gone and the reference to each property begins with `this`. Later, I return to the custom method after giving you a look at the rest of the Head code.

Next comes the object constructor function, which performs several important tasks. For one, everything in this function establishes the structure of your custom object: the properties available for data storage and retrieval and any methods that the object can invoke. The name of the function is the name you use later to create new instances of the object. Therefore, choosing a name that truly reflects the nature of the object is important. And, because you probably want to stuff some data into the function's properties to get one or more instances of the object loaded and ready for the page's user, the function definition includes parameters for each of the properties defined in this object definition.

Inside the function, you use the `this` keyword to assign data that comes in as parameters to labeled properties. For this example, I use the same names for both the incoming parameter variables and the properties. That's primarily for convenience (and is very common practice), but you can assign any variable and property names you want and connect them any way you like. In the `planet()` constructor function, five property slots are reserved for every instance of the object whether or not any data actually is placed in every property (any unassigned slot has a value of `null`).

The last entry in the `planet()` constructor function is a reference to the `showPlanet()` function defined earlier. Notice that the assignment statement doesn't refer to the function with its parentheses — just to the function name. When JavaScript sees this assignment statement, it looks back through existing definitions (those functions defined ahead of the current location in the script) for a match. If it finds a function (as it does here), JavaScript knows to assign the function to the identifier on the left side of the assignment statement. In doing this task with a function, JavaScript automatically sets up the identifier as a method name for this object. As you do in every JavaScript method you encounter, you must invoke a method by using a reference to the object, a period, and the method name followed by a set of parentheses. You see that syntax in a minute.

The next long block of statements creates the individual objects according to the definition established in the `planet()` constructor. Similar to an array, an assignment statement and the keyword `new` create an object. I assign names that are not only the real names of planets (the `Mercury` object name is the Mercury planet object) but that also can come in handy later when the `doDisplay()` function extracts names from the pop-up list in search of a particular object's data.

The act of creating a new object sets aside space in memory (associated with the current document) for this object and its properties. In this script, you create nine object spaces, each with a different set of properties. Notice that no parameter is sent (or expected at the function) that corresponds to the `showPlanet()` method. Omitting that parameter here is fine because the specification of that method in the object definition means that the script automatically attaches the method to every version (instance) of the planet object that it creates.

The last function definition, `doDisplay()`, is invoked whenever the user makes a choice from the list of planets in the upper frame. This function is also invoked via the frameset's `onLoad` event handler so that an initial table is displayed from the default selected item (see Figure 41-1). Invoking the function from the upper frame's `onLoad` event handler can cause problems (such as the failure of the other frame) if the frameset is not completely loaded.

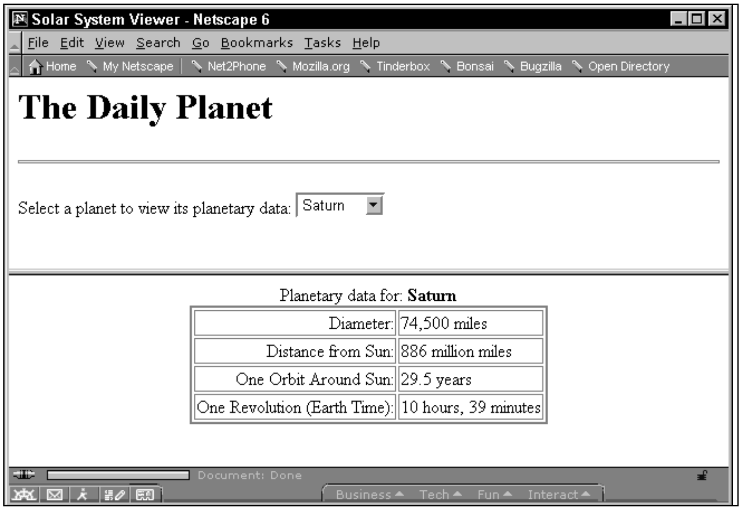

Figure 41-1: An external and internal face-lift for an earlier application

The `onChange` event handler in the SELECT list passes that SELECT element's reference to the `doDisplay()` function. In that function, the SELECT object is assigned to a variable called `popup` to help you visualize that the object is the pop-up list. The first statement extracts the index value of the selected item. Using that index value, the script extracts the text. But things get a little tricky because you need to use that text string as a variable name — the name of the planet — and append it to the call to the `showPlanet()` method. To make the disparate data types come together, use the `eval()` function. Inside the parentheses, extract the string for the planet name and concatenate a string that completes the reference to the object's `showPlanet()` method. The `eval()` function evaluates that string, which turns it into a valid method call. Therefore, if the user selects Jupiter from the pop-up list, the method call becomes `Jupiter.showPlanet()`.

Now it's time to look back to the `showPlanet()` function/method definition at the top of the script. When that method runs in response to a user selection of the planet Jupiter, the method's only scope is of the `Jupiter` object. Therefore, all references to `this.propertyName` in `showPlanet()` refer to `Jupiter` only. The only possibility for `this.name` in the `Jupiter` object is the value assigned to the `name` property for `Jupiter`. The same goes for the rest of the properties extracted in the function/method.

Creating an array of objects

In Listing 41-6, each of the planet objects is assigned to a global variable whose name is that of the planet. If the idea of custom objects is new to you, this idea probably doesn't sound so bad because it's easy to visualize each variable representing an object. But, as shown in the `doDisplay()` function, accessing an object by name requires use of the `eval()` function to convert a string representation to a valid object reference. While it's not too important in this simple example, the `eval()` function is not particularly efficient in JavaScript. If you find yourself using an eval() function, look for ways to improve efficiency such that you can reference an object by string. The way to accomplish that streamlining for this application is to place the objects in an array whose index values are the planet names.

To assign the custom objects in Listing 41-6 to an array, first create an empty array and then assign the result of each object constructor call to an entry in the array. The modified code section looks like the following (formatted to fit this printed page):

```
// create array
var planets = new Array()
// populate array with new planet objects
planets["Mercury"] =
    new planet("Mercury","3100 miles", "36 million miles",
    "88 days", "59 days")
planets["Venus"] =
    new planet("Venus", "7700 miles", "67 million miles",
    "225 days", "244 days")
planets["Earth"] =
    new planet("Earth", "7920 miles", "93 million miles",
    "365.25 days","24 hours")
planets["Mars"] =
    new planet("Mars", "4200 miles", "141 million miles",
    "687 days", "24 hours, 24 minutes")
planets["Jupiter"] =
    new planet("Jupiter","88,640 miles","483 million miles",
    "11.9 years", "9 hours, 50 minutes")
planets["Saturn"] =
    new planet("Saturn", "74,500 miles","886 million miles",
    "29.5 years", "10 hours, 39 minutes")
planets["Uranus"] =
    new planet("Uranus", "32,000 miles","1.782 billion miles",
    "84 years", "23 hours")
planets["Neptune"] =
    new planet("Neptune","31,000 miles","2.793 billion miles",
    "165 years", "15 hours, 48 minutes")
planets["Pluto"] =
    new planet("Pluto", "1500 miles", "3.67 billion miles",
    "248 years", "6 days, 7 hours")
```

The supreme advantage to this approach comes in a modified doDisplay() function, which can use the string value from the SELECT element directly without any conversion to an object reference:

```
// called from push button to invoke planet object method
function doDisplay(popup) {
    i = popup.selectedIndex
    planets[popup.options[i].text].showPlanet()
}
```

The presence of so many similar objects cries out for their storage as an array. Because the names play a key role in their choice for this application, the named index values work best; in other situations, you may prefer to use numeric indexes to facilitate looping through the array.

Adding a custom method

You're approaching advanced subject matter at this point, so I merely mention and briefly demonstrate an additional power of defining and using custom objects. A custom object can have a reference to another custom object as a property. Let's extend the planet example to help you understand the implications.

Say that you want to beef up the planet page with a photo of each planet. Each photo has a URL for the photo file; each photo also contains other information, such as the copyright notice and a reference number, which displays on the page for the user. One way to handle this additional information is to create a separate object definition for a photo database. Such a definition may look like this:

```
function photo(name, URL, copyright, refNum) {
    this.name = name
    this.URL = URL
    this.copyright = copyright
    this.refNum = refNum
}
```

You then need to create individual `photo` objects for each picture. One such definition may look like this:

```
mercuryPhoto = new photo("Planet Mercury", "/images/merc44.gif", "(c)1990 NASA",
28372)
```

Attaching a `photo` object to a `planet` object requires modifying the `planet` constructor function to accommodate one more property. The new `planet` constructor looks like this:

```
function planet(name, diameter, distance, year, day, photo) {
    this.name = name
    this.diameter = diameter
    this.distance = distance
    this.year = year
    this.day = day
    this.showPlanet = showPlanet
    this.photo = photo // add photo property
}
```

Once the `photo` objects are created, you can then create each `planet` object by passing one more parameter — a `photo` object you want associated with that object:

```
// create new planet objects, and store in a series of variables
Mercury = new planet("Mercury","3100 miles",  "36 million miles",   "88 days",
"59 days",  mercuryPhoto)
```

To access a property of an `photo` object, your scripts then have to assemble a reference that works its way through the connection with the `planet` object:

```
copyrightData = Mercury.photo.copyright
```

The potential of custom objects of this type is enormous. For example, you can embed all the copy elements and image URLs for an online catalog in a single document. As the user selects items to view (or cycles through them in sequence), a new JavaScript-written page displays the information in an instant. This requires only the image to be downloaded — unless the image was precached, as described in the image object discussion in Chapter 18. In this case, everything works instantaneously — no waiting for page after page of catalog.

If, by now, you think you see a resemblance between this object-within-an-object construction and a relational database, give yourself a gold star. Nothing prevents multiple objects from having the same subobject as their properties — like multiple business contacts having the same company object property.

More ways to create objects

The examples in Listings 41-5 and 41-6 show a way of creating objects that works with all scriptable browsers. If your audience is limited to users with more modern browsers, additional ways of creating custom objects exist.

From NN3+ and IE4+, you can use the `new Object()` constructor to generate a blank object. From that point on, you can define property and method names by simple assignment, as in the following:

```
var Earth = new Object()
Earth.diameter = "7920 miles"
Earth.distance = "93 million miles"
Earth.year = "365.25"
Earth.day = "24 hours"
Earth.showPlanet = showPlanet  // function reference
```

When you create a lot of like-structured objects, the custom object constructor shown in Listing 41-6 is more efficient. But for single objects, the `new Object()` constructor is more efficient.

NN4+ and IE4+ scripters can also benefit from a shortcut literal syntax for creating a new object. You can set pairs of property names and their values inside a set of curly braces, and you can assign the whole construction to a variable that becomes the object name. The following script shows how to organize this kind of object constructor:

```
var Earth = {diameter:"7920 miles", distance:"93 million miles", year:"365.25",
             day:"24 hours", showPlanet:showPlanet}
```

Colons link name/value pairs, and commas separate multiple name/value pairs. The value portion of a name/value pair can even be an array (using the `[...]` constructor shortcut) or a nested object (using another pair of curly braces). In fact, you can nest arrays and objects to your heart's content to create exceedingly complex objects. All in all, this is a very compact way to embed data in a page for script manipulation. If your CGI, XML, and database skills are up to the task, consider using a server program to convert XML data into this compact JavaScript version with each XML record being its own JavaScript object. For multiple records, assign the curly-braced object definitions to an array entry. Then your scripts on the client can iterate through the data and generate the HTML to display the data in a variety of forms and sorted according to different criteria (thanks to the JavaScript array-sorting powers).

Object watcher methods

NN4+ includes two special functions for objects that were designed primarily for use with external debugging tools: `watch()` and `unwatch()`. The `watch()` method instructs JavaScript to keep an eye on a particular property in an object (any JavaScript-accessible object) and execute a function when the value of the property changes by assignment (that is, not by user interaction).

You can see how this works in the simplified example of Listing 41-7. Three buttons set the `value` property of a text box. You can turn on the `watch()` method, which calls a handler and passes the name of the property, the old value, and the new value. An alert in the listing's function demonstrates what those values contain.

Listing 41-7: **Object Watching in NN4+**

```
<HTML>
<HEAD>
<TITLE>Object Watching</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function setIt(msg) {
    document.forms[0].entry.value = msg
}
function watchIt(on) {
    var obj = document.forms[0].entry
    if (on) {
        obj.watch("value",report)
    } else {
        obj.unwatch("value")
    }
}
function report(id, oldval, newval) {
    alert("The field's " + id + " property on its way from \n'" + oldval +
"'\n to \n'" + newval + "'.")
    return newval
}
</SCRIPT>
<BODY>
<B>Watching Over You</B>
<HR>
<FORM>
Enter text here:
<INPUT TYPE="text" NAME="entry" SIZE=50 VALUE="Default Value"><P>
<INPUT TYPE="button" VALUE="Set to Phrase I" onClick="setIt('Four score and
seven years ago...')"><BR>
<INPUT TYPE="button" VALUE="Set to Phrase 2" onClick="setIt('When in the course
of human events...')"><BR>
<INPUT TYPE="reset" onClick="setIt('Default Value')"><P>
<INPUT TYPE="button" VALUE="Watch It" onClick="watchIt(true)">
<INPUT TYPE="button" VALUE="Don't Watch It" onClick="watchIt(false)">
</FORM>
</BODY>
</HTML>
```

Better ways exist to intercept and preprocess user input, but the `watch()` function can be a helpful debugging tool when you want to monitor the hidden workings of scripts.

Defining object property getters and setters

A future version of the ECMA-262 language specification will likely include a pair of facilities called *getter* and *setter*. Until such time as the formal syntax is finalized, you can begin to experiment with this technique in NN6 using temporary syntax that adheres to the likely format (but intentionally uses different keywords until the standard is adopted). When the standard is adopted, a subsequent version of NN will include the standard keywords.

I introduced the idea of creating a getter and setter for an object briefly in Chapter 14, where the NN6 syntax style extended properties of some W3C DOM objects to include some of the Microsoft-specific (and very convenient) DOM syntax. Most notably, you can define a getter for any container to return an array of nested elements just like the IE-only `document.all` collection.

The purpose of a getter is to assign a new property to the prototype of an object and to define how the value returned by the property should be evaluated. A setter does the same, but it also defines how a new value assigned to the property should apply the value to the object. Both definitions are written in the form of anonymous functions, such that reading or writing an object's property value can include sophisticated processing for either operation.

Getters and setters are assigned to the `prototype` property of an object, thus enabling you to customize native and DOM objects. The NN6 syntax fashions getters, setters, and methods of an object's prototype with the following syntax:

```
object.prototype.__defineGetter__("propName", function)
object.prototype.__defineSetter__("propName", function)
```

Note that the underscores before and after the method names are actually pairs of underscore characters (that is, _, _, `defineGetter`, _, _). This double underscore was chosen as a syntax that the ECMA standard will not use, so it will not conflict with the eventual syntax for this facility.

The first parameter of the method is the name of the property for which the getter or setter is defined. This can be an existing property name that you want to override. The second parameter can be a function reference; but more likely it will be an anonymous function defined in place. By using an anonymous function, you can take advantage of the context of the object for which the property is defined. For each property, define both a getter and setter — even if the property is meant to be read-only or write-only.

To see how this mechanism works, let's use the getter and setter shown in Chapter 14 to add an `innerText` property to HTML elements in NN6. This property is read/write, so functions are defined for both the getter and setter. The getter definition is as follows:

```
HTMLElement.prototype.__defineGetter__("innerText", function () {
    var rng = document.createRange()
    rng.selectNode(this)
    return rng.toString()
})
```

The modified object is the basic HTMLElement object—the object that NN6 uses to create instances of every HTML element for the page. After the statement above executes, every HTML element on the page inherits the new innerText property. Each time the innerText property is read for an element, the anonymous function in this getter executes. Thus, after a text range object is created, the range is set to the node that is the current element. This is an excellent example of how the context of the current object allows the use of the this keyword to refer to the very same object. Finally, the string version of the selected range is returned. It is essential that a getter function include a return statement and that the returned value is of the desired data type. Also take notice of the closing of the function's curly brace and the getter method's parenthesis.

By executing this function each time the property is read, the getter always returns the current state of the object. If content of the element has changed since the page loaded, you are still assured of getting the current text inside the element. This is far superior to simply running the statements inside this function once as the page loads to capture a static view of the element's text.

The corresponding setter definition is as follows:

```
HTMLElement.prototype.__defineSetter__("innerText", function (txt) {
    var rng = document.createRange()
    rng.selectNodeContents(this)
    rng.deleteContents()
    var newText = document.createTextNode(txt)
    this.appendChild(newText)
    return txt
})
```

To assign a value to an object's property, the setter function requires that a parameter variable receive the assigned value. That parameter variable plays a role somewhere within the function definition. For this particular setter, the current object (this) also manipulates the text range object. The contents of the current element are deleted, and a text node comprising the text passed as a parameter is inserted into the element. To completely simulate the IE behavior of setting the innerText property, the text is returned. While setters don't always return values, this one does so that the expression that assigns a value to the innerText property evaluates to the new text.

If you want to create a read-only property, you still define a setter for the property but you also assign an empty function, as in:

```
Node.prototype.__defineSetter__("all", function() {})
```

This prevents assignment statements to a read-only property from generating errors. A write-only property should also have a getter that returns null or an empty string, as in:

```
HTMLElement.prototype.__defineGetter__("outerHTML", function() {return ""})
```

Because the getter and setter syntax shown here is unique to NN6, you must obviously wrap such statements inside object detection or browser version detection statements. And, to reiterate, this syntax will change in future browser versions once ECMA adopts the formal syntax.

Using custom objects

There is no magic to knowing when to use a custom object instead of an array in your application. The more you work with and understand the way custom objects work, the more likely you will think about your data-carrying scripts in these terms — especially if an object can benefit from having one or more methods associated with it. This avenue is certainly not one for beginners, but I recommend that you give custom objects more than a casual perusal once you gain some JavaScripting experience.

Object-Oriented Concepts

As stated several times throughout this book, JavaScript is object-based rather than object-oriented. Instead of adhering to the class, subclass, and inheritance schemes of object-oriented languages such as Java, JavaScript uses what is called *prototype inheritance*. This scheme works not only for native and DOM objects but also for custom objects.

Adding a prototype

A custom object is frequently defined by a constructor function, which typically parcels out initial values to properties of the object, as in the following example:

```
function car(plate, model, color) {
    this.plate = plate
    this.model = model
    this.color = color
}
var car1 = new car("AB 123", "Ford", "blue")
```

NN4+ and IE4+ offer a handy shortcut, as well, to stuff default values into properties if none are provided (the supplied value is `null`, `0`, or an empty string). The `OR` operator (`||`) can let the property assignment statement apply the passed value, if present, or a default value you hard-wire into the constructor. Therefore, you can modify the preceding function to offer default values for the properties:

```
function car(plate, model, color) {
    this.plate = plate || "missing"
    this.model = model || "unknown"
    this.color = color || "unknown"
}
var car1 = new car("AB 123", "Ford", "")
```

After the preceding statements run, the `car1` object has the following properties:

```
car1.plate    // value = "AB 123"
car1.model    // value = "Ford"
car1.color    // value = "unknown"
```

If you then add a new property to the constructor's `prototype` property, as in

```
car.prototype.companyOwned = true
```

any car object you already created or are about to create automatically inherits the new companyOwned property and its value. You can still override the value of the companyOwned property for any individual car object. But if you don't override the property for instances of the car object, the car objects whose companyOwned property is not overridden automatically inherit any change to the prototype.companyOwned value. This has to do with the way JavaScript looks for prototype property values.

Prototype inheritance

Each time your script attempts to read or write a property of an object, JavaScript follows a specific sequence in search of a match for the property name. The sequence is as follows:

1. If the property has a value assigned to the current (local) object, this is the value to use.
2. If there is no local value, check the value of the property's prototype of the object's constructor.
3. Continue up the prototype chain until either a match of the property is found (with a value assigned to it) or the search reaches the native Object object.

Therefore, if you change the value of a constructor's prototype property and you do not override the property value in an instance of that constructor, JavaScript returns the current value of the constructor's prototype property.

Nested objects and prototype inheritance

When you begin nesting objects, especially when one object invokes the constructor of another, there is an added wrinkle to the prototype inheritance chain. Let's continue with the car object defined earlier. In this scenario, consider the car object to be akin to a root object that has properties shared among two other types of objects. One of the object types is a company fleet vehicle, which needs the properties of the root car object (plate, model, color) but also adds some properties of its own. The other object that shares the car object is an object representing a car parked in the company garage — an object that has additional properties regarding the parking of the vehicle. This explains why the car object is defined on its own.

Now look at the constructor function for the parking record, along with the constructor for the basic car object:

```
function car(plate, model, color) {
    this.plate = plate || "missing"
    this.model = model || "unknown"
    this.color = color || "unknown"
}
function carInLot(plate, model, color, timeIn, spaceNum) {
    this.timeIn = timeIn
    this.spaceNum = spaceNum
    this.carInfo = car
    this.carInfo(plate, model, color)
}
```

The carInLot constructor not only assigns values to its unique properties (timeIn and spaceNum), but it also includes a reference to the car constructor arbitrarily assigned to a property called carInfo. This property assignment is merely a conduit that allows property values intended for the car constructor to be passed within the carInLot constructor function. To create a carInLot object, use a statement like the following:

```
var car1 = new carInLot("AA 123", "Ford", "blue", "10:02AM", "31")
```

After this statement, the car1 object has the following properties and values:

```
car1.timeIn       // value = "10:02AM"
car1.spaceNum     // value = "31"
car1.carInfo      // value = reference to car object constructor function
car1.plate        // value = "AA 123"
car1.model        // value = "Ford"
car1.color        // value = "blue"
```

Let's say that five carInLot objects are created in the script (car1 through car5). The prototype wrinkle comes into play if, for example, you assign a new property to the car constructor prototype:

```
car.prototype.companyOwned = true
```

Even though the carInLot objects use the car constructor, the instances of carInLot objects do not have a prototype chain back to the car object. As the preceding code stands, even though you've added a companyOwned property to the car constructor, no carInLot object inherits that property (even if you were to create a new carInLot object after defining the new prototype property for car). To get the carInLot instances to inherit the prototype.companyOwned property, you must explicitly connect the prototype of the carInLot constructor to the car constructor prior to creating instances of carInLot objects:

```
carInLot.prototype = new car()
```

The complete sequence, then, is as follows:

```
function car(plate, model, color) {
    this.plate = plate || "missing"
    this.model = model || "unknown"
    this.color = color || "unknown"
}
function carsInLot(plate, model, color, timeIn, spaceNum) {
    this.timeIn = timeIn
    this.spaceNum = spaceNum
    this.carInfo = car
    this.carInfo(plate, model, color)
}
carsInLot.prototype = new car()
var car1 = new carsInLot("123ABC", "Ford","blue","10:02AM", "32")
car.prototype.companyOwned = true
```

After this stretch of code runs, the car1 object has the following properties and values:

```
car1.timeIn             // value = "10:02AM"
car1.spaceNum           // value = "31"
car1.carInfo            // value = reference to car object constructor function
car1.plate              // value = "AA 123"
car1.model              // value = "Ford"
car1.color              // value = "blue"
car1.companyOwned       // value = true
```

NN4+ provides one extra, proprietary bit of syntax in this prototype world. The `__proto__` property (that's with double underscores before and after the word "proto") returns a reference to the object that is next up the prototype chain. For example, if you inspect the properties of `car1.__proto__` after the preceding code runs, you see that the properties of the object next up the prototype chain are as follows:

```
car1.__proto__.plate           // value = "AA 123"
car1.__proto__.model           // value = "Ford"
car1.__proto__.color           // value = "blue"
car1.__proto__.companyOwned    // value = true
```

This property can be helpful in debugging custom objects and prototype inheritance chain challenges, but the property is not part of the ECMA standard. Therefore, I discourage you from using the property in your production scripts.

Object Object

Properties	***Methods***
`constructor`	`hasOwnProperty()`
`prototype`	`isPrototypeOf()`
	`propertyIsEnumerable()`
	`toLocaleString()`
	`toString()`
	`valueOf()`

Syntax

Creating an object object:

```
function constructorName([arg1,...[,argN]]) {
    statement(s)
}
var objName = new constructorName(["argName1",...[,"argNameN"])
var objName = new Object()
var objName = {propName1:propVal1[, propName2:propVal2[,...N]}}
```

Accessing an object object properties and methods:

```
objectReference.property | method([parameters])
```

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	(✓)	✓	✓	✓	✓

About this object

While it might sound like doubletalk, the `Object` object is a vital native object in the JavaScript environment. It is the root object on which all other native objects — such as `Date`, `Array`, `String`, and the like — are based. This object also provides the foundation for creating custom objects, as described earlier in this chapter.

By and large, your scripts do not access the properties of the native `Object` object. The same is true for many of its methods, such as `toString()` and `valueOf()`, which internally allow debugging alert dialog boxes (and The Evaluator) to display something when referring to an object or its constructor.

You can use a trio of methods, described next, in IE5.5 and NN6 to perform some inspection of the prototype environment of an object instance. They are of interest primarily to advanced scripters who are building extensive, simulated object-oriented applications.

Methods

hasOwnProperty("*propName*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `hasOwnProperty()` method returns `true` if the current object instance has the property defined in its constructor or in a related constructor function. But if this property is defined externally, as via assignment to the object's `prototype` property, the method returns `false`.

Using the example of the `car` and `carInLot` objects from earlier in this chapter, the following expressions evaluate to `true`:

```
car1.hasOwnProperty("spaceNum")
car1.hasOwnProperty("model")
```

Even though the `model` property is defined in a constructor that is invoked by another constructor, the property belongs to the `car1` object. The following statement, however, evaluates to `false`:

```
car1.hasOwnProperty("companyOwned")
```

This property is defined by way of the prototype of one of the constructor functions and is not a built-in property for the object instance.

isPrototypeOf(*objRef*)

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The `isPrototypeOf()` method is intended to reveal whether or not the current object has a prototype relation with an object passed as a parameter. In practice, the IE5.5 and NN6 versions of this method not only operate differently, but they also do not appear in either browser to report prototype relationships correctly between objects. If any updated information is available for this method within these browsers, I will post it to the *JavaScript Bible* Support Center at `http://www.dannyg.com/update.html`.

propertyIsEnumerable("*propName*")

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

In the terminology of the ECMA-262 language specification, a value is enumerable if constructions such as the `for-in` property inspection loop (Chapter 39) can inspect it. Enumerable properties include values such as arrays, strings, and virtually every kind of object. According to the ECMA specification, this method is not supposed to work its way up the prototype chain. IE5.5 appears to adhere to this, whereas NN6 treats a property inherited from an object's prototype as a valid parameter value.

✦ ✦ ✦

CHAPTER 42

Global Functions and Statements

✦ ✦ ✦ ✦

In This Chapter

Converting strings into object references

Creating URL-friendly strings

Adding comments to scripts

✦ ✦ ✦ ✦

In addition to all the objects and other language constructs described in the preceding chapters of this reference part of the book, several language items need to be treated on a global scale. These items apply to no particular objects (or any object), and you can use them anywhere in a script. If you read earlier chapters, you were introduced to many of these functions and statements. This chapter serves as a convenient place to highlight these all-important items that are otherwise easily forgotten. At the end of the chapter, note the brief introduction to several objects that are built into the Windows-only versions of Internet Explorer. Some of these objects have pointers to more details at Microsoft's Web site.

This chapter begins with coverage of the following global functions and statements that are part of the core JavaScript language:

Functions	*Statements*
`decodeURI()`	`//` and `/*...*/` (comment)
`decodeURIComponent()`	`const`
`encodeURI()`	`var`
`encodeURIComponent()`	
`escape()`	
`eval()`	
`isFinite()`	
`isNaN()`	
`Number()`	
`parseFloat()`	
`parseInt()`	
`toString()`	
`unescape()`	
`unwatch()`	
`watch()`	

Global functions are not tied to the document object model. Instead, they typically enable you to convert data from one type to another type. The list of global statements is short, but a couple of them appear extensively in your scripting.

Functions

decodeURI("*encodedURI*")
decodeURIComponent("*encodedURIComponent*")
encodeURI("*URIString*")
encodeURIComponent("*URIComponentString*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

The ECMA-262 Edition 3 standard, as implemented in IE5.5 and NN6, provides utility functions that perform a more rigorous conversion of strings to valid URI strings and vice versa than was achieved earlier via the `escape()` and `unescape()` functions (described later in this chapter). The purpose of the encoding functions is to convert any string to a version that you can use as a Uniform Resource Identifier, such as a Web page address or an invocation of a server CGI script. While Latin alphanumeric characters pass through the encoding process untouched, you must use the encoding functions to convert some symbols and other Unicode characters to a form (hexadecimal representations of the character numbers) that the Internet can pass from place to place. The space character, for example, must be encoded to its hex version: `%20`.

Perhaps the biggest difference between the `encodeURI()` and `escape()` functions (and their `decodeURI()` and `unescape()` counterparts) is that the more modern versions do not encode a wide range of symbols that are perfectly acceptable as URI characters according to the syntax recommended in RFC2396 (`http://www.ietf.org/rfc/rfc2396.txt`). Thus, the following characters are not encoded via the `encodeURI()` function:

```
; / ? : @ & = + $ , - _ . ! ~ * ' ( ) #
```

Use the `encodeURI()` and `decodeURI()` functions only on complete URIs. Applicable URIs can be relative or absolute, but these two functions are wired especially so symbols that are part of the protocol (`://`), search string (? and =, for instance), and directory level delimiters (/) are not encoded. The `decodeURI()` function should work with URIs that arrive from servers as page locations, but be aware that some server CGIs encode spaces into plus symbols (+) that are not decoded back to spaces by the JavaScript function. If the URIs your script needs to decode contain plus symbols in place of spaces, you need to run your decoded URI through a string replacement method to finish the job (regular expressions come in handy here). If you are decoding URI strings that your scripts encoded, use the decode functions only on URIs that were encoded via the corresponding encode function. Do not attempt to decode a URI that was created via the old `escape()` function because the conversion processes work according to different rules.

The difference between a URI and a URI component is that a *component* is a single piece of a URI, generally not containing delimiter characters. For example, if you use the `encodeURIComponent()` function on a complete URI, almost all of the symbols (other than things such as periods) are encoded into hexadecimal versions — including directory delimiters. Therefore, you should use the component-level conversion functions only on quite granular pieces of a URI. For example, if you assemble a search string that has a name/value pair, you can use the `encodeURIComponent()` function separately on the name and on the value. But if you use that function on the pair that is already in the form *`name=value`*, the function encodes the equal symbol to a hexadecimal equivalent.

Use The Evaluator (Chapter 13) to experiment with the differences between encoding a full URI and a component and encoding and escaping a URI string. For example, compare the results of the following three statements:

```
escape("http://www.giantco.com/index.html?code=42")
encodeURI("http://www.giantco.com/index.html?code=42")
encodeURIComponent("http://www.giantco.com/index.html?code=42")
```

Because the sample URI string is valid as is, the `encodeURI()` version makes no changes. Experiment further by making the search string value into a string with a space, and see how each function treats that character.

escape("*URIString*" [,1])
unescape("*escapedURIString*")

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

If you watch the content of the Location field in your browser, you may occasionally see URLs that include a lot of `%` symbols plus some numbers. The format you see is *URL encoding* (more accurately called *URI encoding* — Uniform Resource Identifier rather than Uniform Resource Locator). This format allows even multiple word strings and nonalphanumeric characters to be sent as one contiguous string of a very low, common-denominator character set. This encoding turns a character, such as a space, into its hexadecimal equivalent value preceded by a percent symbol. For example, the space character (ASCII value 32) is hexadecimal 20, so the encoded version of a space is `%20`.

All characters, including tabs and carriage returns, can be encoded in this way and sent as a simple string that can be decoded on the receiving end for reconstruction. You can also use this encoding to preprocess multiple lines of text that must be stored as a character string in databases. To convert a plain-language string to its encoded version, use the `escape()` method. This function returns a string consisting of the encoded version. For example:

```
var theCode = escape("Hello there")
    // result: "Hello%20there"
```

Most, but not all, nonalphanumeric characters are converted to escaped versions with the `escape()` function. One exception is the plus sign, which URLs use to separate components of search strings. If you must encode the plus symbol, too, then add the optional second parameter to the function to make the plus symbol convert to its hexadecimal equivalent (2B):

```
var a = escape("Adding 2+2")
    // result: "Adding%202+2
var a = escape("Adding 2+2",1)
    // result: "Adding%202%2B2
```

To convert an escaped string back into plain language, use the `unescape()` function. This function returns a string and converts all URL-encoded strings — including those encoded with the optional parameter.

The `escape()` function operates in a way that is approximately midway between the newer functions `encodeURI()` and `encodeComponentURI()`. The `escape()` function is best used on portions of URIs, such as the search string. If your scripts bounce back and forth between escaped and unescaped strings, be sure to balance the functions of the same type; use `unescape()` only on URI strings that are encoded via the `escape()` function.

Finally, be aware of slightly different behavior with regard to the @ symbol in various browsers. This character is not encoded in IE, but it is encoded (to `%40`) in NN.

eval("*string*")

Returns: Object reference.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Expression evaluation, as you probably are well aware by now, is an important concept to grasp in scripting with JavaScript (and programming in general). An expression evaluates to some value. But occasionally you need to force an additional evaluation on an expression to receive the desired results. The `eval()` function acts on a string value to force an evaluation of that string expression.

Perhaps the most common application of the `eval()` function is to convert a string version of an object reference to a genuine object reference. For example, one technique for creating a Dynamic HTML script that accommodates the different ways that IE and NN4 reference positionable objects is to assemble references out of the comparable pieces of references. In the following function, the name of a positionable object is passed as a parameter. This example assumes that global variable flags are set elsewhere for isNav4 and isIE4. The function must create a valid reference to the object depending on which browser the user runs:

```
function getReference(objName) {
    if (navigator.appVersion.charAt(0) == "4") {
        if (navigator.appName == "Netscape") {
            var range = ""
            var styleObj = ""
        } else {
            var range = ".all"
            var styleObj = ".style"
        }
        var theObj = eval("document" + range + "." + objName + styleObj)
        return theObj
    }
    return null
}
```

In the NN4 branch of the preceding example, the variables range and styleObj are assigned empty strings; for the Microsoft branch, each variable assumes the components that must be inserted into an object reference for the Microsoft syntax. If the components are concatenated without the eval() function, the result simply is a concatenated string (which is not the same as the object reference). By forcing an additional evaluation with the eval() function, the script invokes JavaScript to see if one more level of evaluation is needed. If JavaScript finds that the evaluation of that string is a valid object reference, it returns the reference as the result; otherwise, the function returns undefined.

The eval() function can evaluate any JavaScript statement or expression stored as a string. This includes string equivalents of arithmetic expressions, object value assignments, and object method invocation.

I do not recommend that you rely on the eval() function, however, because this function is inherently inefficient (from the standpoint of performance). Fortunately, you may not need the eval() function to get from a string version of an object's name to a valid object reference. For example, if your script loops through a series of objects whose names include serial numbers, you can use the object names as array indices rather than use eval() to assemble the object references. The inefficient way to set the value of a series of fields named data0, data1, and so on, is as follows:

```
function fillFields() {
    var theObj
    for (var i = 0; i < 10; i++) {
        theObj = eval("document.forms[0].data" + i)
        theObj.value = i
    }
}
```

A more efficient way is to perform the concatenation within the index brackets for the object reference:

```
function fillFields() {
    for (var i = 0; i < 10; i++) {
        document.forms[0].elements["data" + i].value = i
    }
}
```

Tip Whenever you are about to use an `eval()` function, look for ways to use string index values of arrays of objects instead. The W3C DOM (in IE5+ and NN6) makes it even easier with the help of the `document.getElementById()` method, which takes a string as a parameter and returns a reference to the named object.

`isFinite(number)`

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

It is unlikely that you will ever need the `isFinite()` function, but its purpose is to advise whether a number is beyond the absolute minimum or maximum values that JavaScript can handle. If a number is outside of that range, the function returns `false`. The parameter to the function must be a number data type.

`isNaN(expression)`

Returns: Boolean.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	✓	✓	✓	✓	✓

For those instances in which a calculation relies on data coming from a text field or other string-oriented source, you frequently need to check whether the value is a number. If the value is not a number, the calculation may result in a script error.

Use the `isNaN()` function to test whether a value is a number prior to passing the value onto the operation. The most common use of this function is to test the result of a `parseInt()` or `parseFloat()` function. If the strings submitted for conversion to those functions cannot be converted to a number, the resulting value is `NaN` (a special symbol indicating "not a number"). The `isNaN()` function returns `true` if the value is not a number.

A convenient way to use this function is to intercept improper data before it can do damage, as follows:

```
function calc(form) {
    var inputValue = parseInt(form.entry.value)
    if (isNaN(inputValue)) {
        alert("You must enter a number to continue.")
    } else {
        statements for calculation
    }
}
```

Probably the biggest mistake scripters make with this function is failing to observe the case of all the letters in the function name. The trailing uppercase "N" is easy to miss.

Note The `isNaN()` function works in Navigator 2 only on UNIX platforms. It is available on all platforms in Navigator 3+ and Internet Explorer 3+.

Number("*string*")
parseFloat("*string*")
parseInt("*string*" [,*radix*])

Returns: Number.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	(✓)	✓	✓	(✓)	(✓)	✓	✓	✓

All three of these functions convert a string value into a numeric value. The `parseInt()` and `parseFloat()` functions are compatible across all versions of all browsers; the `Number()` function is new with NN4 and IE4.

Use the `Number()` function when your script is not concerned with the precision of the value and prefers to let the source string govern whether the returned value is a floating-point number or an integer. The function takes a single parameter — a string to convert to a number value.

The `parseFloat()` function also lets the string source value determine whether the returned value is a floating-point number or an integer. If the source string includes any non-zero value to the right of the decimal, the result is a floating-point number. But if the string value were, say, `"3.00"`, the returned value would be an integer value.

An extra, optional parameter for `parseInt()` enables you to define the number base for use in the conversion. If you don't specify a radix parameter, JavaScript tries to look out for you; but in doing so, JavaScript may cause some difficulty for you. The primary problem arises when the string parameter for `parseInt()` starts with a zero, which a text box entry or database field might do. In JavaScript, numbers starting with zero are treated as octal (base-8) numbers. Therefore, `parseInt("010")` yields the decimal value `8`.

When you apply the `parseInt()` function, always specify the radix of 10 if you are working in base-10 numbers. You can, however, specify any radix value from 2 through 36. For example, to convert a binary number string to its decimal equivalent, assign a radix of 2 as follows:

```
var n = parseInt("011",2)
    // result: 3
```

Similarly, you can convert a hexadecimal string to its decimal equivalent by specifying a radix of 16:

```
var n = parseInt("4F",16)
    // result: 79
```

Both `parseInt()` and `parseFloat()` exhibit a very useful behavior: If the string passed as a parameter starts with at least one number followed by, say, letters, the functions do their jobs on the numeric part of the string and ignore the rest. This is why you can use `parseFloat()` on the `navigator.appVersion` string to extract just the reported version number without having to parse the rest of the string. For example, NN6 for Windows reports a `navigator.appVersion` value as

```
5.0 (Windows; en-US)
```

But you can get just the numeric part of the string via `parseFloat()`:

```
var ver = parseFloat(navigator.appVersion)
```

Because the result is a number, you can perform numeric comparisons to see, for instance, whether the version is greater than or equal to 4.

toString([*radix*])

Returns: String.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	(✓)	✓	✓	✓	✓

Every JavaScript core language object and every DOM `document` object has a `toString()` method associated with it. This method is designed to render the contents of the object in as meaningful a way as possible. Table 42-1 shows the result of applying the `toString()` method on each of the convertible core `language` object types.

Table 42-1 toString() Method Results for Object Types

Object Type	*Result*
String	The same string
Number	String equivalent (but numeric literals cannot be converted)
Boolean	`"true"` or `"false"`
Array	Comma-delimited list of array contents (with no spaces after commas)
Function	Decompiled string version of the function definition

Many DOM objects can be converted to a string. For example, a `location` object returns its URL. But when an object has nothing suitable to return for its content as a string, it usually returns a string in the following format:

```
[object objectType]
```

The `toString()` method is available on all versions of all browsers. However, a convenient improvement to `toString()` for NN3 and IE3/J2 is the optional `radix` parameter. By setting this parameter between 2 and 16, you can convert numbers to string equivalents in different number bases. Listing 42-1 calculates and draws a conversion table for decimal, hexadecimal, and binary numbers between 0 and 20. In this case, the source of each value is the value of the index counter variable each time the `for` loop's statements execute.

Listing 42-1: Using toString() with Radix Values

```
<HTML>
<HEAD>
<TITLE>Number Conversion Table</TITLE>
</HEAD>
<BODY>
<B>Using toString() to convert to other number bases:</B>
<HR>
<TABLE BORDER=1>
<TR>
<TH>Decimal</TH><TH>Hexadecimal</TH><TH>Binary</TH></TR>
<SCRIPT LANGUAGE="JavaScript">
var content = ""
for (var i = 0; i <= 20; i++) {
    content += "<TR>"
    content += "<TD>" + i.toString(10) + "</TD>"
    content += "<TD>" + i.toString(16) + "</TD>"
    content += "<TD>" + i.toString(2) + "</TD></TR>"
}
document.write(content)
</SCRIPT>
</TABLE>
</BODY>
</HTML>
```

The `toString()` method of user-defined objects does not convert the object into a meaningful string, but you can create your own method to do just that. For example, if you want to make your custom object's `toString()` method behave like an array's method, then define the action of the method and assign that function to a property of the object (as shown in Listing 42-2).

Listing 42-2: Creating a Custom toString() Method

```
<HTML>
<HEAD>
<TITLE>Custom toString()</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function customToString() {
    var dataArray = new Array()
    var count = 0
    for (var i in this) {
        dataArray[count++] = this[i]
```

Continued

Listing 42-2 *(continued)*

```
        if (count > 2) {
            break
        }
    }
    return dataArray.join(",")
}
var book = {title:"The Aeneid", author:"Virgil", pageCount:543}
book.toString = customToString
</SCRIPT>
</HEAD>
<BODY>
<B>A user-defined toString() result:</B>
<HR>
<SCRIPT LANGUAGE="JavaScript">
document.write(book.toString())
</SCRIPT>
</BODY>
</HTML>
```

When you run Listing 42-2, you can see how the `custom` object's `toString()` handler extracts the values of all elements of the object except for the last one, which is the function handler reference. You can customize how the data should be labeled and/or formatted.

unwatch(*property*)
watch(*property, handler*)

Returns: Nothing.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

To supply the right kind of information to external debuggers, JavaScript in NN4+ implements two global functions that belong to every object — including user-defined objects. The `watch()` function keeps an eye on a desired object and property. If that property is set by assignment, the function invokes another user-defined function that receives information about the property name, its old value, and its new value. The `unwatch()` function turns off the watch functionality for a particular property. See Listing 41-7 in Chapter 41 for an example of how to use these functions that you can assign to any object.

Statements

//
/*...*/

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Comments are statements that the JavaScript interpreter (or server-side compiler) ignores. However, these statements enable authors to leave notes about how things work in their scripts. While lavish comments are useful to authors during a script's creation and maintenance, the full content of a client-side comment is downloaded with the document. Every byte of non-operational content of the page takes a bit more time to download. Still, I recommend lots of comments — particularly as you create a script.

JavaScript offers two styles of comments. One style consists of two forward slashes (no spaces between them). JavaScript ignores any characters to the right of those slashes on the same line, even if they appear in the middle of a line. You can stack as many lines of these single-line comments as is necessary to convey your thoughts. I typically place a space between the second slash and the beginning of my comment. The following are examples of valid, one-line comment formats:

```
// this is a comment line usually about what's to come
var a = "Fred"  // a comment about this line
// You may want to capitalize the first word of a comment
// sentence if it runs across multiple lines.
//
// And you can leave a completely blank line, like the one above.
```

For longer comments, it is usually more convenient to enclose the section in the other style of comment. The following comment opens with a forward slash and asterisk (/*) and ends with an asterisk and forward slash (*/). JavaScript ignores all statements in between — including multiple lines. If you want to comment out briefly a large segment of your script for debugging purposes, it is easiest to bracket the segment with these comment symbols. To make these comment blocks easier to find, I generally place these symbols on their own lines as follows:

```
/*
some
  commented-out
    statements
*/
```

If you are developing rather complex documents, you might find using comments a convenient way to help you organize segments of your scripts and make each segment easier to find. For example, you can define a comment block above each function and describe what the function is about, as in the following example.

```
/*-----------------------------------------------
   calculate()
   Performs a mortgage calculation based on
   parameters blah, blah, blah.  Called by blah
   blah blah.
-----------------------------------------------*/
function calculate(form) {
    statements
}
```

const

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

The `const` keyword initializes a constant. Unlike a variable, whose data is subject to change while a page loads, a constant's value cannot be modified once it is assigned. It is common practice in many programming languages to define constant identifiers with all uppercase letters, usually with underscore characters to delimit multiple words. This style makes it easier to see a constant's application later in the program.

Listing 42-3 shows how you can use a constant. The page conveys temperature data for several cities. (Presumably, this data is updated on the server and fashioned into an array of data when the user requests the page.) For temperatures below freezing, the temperature is shown in a distinctive text style. Because the freezing temperature is a constant reference point, it is assigned as a constant.

Listing 42-3: **Using the const Keyword**

```
<HTML>
<HEAD>
<TITLE>const(ant)</TITLE>
<STYLE TYPE="text/css">
.cold {font-weight:bold; color:blue}
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
const FREEZING_F = 32
var cities = ["London", "Moscow", "New York", "Tokyo", "Sydney"]
var tempsF = [33, 12, 20, 40, 75]
function showData() {
    var tableData = ""
    for (var i = 0; i < cities.length; i++) {
        tableData += "<TR><TD>" + cities[i] + "</TD><TD "
        tableData += (tempsF[i] < FREEZING_F) ? "CLASS='cold'" : ""
        tableData += ">" + tempsF[i] + "</TR>"
```

```
    }
    document.getElementById("display").innerHTML = tableData
}
</SCRIPT>
</HEAD>
<BODY onLoad="showData()">
<H1>The const keyword</H1>
<HR>
<TABLE ID="temps">
<TR><TH>City<TH>Temperature</TR>
<TBODY ID="display">
</TBODY>
</TABLE>
</BODY>
</HTML>
```

The `const` keyword likely will be adopted in the next version of the ECMA-262 standard and will become part of the JavaScript vernacular in future browsers.

var

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Before using any variable, you should declare it (and optionally initialize it with a value) via the `var` statement. If you omit the `var` keyword, the variable is automatically assigned as a global variable within the current document. To keep a variable local to a function, you must declare or initialize the variable with the `var` keyword inside the function's braces.

If you assign no value to a variable, it evaluates to `null`. Because a JavaScript variable is not limited to one variable type during its lifetime, you don't need to initialize a variable to an empty string or zero unless that initial value helps your scripting. For example, if you initialize a variable as an empty string, you can then use the add-by-value operator (+=) to append string values to that variable in a future statement in the document.

To save statement lines, you can declare and/or initialize multiple variables with a single `var` statement. Separate each *varName=value* pair with a comma, as in

```
var name, age, height  // declare as null
var color="green", temperature=85.6 // initialize
```

Variable names (also known as identifiers) must be one contiguous string of characters, and the first character must be a letter. Many punctuation symbols are also banned, but the underscore character is valid and often is used to separate multiple words in a long variable name. All variable names (like most identifiers in JavaScript) are case-sensitive, so you must name a particular variable identically throughout the variable's scope.

IE/Windows Objects

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Microsoft prides itself on the integration between Web browser functionality and the Windows operating system. The linkage between browser and OS is most apparent in IE's facilities for accessing ActiveX objects. Microsoft has fashioned several such objects for access to scripters — again, provided the deployment is intended only for Windows versions of Internet Explorer. Some objects also exist as a way to expose some Visual Basic Script (VBScript) functionality to JavaScript. Because these objects are more within the realm of Windows and ActiveX programming, the details and quirks of working with them from IE/Windows is best left to other venues. But in case you are not familiar with these facilities, the following discussions introduce the basic set of IE/Windows objects. You can find more details at the Microsoft Developer Network (MSDN) Web site; in addition, I provide appropriate URLs for your further exploration.

The objects mentioned here are the `ActiveXObject`, `Dictionary`, `Enumerator`, `FileSystemObject`, and `VBArray` objects. Microsoft documents these objects as if they are part of the native JScript language. However, you can be sure that they will remain proprietary certainly to Internet Explorer, if not exclusively for Windows-only versions.

ActiveXObject

`ActiveXObject` is a generic object that allows your script to open and access what Microsoft sometimes calls *automation objects*. An automation object is an executable program that might run on the client or be served from a server. This can include local applications, such as applications from the Microsoft Office suite, executable DLLs (dynamic-link libraries), and so on.

Use the constructor for the `ActiveXObject` to obtain a reference to the object according to the following syntax:

```
var objRef = new ActiveXObject(appName.className[, remoteServerName])
```

This JScript syntax is the equivalent of the VBScript `CreateObject()` method. You need to know a bit about Windows programming to determine the application name and the classes or types available for that application. For example, to obtain a reference to an Excel worksheet, use this constructor:

```
var mySheet = new ActiveXObject("Excel.Sheet")
```

Once you have a reference to the desired object, you must also know the names of the properties and methods of the object you'll be addressing. You can access much of this information via Microsoft's developer tools, such as Visual InterDev or the tools that come with Visual Basic. These tools enable you to query an object to discover its properties and methods. Unfortunately, an `ActiveXObject`'s properties are not enumerable through a typical JavaScript `for-in` property inspector.

Accessing an ActiveXObject, especially one on the client, involves some serious security considerations. The typical security setup for an IE client prevents scripts from accessing client applications, at least not without asking the user if it's okay to do so. While it's foolhardy to state categorically that you cannot perform surreptitious inspection or damage to a client without the user's knowledge (hackers find holes from time to time), it is highly unlikely. In a corporate environment, where some level of access to all clients is desirable, the client may be set up to accept instructions to work with ActiveX objects when they come from trusted sources. The bottom line is that unless you are well versed in Windows programming, don't expect the ActiveXObject to become some kind of magic portal that enables you to invade the privacy or security of unsuspecting users.

For more details, visit http://msdn.microsoft.com/scripting/jscript/doc/jsobjActiveXObject.htm.

Dictionary

While the Dictionary object is very helpful to VBScript authors, JavaScript already provides the equivalent functionality natively. A Dictionary object behaves very much like a JavaScript array that has string index values (similar to a Java hash table), although numeric index values are also acceptable in the Dictionary. Indexes are called *keys* in this environment. VBScript arrays do not have this facility natively, so the Dictionary object supplements the language for the sake of convenience. Unlike a JavaScript array, however, you must use the various properties and methods of the Dictionary object to add, access, or remove items from it.

You create a Dictionary object via ActiveXObject as follows:

```
var dict = new ActiveXObject("Scripting.Dictionary")
```

You must create a separate Dictionary object for each array. Table 42-2 lists the properties and methods of the Dictionary object. After you create a blank Dictionary object, populate it via the Add() method for each entry. For example, the following statements create a Dictionary object to store U.S. state capitals:

```
var stateCaps = new ActiveXObject("Scripting.Dictionary")
stateCaps.Add("Illinois", "Springfield")
```

You can then access an individual item via the Key property (which, thanks to its VBScript heritage, looks more like a JavaScript method). One convenience of the Dictionary object is the Keys() method, which returns an array of all the keys in the dictionary — something that a string-indexed JavaScript array could use.

Table 42-2 Dictionary Object Properties and Methods

Property	***Description***
Count	Integer number of entries in the dictionary (read-only)
Item("*key*")	Reads or writes a value for an entry whose name is *key*
Key("*key*")	Assigns a new key name to an entry

Continued

Table 42-2 *(continued)*

Method	***Description***
`Add("key", value)`	Adds a value associated with a unique key name
`Exists("key")`	Returns Boolean `true` if `key` exists in dictionary
`Items()`	Returns VBArray of values in dictionary
`Keys()`	Returns VBArray of keys in dictionary
`Remove("key")`	Removes `key` and its value
`RemoveAll()`	Removes all entries

For more details, visit `http://msdn.microsoft.com/scripting/jscript/doc/jsobjDictionary.htm`.

Enumerator

An `Enumerator` object provides JavaScript with access to collections that otherwise do not allow direct access to their items via index number or name. This object isn't necessary when working with DOM collections, such as `document.all`, because you can use the `item()` method to obtain a reference to any member of the collection. But if you are scripting ActiveX objects, some of these objects' methods or properties may return collections that cannot be accessed through this mechanism or the JavaScript `for-in` property inspection technique. Instead, you must wrap the collection inside an `Enumerator` object.

To wrap a collection in an `Enumerator`, invoke the constructor for the object, passing the collection as the parameter:

```
var myEnum = new Enumerator(someCollection)
```

This enumerator instance must be accessed via one of its four methods to position a "pointer" to a particular item and then extract a copy of that item. In other words, you don't access a member directly (that is, by diving into the collection with an item number to retrieve). Instead, you move the pointer to the desired position and then read the item value. As you can see from the list of methods in Table 42-3, this object is truly intended for looping through the collection. Pointer control is limited to positioning it at the start of the collection and incrementing its position along the collection by one:

```
myEnum.moveFirst()
for (; !myEnum.atEnd(); myEnum.moveNext()) {
    val = myEnum.item()
    // more statements that work on value
}
```

Table 42-3 Enumerator Object Methods

Method	*Description*
`atEnd()`	Returns `true` if pointer is at end of collection
`item()`	Returns value at current pointer position
`moveFirst()`	Moves pointer to first position in collection
`moveNext()`	Moves pointer to next position in collection

For more details, visit `http://msdn.microsoft.com/scripting/jscript/doc/jsobjEnumerator.htm`.

FileSystemObject

Of all the IE/Windows objects, the one whose capabilities most scripters want to have as a cross-browser native object is `FileSystemObject`. A common wish among scripters is to be able to save some user-entered data on the client in file form rather than as a cookie. Of course, there can't be wide-open access to the file system because unscrupulous scripters could wreak havoc with a user's system and privacy — especially in such a well-documented and constant OS file structure as Windows. Netscape Navigator can accomplish many of these same operations via direct access to Java classes and signed scripts (which obtain the user's permission before accessing the file system).

`FileSystemObject` has a large library of methods (and one property) that scripts with the proper security clearance and permission can use to read and write files, create and delete files and directories, and, essentially, have its way with the contents of the client's hard disk. Table 42-4 shows a summary of these methods.

Table 42-4 FileSystemObject Property and Methods

Property	***Description***
`Drives`	Returns a collection of (disk) `Drive` objects (a `Drive` object has 15 properties)

Method	***Description***
`BuildPath(`*`path`*`, `*`name`*`)`	Appends name to existing *`path`*
`CopyFile(`*`src`*`, `*`dest`*`[, `*`overwrite`*`])`	Copies file at *`src`* path to *`dest`* path, optionally to automatically overwrite existing *`dest`* file of same name
`CopyFolder(`*`src`*`, `*`dest`*`[, `*`overwrite`*`])`	Copies directory at *`src`* path to *`dest`* path, optionally to automatically overwrite existing *`dest`* directory of same name
`CreateFolder(`*`path`*`)`	Creates folder with name specified in *`path`*
`CreateTextFile(`*`path`*`[, `*`overwrite`*`[, `*`unicode`*`]])`	Returns `TextStream` object after opening an empty file at *`path`*, optionally to overwrite existing file at *`path`* and optionally to save characters in Unicode (instead of ASCII)
`DeleteFile(`*`path`*`[, `*`force`*`])`	Deletes file at *`path`*, optionally to force deletion of read-only file
`DeleteFolder(`*`path`*`[, `*`force`*`])`	Deletes directory at *`path`*, optionally to force deletion of read-only directory
`DriveExists(`*`drivespec`*`)`	Returns `true` if specified drive exists on client
`FileExists(`*`filespec`*`)`	Returns `true` if specified file exists
`FolderExists(`*`folderspec`*`)`	Returns `true` if specified directory exists
`GetAbsolutePathName(`*`pathspec`*`)`	Returns full path based on parameters supplied in *`pathspec`*
`GetBaseName(`*`filespec`*`)`	Returns base name of rightmost item in *`filespec`* but without file extension
`GetDrive(`*`drivespec`*`)`	Returns `Drive` object referenced by *`drivespec`* (for example, `c:\`)
`GetDriveName(`*`path`*`)`	Returns name of the drive for a given *`path`*
`GetExtensionName(`*`path`*`)`	Returns file extension for rightmost item in the *`path`*
`GetFile(`*`filespec`*`)`	Returns `File` object (a `File` object has 12 properties and 4 methods of its own)

Method	Description
GetFileName(*filespec*)	Returns the full filename of rightmost item in *pathspec*
GetFileVersion(*filespec*)	Returns version number associated with a file
GetFolder(*folderspec*)	Returns Folder object (a Folder object has 15 properties and 4 methods of its own)
GetParentFolderName(*path*)	Returns name of parent directory of *path*
GetSpecialFolder(*type*)	Returns Folder object of type 0 (Windows), 1 (Windows\System), or 2 (Windows\Temp)
GetTempName()	Returns a nonsense name for use as a temp filename
MoveFile(*src*, *dest*)	Moves *src* file(s) to *dest*
MoveFolder(*src*, *dest*)	Moves *src* folder(s) to *dest*
OpenTextFile(*path*[, *iomode*[, *create*[, *format*]]])	Returns a TextStream object after opening a file at *path* for mode (ForReading, ForWriting, ForAppending); optionally to create file if not existing; optionally to treat characters as Unicode (TristateTrue), ASCII (TristateFalse), or system default (TristateUseDefault)

As for the basic task of writing some data to a hard disk, the sequence involves creating an instance of FileSystemObject, opening an output stream for text, writing content to the file, and closing the file. Such a sequence might look like the following:

```
function saveLocalData(theData) {
    var fsObj = new ActiveXObject("Scripting.FileSystemObject")
    var theFile = fsObj.CreateTextFile("c:\\giantco.txt", true)
    theFile.WriteLine(theData)
    theFile.Close()
}
```

The WriteLine() method belongs to the TextStream object, which is returned by FileSystemObject's CreateTextFile() method. You can read more about the TextStream object and the details of the FileSystemObject at http://msdn.microsoft.com/scripting/jscript/doc/jsobjtextstream.htm and http://msdn.microsoft.com/scripting/jscript/doc/jsobjFileSystem.htm.

VBArray

The VBArray object provides JavaScript access to Visual Basic *safe arrays*. Such an array is read-only and is commonly returned by ActiveX objects. Such arrays can be composed in VBScript sections of client-side scripts. Visual Basic arrays by their very nature can have multiple dimensions. For example, the following code creates a three-by-two VB array:

```
<SCRIPT LANGUAGE="VBScript">
Dim myArray(2, 1)
myArray(0, 0) = "A"
myArray(0, 1) = "a"
myArray(1, 0) = "B"
myArray(1, 1) = "b"
myArray(2, 1) = "C"
myArray(2, 2) = "c"
</SCRIPT>
```

Once you have a valid VB array, you can convert it to an object that the JScript interpreter can't choke on:

```
<SCRIPT LANGUAGE="JavaScript">
var theVBArray = new VBArray(myArray)
</SCRIPT>
```

Global variables from one script language block can be accessed by another block, even in a different language. But at this point, the array is not in the form of a JavaScript array yet. You can either convert it to such via the `VBArray.toArray()` method or access information about the `VBArray` object through its other methods (described briefly in Table 42-5). Once you convert a `VBArray` to a JavaScript array, you can then iterate through the values just like any JavaScript array.

Table 42-5 VBArray Object Methods

Method	*Description*
`dimensions()` original array	Returns number of dimensions of the
`getItem(`*`dim1`*`[, `*`dim2`*`[,...`*`dimN`*`]])`	Returns value at array location defined by dimension addresses
`ibound(`*`dim`*`)`	Returns lowest index value for a given dimension
`toArray()`	Returns JavaScript array version of `VBArray`
`ubound(`*`dim`*`)`	Returns highest index value for a given dimension

When you use the `toArray()` method and the source array has multiple dimensions, values from dimensions after the first "row" are simply appended to the JavaScript array with no nesting structure. IE through version 5.5 provides no backward conversion from a JavaScript array to a VB array.

For more details, visit `http://msdn.microsoft.com/scripting/jscript/doc/jsobjVBArray.htm`.

✦ ✦ ✦

PART

V

Putting JavaScript to Work

In This Part

CHAPTER 43

Data-Entry Validation

✦ ✦ ✦ ✦

In This Chapter

Validating data as it is being entered

Validating data immediately prior to submission

Organizing complex data-validation tasks

✦ ✦ ✦ ✦

Give users a field in which to enter data and you can be sure that some users will enter the wrong kind of data. Often the "mistake" is accidental — a slip of the pinkie on the keyboard; other times, users intentionally type the incorrect entry to test the robustness of your application. Whether you solicit a user's entry for client-side scripting purposes or for input into a server-based CGI or database, you should use JavaScript on the client to handle validation of the user's entry. Even for a form connected to a CGI script, it's far more efficient (from the perspective of bandwidth, server load, and execution speed) to let client-side JavaScript get the data straight before your server program deals with it.

Real-Time Versus Batch Validation

You have two opportunities to perform data-entry validation in a form: as the user enters data into a form and just before the form is submitted. I recommend you take advantage of both of these opportunities.

Real-time validation triggers

The most convenient time to catch an error is immediately after the user makes it — especially for a long form that requests a wide variety of information. You can make the user's experience less frustrating if you catch an entry mistake just after the user enters the information: his or her attention is already focused on the nature of the content (or some paper source material may already be in front of the user). It is much easier for the user to address the same information entry right away.

A valid question for the page author is how to trigger the real-time validation. Backward-compatible text boxes have two potential event handlers for this purpose: `onChange` and `onBlur`. I personally avoid `onBlur` event handlers, especially ones that can display an alert dialog box (as a data-entry validation is likely to do). Because a good validation routine brings focus to the errant text box, you can get some odd behavior with the interaction of the `focus()` method and the onBlur event handler. Users who wish to continue past an invalid field are locked in a seemingly endless loop.

The problem with using onChange as the validation trigger is that a user can defeat the validation. A change event occurs only when the text of a field indeed changes when the user tabs or clicks out of the field. If the user is alerted about some bad entry in a field and doesn't fix the error, the change event doesn't fire again. In some respects, this is good because a user may have a legitimate reason for passing by a particular form field initially with the intention of returning to the entry later. Because a user can defeat the onChange event handler trigger, I recommend you also perform batch validation prior to submission.

In NN4+ and IE4+, you also have the luxury of letting keyboard events trigger validations. This is most helpful when you want to prevent some character(s) from being entered into a field. For example, if a field is supposed to contain only a positive integer value, you can use the onKeyPress event handler of the text box to verify that the character just typed is a number. If the character is not a number, the event is trapped and no character reaches the text box. You should also alert the user in some way about what's going on. Listing 43-1 demonstrates a simplified version of this kind of keyboard trapping, compatible with NN4+ and IE4+ event models. The message to the user is displayed in the statusbar. Displaying the message there has the advantage of being less intrusive than an alert dialog box (and keeps the text insertion cursor in the text box), but it also means that users might not see the message. The onSubmit event handler in the listing prevents a press of the Enter key in this one-field form from reloading this sample page.

Listing 43-1: **Allowing Only Numbers into a Text Box**

```
<HTML>
<HEAD>
<TITLE>Letting Only Numbers Pass to a Form Field</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkIt(evt) {
    evt = (evt) ? evt : window.event
    var charCode = (evt.which) ? evt.which : evt.keyCode
    if (charCode > 31 && (charCode < 48 || charCode > 57)) {
        status = "This field accepts numbers only."
        return false
    }
    status = ""
    return true
}
</SCRIPT>
</HEAD>

<BODY>
<H1>Letting Only Numbers Pass to a Form Field</H1>
<HR>
<FORM onSubmit="return false">
Enter any positive integer: <INPUT TYPE="text" NAME="numeric"
    onKeyPress="return checkIt(event)">
</FORM>
</BODY>
</HTML>
```

Keyboard event monitoring isn't practical for most validation actions, however. For example, if the user is supposed to enter an e-mail address, you need to validate the complete entry for the presence of an `@` symbol (via the `onChange` event handler). On the other hand, you can be granular about your validations and use both the `onChange` and `onKeyPress` event handlers; you employ the latter for blocking invalid characters in e-mail addresses (such as spaces).

Batch mode validation

In all scriptable browsers, the `onSubmit` event handler cancels the submission if the handler evaluates to `return false`. Additional submission event cancelers include setting the IE4+ `event.returnValue` property to `false` and invoking the *`evt`*`.preventDefault()` method in NN6 (see Chapter 29 on event objects for details). You can see an example of the basic `return false` behavior in Listing 23-4 of Chapter 23. That example uses the results of a `window.confirm()` dialog box to determine the return value of the event handler. But you can also use a return value from a series of individual text box validation functions. If any one of the validations fails, the user is alerted and the submission is canceled.

Before you worry about two versions of validation routines loading down the scripts in your page, you'll be happy to know that you can reuse the same validation routines in both the real-time and batch validations. Later in this chapter, I demonstrate what I call "industrial-strength" data-entry validation adapted from a real intranet application. But before you get there, you should learn about general validation techniques that you can apply to both types of validations.

Designing Filters

The job of writing data-validation routines essentially involves designing filters that weed out characters or entries that don't fit your programming scheme. Whenever your filter detects an incorrect entry, it should alert the user about the nature of the problem and enable the user to correct the entry.

Before you put a text or TEXTAREA object into your document that invites users to enter data, you must decide if any possible entry can disturb the execution of the rest of your scripts. For example, if your script must have a number from that field to perform calculations, you must filter out any entry that contains letters or punctuation — except for periods if the program can accept floating-point numbers. Your task is to anticipate every possible entry users can make and allow only those entries your scripts can use.

Not every entry field needs a data-validation filter. For example, you may prompt a user for information that is eventually stored as a `document.cookie` or in a string database field on the server for future retrieval. If no further processing takes place on that information, you may not have to worry about the specific contents of that field.

One other design consideration is whether a text field is even the proper user interface element for the data required of the user. If the range of choices for a user entry is small (a dozen or fewer), a more sensible method is to avoid the data-entry problem altogether by turning that field into a SELECT element. Your HTML attributes for the object ensure that you control the kind of entry made to that object. As long as your script knows how to deal with each of the options defined for that object, you're in the clear.

Building a Library of Filter Functions

A number of basic data-validation processes function repeatedly in form-intensive HTML pages. Filters for integers only, numbers only, empty entries, alphabet letters only, and the like are put to use every day. If you maintain a library of generalizable functions for each of your data-validation tasks, you can drop these functions into your scripts at a moment's notice and be assured that they will work. For NN3+ and IE4+, you can also create the library of validation functions as a separate `.js` library file and link the scripts into any HTML file that needs them.

Making validation functions generalizable requires careful choice of wording and logic so that they return Boolean values that make syntactical sense when called from elsewhere in your scripts. As you see later in this chapter, when you build a larger framework around smaller functions, each function is usually called as part of an `if...else` conditional statement. Therefore, assign a name that fits logically as part of an `if` clause in plain language. For example, you can name a function that checks whether an entry is empty `isEmpty()`. The calling statement for this function is:

```
if (isEmpty(value)) { ... }
```

From a plain-language perspective, the expectation is that the function returns `true` if the passed value is empty. With this design, the statements nested in the `if` construction handle empty entry fields. I revisit this design later in this chapter when I start stacking multiple-function calls together in a larger validation routine.

To get you started with your library of validation functions, this chapter provides some building blocks that you can learn from and use as starting points for more specific filters of your own design. Some of these functions are put to use in the JavaScript application in Chapter 50.

isEmpty()

This first function, shown in Listing 43-2, checks to see if the incoming value is either empty or `null`. Adding a check for `null` means that you can use this function for purposes other than just text-object validation. For example, if another function defines three parameter variables, but the calling function passes only two, the third variable is set to `null`. If the script then performs a data-validation check on all parameters, the `isEmpty()` function responds that the `null` value is devoid of data.

Listing 43-2: **Is an Entry Empty or Null?**

```
// general purpose function to see if an input value has been
// entered at all
function isEmpty(inputStr) {
    if (inputStr == null || inputStr == "") {
        return true
    }
    return false
}
```

This function uses a Boolean OR operator (`||`) to test for the existence of a `null` value or an empty string in the value passed to the function. Because the name of the function implies a `true` response if the entry is empty, that value is the one that returns to the calling statement if either condition is true. Because a `return` statement halts further processing of a function, the `return false` statement lies outside of the `if` construction. If processing reaches this statement, the `inputStr` value has failed the test.

If this seems like convoluted logic — `return true` when the value is empty — you can also define a function that returns the inverse values. You can name it `isNotEmpty()`. As it turns out, however, typical processing of an empty entry is better served when the test returns a `true` than when the value is empty — aiding the `if` construction that calls the function in the first place.

isPosInteger()

This next function examines each character of the value to make sure that only numbers from 0 through 9 with no punctuation or other symbols exist. The goal of the function in Listing 43-3 is to weed out any value that is not a positive integer.

Listing 43-3: **Test for Positive Integers**

```
// general purpose function to see if a suspected numeric input
// is a positive integer
function isPosInteger(inputVal) {
    inputStr = inputVal.toString()
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.charAt(i)
        if (oneChar < "0" || oneChar > "9") {
            return false
        }
    }
    return true
}
```

Notice that this function makes no assumption about the data type of the value that is passed as a parameter. If the value had come directly from a text object, it would already be a string and the line that forced data conversion to a string would be unnecessary. But to generalize the function, the conversion is included to accommodate the possibility that it may be called from another statement that has a numeric value to check.

The function requires you to convert the input value to a string because it performs a character-by-character analysis of the data. A `for` loop picks apart the value one character at a time. Rather than force the script to invoke the *`string`*`.charAt()` method twice for each time through the loop (inside the `if` condition), one statement assigns the results of the method to a variable, which is then used twice in the `if` condition. Placing the results of the `charAt()` method into a variable makes the `if` condition shorter and easier to read and also is microscopically more efficient.

In the `if` condition, the ASCII value of each character is compared against the range of 0 through 9. This method is safer than comparing numeric values of the single characters because one of the characters can be nonnumeric. (You can encounter all kinds of other problems trying to convert that character to a number for numeric comparison.) The ASCII value, on the other hand, is neutral about the meaning of a character: If the ASCII value is less than 0 or greater than 9, the character is not valid for a genuine positive integer. The function bounces the call with a false reply. On the other hand, if the `for` loop completes its traversal of all characters in the value without a hitch, the function returns `true`.

You may wonder why this validation function doesn't use the `parseInt()` global function (Chapter 42). That function returns `NaN` only if the first character of the input string is not a number. But because `parseInt()` and `parseFloat()` peel off any initial numeric values from a string, neither returns `NaN` if the input string is, for example, `35a`.

isInteger()

The next possibility includes the entry of a negative integer value. Listing 43-4 shows that you must add an extra check for a leading negation sign.

Listing 43-4: **Checking for Leading Minus Sign**

```
// general purpose function to see if a suspected numeric input
// is a positive or negative integer
function isInteger(inputVal) {
    inputStr = inputVal.toString()
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.charAt(i)
        if (i == 0 && oneChar == "-") {
            continue
        }
        if (oneChar < "0" || oneChar > "9") {
            return false
        }
    }
    return true
}
```

When a script can accept a negative integer, the filter must enable the leading minus sign to pass unscathed. You cannot just add the minus sign to the `if` condition of Listing 43-3 because you can accept that symbol only when it appears in the first position of the value—anywhere else makes the value an invalid number. To handle the possibility of a leading minus sign, you add another `if` statement whose condition looks for a special combination: the first character of the string (as indexed by the loop-counting variable) and the minus character. If both of these conditions are met, execution immediately loops back around to the update expression of the `for` loop (because of the `continue` statement) rather than carrying out the second `if` statement, which would obviously fail. By putting the `i == 0` comparison operation at the front of the condition, you ensure the entire condition short circuits to `false` for all subsequent iterations through the loop.

isNumber()

The final numeric filter function in this series enables any integer or floating-point number to pass while filtering out all others (Listing 43-5). All that distinguishes an integer from a floating-point number for data-validation purposes is the decimal point.

Listing 43-5: Testing for a Decimal Point

```
// general purpose function to see if a suspected numeric input
// is a positive or negative number
function isNumber(inputVal) {
    oneDecimal = false
    inputStr = inputVal.toString()
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.charAt(i)
        if (i == 0 && oneChar == "-") {
            continue
        }
        if (oneChar == "." && !oneDecimal) {
            oneDecimal = true
            continue
        }
        if (oneChar < "0" || oneChar > "9") {
            return false
        }
    }
    return true
}
```

Anticipating the worst, however, the function cannot simply treat a decimal point at any position within the string as a valid character. Such an act assumes that no one would ever enter more than one decimal point into a numeric text field. Only one decimal point is allowed for this function (as well as for JavaScript math). Therefore, you add a Boolean flag variable (`oneDecimal`) to the function and a separate `if` condition that sets that flag to `true` when the function encounters the first decimal point. Should another decimal point appear in the string, the final `if` statement gets a crack at the character. Because the character falls outside the ASCII range of 0 through 9, it fails the entire function.

If you want to accept only positive floating-point numbers, you can make a new version of this function by removing the statement that lets the leading minus sign through. Be aware that this function works only for values that are not represented in exponential notation.

Custom validation functions

The listings shown so far in this chapter should give you plenty of source material to use in writing customized validation functions for your applications. Listing 43-6 shows an example of such an application-specific variation (extracted from the application in Chapter 50).

Listing 43-6: A Custom Validation Function

```
// function to determine if value is in acceptable range
// for this application
function inRange(inputStr) {
    num = parseInt(inputStr)
    if (num < 1 || num > 586 && num < 596 || num > 599 && num < 700 || num >
728) {
        return false
    }
    return true
}
```

For this application, you need to see if an entry falls within multiple ranges of acceptable numbers. The first statement of the `inRange()` function converts the incoming value to a number (via the `parseInt()` function) so that the value can be compared numerically against maximum and minimum values of several ranges within the database. Following the logic of the previous validation functions, the `if` condition looks for values outside the acceptable range, so it can alert the user and return a `false` value.

The `if` condition is quite a long sequence of operators. As you noticed in the list of operator precedence (Chapter 40), the Boolean AND operator (`&&`) has precedence over the Boolean OR operator (`||`). Therefore, the AND expressions evaluate first, followed by the OR expressions. Parentheses may help you better visualize what's going on in that monster condition:

```
if (num < 1 || (num > 586 && num < 596) ||(num > 599 && num < 700) || num > 728)
```

In other words, you exclude four possible ranges from consideration:

✦ Values less than 1

✦ Values between 586 and 596

✦ Values between 599 and 700

✦ Values greater than 728

Any value for which any one of these tests is true yields a Boolean `false` from this function. Combining all these tests into a single condition statement eliminates the need to construct an otherwise complex series of nested `if` constructions.

Combining Validation Functions

When you design a page that requests a particular kind of text input from a user, you often need to call more than one data-validation function to handle the entire job. For example, if you merely want to test for a positive integer entry, your validation should test for the presence of any entry as well as the validation as an integer.

After you know the kind of permissible data that your script will use after validation, you're ready to plot the sequence of data validation. Because each page's validation task is different, I supply some guidelines to follow in this planning rather than prescribe a fixed route for all to take.

My preferred sequence is to start with examinations that require less work and increase the intensity of validation detective work with succeeding functions. I borrow this tactic from real life: When a lamp fails to turn on, I look for a pulled plug or a burned-out lightbulb before tearing the lamp's wiring apart to look for a short.

Using the data-validation sequence from the data-entry field (which must be a three-digit number within a specified range) in Chapter 50, I start with the test that requires the least amount of work: Is there an entry at all? After my script is ensured an entry of some kind exists, it next checks whether that entry is "all numbers as requested of the user." If so, the script compares the number against the ranges of numbers in the database.

To make this sequence work together efficiently, I create a master validation function consisting of nested `if...else` statements. Each `if` condition calls one of the generalized data-validation functions. Listing 43-7 shows the master validation function.

Listing 43-7: **Master Validation Function**

```
// Master value validator routine
function isValid(inputStr) {
    if (isEmpty(inputStr)) {
        alert("Please enter a number into the field before clicking the
button.")
        return false
    } else {
        if (!isNumber(inputStr)) {
            alert("Please make sure entries are numbers only.")
            return false
        } else {
            if (!inRange(inputStr)) {
                var msg = "Sorry, the number you entered is not part of our
database."
                msg += "Try another three-digit number."
                alert(msg)
                return false
            }
        }
    }
    return true
}
```

This function, in turn, is called by the function that controls most of the work in this application. All that the main function wants to know is whether the entered number is valid. The details of validation are handed off to the `isValid()` function and its special-purpose validation testers.

I construct the logic in Listing 43-7 so that if the input value fails to be valid, the `isValid()` function alerts the user of the problem and returns `false`. That means I have to watch my `true`s and `false`s very carefully.

In the first validation test, an empty value is a bad thing; thus, when the `isEmpty()` function returns `true`, the `isValid()` function returns `false` because an empty string is not a valid entry. In the second test, a number value is good so the logic has to flip 180 degrees. The `isValid()` function returns `false` only if the isNumber() function returns false. But because isNumber() returns true when the value is a number, I switch the condition to test for the opposite results of the isNumber() function by negating the function name (preceding the function with the Boolean NOT (!) operator). This operator works only with a value that evaluates to a Boolean expression — which the isNumber() function always does. The final test for being within the desired range works on the same basis as isNumber(), using the Boolean NOT operator to turn the results of the inRange() function into the method that works best for this sequence.

Finally, if all validation tests fail to find bad or missing data, the entire isValid() function returns true. The statement that calls this function can now proceed with processing, ensured that the value entered by the user will work.

There is one additional point worth reinforcing, especially for newcomers. Although all these functions seem to be passing around the same input string as a parameter, notice that any changes made to the value (such as converting it to a string or number) are kept private to each function. These subfunctions never touch the original value in the calling function — they work only with copies of the original value. Therefore, even after the data validation takes place, the original value is in its original form and ready to go.

Date and Time Validation

You can scarcely open a bigger can of cultural worms than when trying to program around the various date and time formats in use around the world. If you have ever looked through the possible settings in your computer's operating system, you can begin to understand the difficulty of this issue.

Trying to write JavaScript that accommodates all of the world's date and time formats for validation is an enormous, if not wasteful, challenge. It's one thing to validate that a text box contains data in the form xx/xx/xxxx, but there are also valid value concerns that can get very messy on an international basis. For example, while North America typically uses the mm/dd/yyyy format, a large portion of the rest of the world uses dd/mm/yyyy (with different delimiter characters, as well). Therefore, how should your validation routine treat the entry 20/03/2002? Is it incorrect because there are not 20 months in a year; or is it correct as March 20th? To query a user for this kind of information, I suggest you divide the components into individually validated fields (separate text objects for hours and minutes) or make SELECT element entries whose individual values can be assembled at submit time into a hidden date field for processing by the database that needs the date information. (Alternately, you can let your server CGI handle the conversion.)

Despite my encouragement to "divide and conquer" date entries, there may be situations in which you feel it's safe to provide a single text box for date entry (perhaps for a form that is used on a corporate intranet strictly by users in one country). You see some more sophisticated code later in this chapter, but a "quick-and-dirty" solution runs along these lines:

1. Use the entered data (for example, in mm/dd/yyyy format) as a value passed to the new Date() constructor function.
2. From the newly created date object, extract each of the three components (month, day, and year) into separate numeric values (with the help of parseInt()).

3. Compare each of the extracted values against the corresponding date, month, and year values returned by the date object's `getDate()`, `getMonth()`, and `getFullYear()` methods (adjusting for zero-based values of `getMonth()`).

4. If all three pairs of values match, then the entry is apparently valid.

Listing 43-8 puts this action sequence to work. The `validDate()` function receives a reference to the field being checked. A copy of the field's value is made into a date object, and its components are read. If any part of the date conversion or component extraction fails (because of improperly formatted data or unexpected characters), one or more of the variable values becomes `NaN`. This code assumes that the user enters a date in the `mm/dd/yyyy` format, which is the sequence that the `Date` object constructor expects its data. If the user enters `dd/mm/yyyy`, the validation fails for any day beyond the twelfth.

Listing 43-8: **Simple Date Validation**

```
<HTML>
<HEAD>
<TITLE>Simple Date Validation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function validDate(fld) {
    var testMo, testDay, testYr, inpMo, inpDay, inpYr, msg
    var inp = fld.value
    status = ""
    // attempt to create date object from input data
    var testDate = new Date(inp)
    // extract pieces from date object
    testMo = testDate.getMonth() + 1
    testDay = testDate.getDate()
    testYr = testDate.getFullYear()
    // extract components of input data
    inpMo = parseInt(inp.substring(0, inp.indexOf("/")), 10)
    inpDay = parseInt(inp.substring((inp.indexOf("/") + 1),
inp.lastIndexOf("/")), 10)
    inpYr = parseInt(inp.substring((inp.lastIndexOf("/") + 1), inp.length), 10)
    // make sure parseInt() succeeded on input components
    if (isNaN(inpMo) || isNaN(inpDay) || isNaN(inpYr)) {
        msg = "There is some problem with your date entry."
    }
    // make sure conversion to date object succeeded
    if (isNaN(testMo) || isNaN(testDay) || isNaN(testYr)) {
        msg = "Couldn't convert your entry to a valid date. Try again."
    }
    // make sure values match
    if (testMo != inpMo || testDay != inpDay || testYr != inpYr) {
        msg = "Check the range of your date value."
    }
    if (msg) {
        // there's a message, so something failed
        alert(msg)
```

Continued

Listing 43-8 *(continued)*

```
        // work around IE timing problem with alert by
        // invoking a focus/select function through setTimeout();
        // must pass along reference of fld (as string)
        setTimeout("doSelection(document.forms['" +
        fld.form.name + "'].elements['" + fld.name + "'])", 0)
        return false
    } else {
        // everything's OK; if browser supports new date method,
        // show just date string in status bar
        status = (testDate.toLocaleDateString) ? testDate.toLocaleDateString() :
            "Date OK"
        return true
    }
}

// separate function to accommodate IE timing problem
function doSelection(fld) {
    fld.focus()
    fld.select()
}
</SCRIPT>
</HEAD>

<BODY>
<H1>Simple Date Validation</H1>
<HR>
<FORM NAME="entryForm" onSubmit="return false">
Enter any date (mm/dd/yyyy): <INPUT TYPE="text" NAME="startDate"
    onChange="validDate(this)">
</FORM>
</BODY>
</HTML>
```

Selecting Text Fields for Reentry

During both real-time and batch validations, it is especially helpful to the user if your code — upon discovering an invalid entry — not only brings focus to the subject text field, but also selects the content for the user. By preselecting the entire field, you make it easy for the user to just retype the data into the field for another attempt (or to begin using the left and right arrow keys to move the insertion cursor for editing). The reverse type on the field text also helps bring attention to the field. (Not all operating systems display a special rectangle around a focused text field.)

Form fields have both `focus()` and `select()` methods, which you should invoke for the subject field in that order. IE for Windows, however, exhibits undesirable behavior when trying to focus and select a field immediately after you close an alert dialog box. In most cases, the field does not keep its focus or selection. This is a timing problem, but one that you can cure by processing the focus and select actions through a `setTimeout()` method. The bottom of the script code of Listing 43-9 demonstrates how to do this.

Method calls to the form field reside in a separate function (called `doSelection()` in this example). Obviously, the methods need a reference to the desired field, so the `doSelection()` function requires access to that reference. You can use a global variable to accomplish this (set the value in the validation function; read it in the `doSelection()` function), but globals are not elegant solutions to passing transient data. Even though the validation function receives a reference to the field, that is an object reference, and the `setTimeout()` function's first parameter cannot be anything but a string value. Therefore, the reference to the text field provides access to names of both the form and field. The names fill in as index values for arrays so that the assembled string (upon being invoked) evaluates to a valid object reference:

```
"doSelection(document.forms['" + fld.form.name + "'].elements['" + fld.name +
"'])"
```

Notice the generous use of built-in `forms` and `elements` object arrays, which allow the form and field names to assemble the reference without resorting to the onerous `eval()` function.

For timing problems such as this one, no additional time is truly needed to let IE recover from whatever ails it. Thus, the time parameter is set to 0 milliseconds. Using the `setTimeout()` portal is enough to make everything work. There is no penalty for using this construction with NN or IE/Mac, even though they don't need it.

An "Industrial-Strength" Validation Solution

I had the privilege of working on a substantial intranet project that included dozens of forms, often with two or three different kinds of forms displayed simultaneously within a frameset. Data-entry accuracy was essential to the validity of the entire application. My task was to devise a data-entry validation strategy that not only ensured accurate entry of data types for the underlying (SQL) database, but also intelligently prompted users who made mistakes in their data entry.

Structure

From the start, the validation routines were to be in a client-side library linked in from an external `.js` file. That would allow all forms to share the validation functions. Because there were multiple forms displayed in a frameset, it would prove too costly in download time and memory requirements to include the `validations.js` file in every frame's document. Therefore, the library was moved to load in with the frameset. The `<SCRIPT SRC="validations.js"></SCRIPT>` tag set went in the Head portion of the framesetting document.

This logical placement presented a small challenge for the workings of the validations because there had to be two-way conversations between a validation function (in the frameset) and a form element (nested in a frame). The mechanism required that a reference to the frame containing the form element be passed as part of the validation routine so that the validation script could make corrections, automatic formatting, and erroneous field selections from the frameset document's script. (In other words, the frameset script needed a path back to the form element making the validation call.)

Dispatch mechanism

From the specification drawn up for the application, it is clear that there are more than two dozen specific types of validations across all the forms. Moreover, multiple programmers work on different forms. It is helpful to standardize the way validations are called, regardless of the validation type (number, string, date, phone number, and so on).

My idea was to create one `validate()` function that contained parameters for the current frame, the current form element, and the type of validation to perform. This would make it clear to anyone reading the code later that an event handler calling `validate()` performed validation, and the details of the code were in the `validations.js` library file.

In `validations.js`, I converted a string name of a validation type into the name of the function that performs the validation in order to make this idea work. As a bridge between the two, I created what I called a *dispatch lookup table* for all the primary validation routines that would be called from the forms. Each entry of the lookup table had a label consisting of the name of the validation and a method that invoked the function. Listing 43-9 shows an excerpt of the entire lookup table creation mechanism.

Listing 43-9: **Creating the Dispatch Lookup Table**

```
/*
   Begin validation dispatching mechanism
*/
function dispatcher(validationFunc) {
   this.doValidate = validationFunc
}
var dispatchLookup = new Array()
dispatchLookup["isNotEmpty"] = new dispatcher(isNotEmpty)
dispatchLookup["isPositiveInteger"] = new dispatcher(isPositiveInteger)
dispatchLookup["isDollarsOnly8"] = new dispatcher(isDollarsOnly8)
dispatchLookup["isUSState"] = new dispatcher(isUSState)
dispatchLookup["isZip"] = new dispatcher(isZip)
dispatchLookup["isExpandedZip"] = new dispatcher(isExpandedZip)
dispatchLookup["isPhone"] = new dispatcher(isPhone)
dispatchLookup["isConfirmed"] = new dispatcher(isConfirmed)
dispatchLookup["isNY"] = new dispatcher(isNY)
dispatchLookup["isNum16"] = new dispatcher(isNum16)
dispatchLookup["isM90_M20Date"] = new dispatcher(isM90_M20Date)
dispatchLookup["isM70_0Date"] = new dispatcher(isM70_0Date)
dispatchLookup["isM5_P10Date"] = new dispatcher(isM5_P10Date)
dispatchLookup["isDateFormat"] = new dispatcher(isDateFormat)
```

Each entry of the array is assigned a `dispatcher` object, whose custom object constructor assigns a function reference to the object's `doValidate()` method. For these assignment statements to work, their corresponding functions must be defined earlier in the document. You can see some of these functions later in this section.

The link between the form elements and the dispatch lookup table is the `validate()` function, shown in Listing 43-10. A call to `validate()` requires a minimum of three parameters, as shown in the following example:

```
<INPUT TYPE="text" NAME="phone" SIZE="10"
onChange="parent.validate(window, this, 'isPhone')">
```

The first is a reference to the frame containing the document that is calling the function (passed as a reference to the current window). The second parameter is a reference to the form control element itself (using the `this` operator). After that, you see one or more individual validation function names as strings. This last design allows more than one type of validation to take place with each call to `validate()` (for example, in case a field must check for a data type and check that the field is not empty).

Listing 43-10: **Main Validation Function**

```
// main validation function called by form event handlers
function validate(frame, field, method) {
    gFrame = frame
    gField =  window.frames[frame.name].document.forms[0].elements[field.name]
    var args = validate.arguments
    for (i = 2; i < args.length; i++) {
        if (!dispatchLookup[args[i]].doValidate()) {
            return false
        }
    }
    return true
}
```

In the `validate()` function, the frame reference is assigned to a global variable that is declared at the top of the `validations.js` file. Validation functions in this library need this information to build a reference back to a companion field required of some validations (explained later in this section). A second global variable contains a reference to the calling form element. Because the form element reference by itself does not contain information about the frame in which it lives, the script must build a reference out of the information passed as parameters. The reference must work from the framesetting document down to the frame, its form, and form element name. Therefore, I use the `frame` and `field` object references to get their respective names (within the `frames` and `elements` arrays) to assemble the text field's object reference; the resulting value is assigned to the `gField` global variable. I choose to use global variables in this case because passing these two values to numerous nested validation functions could be difficult to track reliably. Instead, the only parameter passed to specific validation functions is the value under test.

Next, the script creates an array of all arguments passed to the `validate()` function. A `for` loop starts with an index value of `2`, the third parameter containing the first validation function name. For each one, the named item's `doValidate()` method is called. If the validation fails, this function returns `false`; but if all validations succeed, then this function returns `true`. Later you see that this function's returned value is the one that allows or disallows a form submission.

Sample validations

Above the dispatching mechanism in the `validations.js` are the validation functions themselves. Many of the named validation functions have supporting utility functions that other named validation functions often use. Because of the eventual large size of this library file (the production version was about 40KB), I organized the functions into two groups: the named functions first, and the utility functions below them (but still before the dispatching mechanism at the bottom of the document).

To demonstrate how some of the more common data types are validated for this application, I show several validation functions and, where necessary, their supporting utility functions. Figure 43-1 shows a sample form that takes advantage of these validations. (You have a chance to try it later in this chapter.) When you are dealing with critical corporate data, you must go to extreme lengths to ensure valid data. And to help users see their mistakes quickly, you need to build some intelligence into validations where possible.

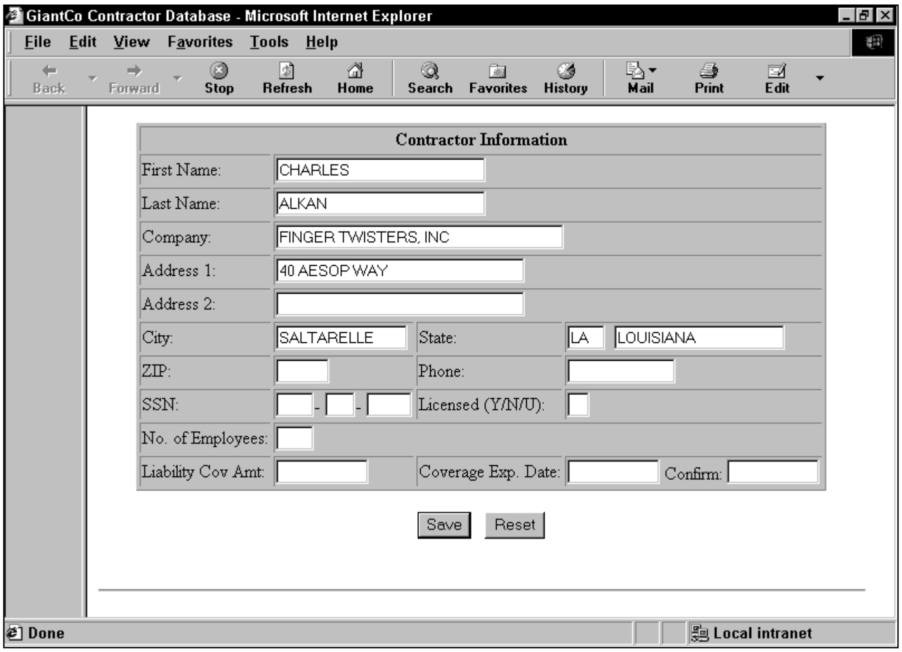

Figure 43-1: Sample form for industrial-strength validations

U.S. state name

The design specification for forms that require entry of a U.S. state calls for entry of the state's two-character abbreviation. A companion field to the right displays the entire state name as user feedback verification. The `onChange` event handler not only calls the validation, but it also feeds the focus to the field following the expanded state field so users are less likely to type into it.

Before the validation can even get to the expansion part, it must first validate that the entry is a valid, two-letter abbreviation. Because I need both the abbreviation and the full state name for this validation, I create an array of all the states using each state abbreviation as the index label for each entry. Listing 43-11 shows that array creation.

Listing 43-11: **Creating a U.S. States Array**

```
// States array
var USStates = new Array(51)
USStates["AL"] = "ALABAMA"
USStates["AK"] = "ALASKA"
USStates["AZ"] = "ARIZONA"
USStates["AR"] = "ARKANSAS"
USStates["CA"] = "CALIFORNIA"
USStates["CO"] = "COLORADO"
USStates["CT"] = "CONNECTICUT"
USStates["DE"] = "DELAWARE"
USStates["DC"] = "DISTRICT OF COLUMBIA"
USStates["FL"] = "FLORIDA"
USStates["GA"] = "GEORGIA"
USStates["HI"] = "HAWAII"
USStates["ID"] = "IDAHO"
USStates["IL"] = "ILLINOIS"
USStates["IN"] = "INDIANA"
USStates["IA"] = "IOWA"
USStates["KS"] = "KANSAS"
USStates["KY"] = "KENTUCKY"
USStates["LA"] = "LOUISIANA"
USStates["ME"] = "MAINE"
USStates["MD"] = "MARYLAND"
USStates["MA"] = "MASSACHUSETTS"
USStates["MI"] = "MICHIGAN"
USStates["MN"] = "MINNESOTA"
USStates["MS"] = "MISSISSIPPI"
USStates["MO"] = "MISSOURI"
USStates["MT"] = "MONTANA"
USStates["NE"] = "NEBRASKA"
USStates["NV"] = "NEVADA"
USStates["NH"] = "NEW HAMPSHIRE"
USStates["NJ"] = "NEW JERSEY"
USStates["NM"] = "NEW MEXICO"
USStates["NY"] = "NEW YORK"
USStates["NC"] = "NORTH CAROLINA"
USStates["ND"] = "NORTH DAKOTA"
USStates["OH"] = "OHIO"
USStates["OK"] = "OKLAHOMA"
USStates["OR"] = "OREGON"
USStates["PA"] = "PENNSYLVANIA"
USStates["RI"] = "RHODE ISLAND"
USStates["SC"] = "SOUTH CAROLINA"
```

Continued

Listing 43-11 *(continued)*

```
USStates["SD"] = "SOUTH DAKOTA"
USStates["TN"] = "TENNESSEE"
USStates["TX"] = "TEXAS"
USStates["UT"] = "UTAH"
USStates["VT"] = "VERMONT"
USStates["VA"] = "VIRGINIA"
USStates["WA"] = "WASHINGTON"
USStates["WV"] = "WEST VIRGINIA"
USStates["WI"] = "WISCONSIN"
USStates["WY"] = "WYOMING"
```

The existence of this array comes in handy in determining if the user enters a valid, two-state abbreviation. Listing 43-12 shows the actual `isUSState()` validation function that puts this array to work.

The function's first task is to assign an uppercase version of the entered value to a local variable (`inputStr`), which is the value being analyzed throughout the rest of the function. If the user enters something in the field (`length > 0`) but no entry in the `USStates` array exists for that value, the entry is not a valid state abbreviation. Time to go to work to help out the user.

Listing 43-12: **Validation Function for U.S. States**

```
// input value is a U.S. state abbreviation; set entered value to all uppercase
// also set companion field (NAME="<xxx>_expand") to full state name
function isUSState() {
    var inputStr = gField.value.toUpperCase()
    if (inputStr.length > 0 && USStates[inputStr] == null) {
        var msg = ""
        var firstChar = inputStr.charAt(0)
        if (firstChar == "A") {
            msg += "\n(Alabama = AL; Alaska = AK; Arizona = AZ; Arkansas = AR)"
        }
        if (firstChar == "D") {
            msg += "\n(Delaware = DE; District of Columbia = DC)"
        }
        if (firstChar == "I") {
            msg += "\n(Idaho = ID; Illinois = IL; Indiana = IN; Iowa = IA)"
        }
        if (firstChar == "M") {
            msg += "\n(Maine = ME; Maryland = MD; Massachusetts = MA;  " +
                      "Michigan = MI; Minnesota = MN; Mississippi = MS; " +
                      "Missouri = MO; Montana = MT)"
        }
        if (firstChar == "N") {
            msg += "\n(Nebraska = NE; Nevada = NV)"
        }
        alert("Check the spelling of the state abbreviation." + msg)
        gField.focus()
        gField.select()
        return false
```

```
    }
    gField.value = inputStr
    var expandField = 
window.frames[gFrame.name].document.forms[0].elements[gField.name + "_expand"]
    expandField.value = USStates[inputStr]
    return true
}
```

The function assumes that the user tried to enter a valid state abbreviation but either had incorrect source material or momentarily forgot a particular state's abbreviation. Therefore, the function examines the first letter of the entry. If that first letter is any one of the five identified as causing the most difficulty, a legend for all states beginning with that letter is assigned to the `msg` variable (for running on newer browsers only, a `switch` construction is preferred). An alert message displays the generic alert, plus any special legend if one is assigned to the `msg` variable. When the user closes the alert, the field has focus and its text is selected. (This application runs solely on Navigator, so the IE `setTimeout()` workaround isn't needed — but you can add it very easily, especially thanks to the global variable reference for the field.) The function returns `false` at this point.

If, on the other hand, the abbreviation entry is a valid one, the field is handed the uppercase version of the entry. The script then uses the two global variables set in `validate()` to create a reference to the expanded display field (whose name must be the same as the entry field plus `"_expand"`). That expanded display field is then supplied the `USStates` array entry value corresponding to the abbreviation label. All is well with this validation, so it returns `true`.

You can see here that the so-called validation routine is doing far more than simply checking validity of the data. By communicating with the field, converting its contents to uppercase, and talking to another field in the form, a simple call to the validation function yields a lot of mileage.

Date validation

Many of the forms in this application have date fields. In fact, dates are an important part of the data maintained in the database behind the forms. All users of this application are familiar with standard date formats in use in the United States, so I don't have to worry about the possibility of cultural variations in date formats. Even so, I want the date entry to accommodate the common date formats, such as `mmddyyyy`, `mm/dd/yyyy`, and `mm-dd-yyyy` (as well as accommodate two-digit year entries spanning 1930 to 2029).

The plan also calls for going further in helping users enter dates within certain ranges. For example, a field used for a birth date (the listings are for medical professionals) should recommend dates starting no more than 90 years, and no less than 20 years, from the current date. And to keep this application running well into the future, the ranges should be on a sliding scale from the current year, no matter when it might be. Whatever the case, the date range validation is only a recommendation and not a transaction stopper.

Rather than create separate validation functions for each date field, I create a system of reusable validation functions for each date range (several fields on different forms require the same date ranges). Each one of these individual functions calls a single, generic date-validation function that handles the date-range checking. Listing 43-13 shows a few examples of these individual range-checking functions.

Listing 43-13: **Date Range Validations**

```
// Date Minus 90/Minus 20
function isM90_M20Date() {
    if (gField.value.length == 0) return true
    var thisYear = getTheYear()
    return isDate((thisYear - 90),(thisYear - 20))
}

// Date Minus 70/Minus 0
function isM70_0Date() {
    if (gField.value.length == 0) return true
    var thisYear = getTheYear()
    return isDate((thisYear - 70),(thisYear))
}

// Date Minus 5/Plus 10
function isM5_P10Date() {
    if (gField.value.length == 0) return true
    var thisYear = getTheYear()
    return isDate((thisYear - 5),(thisYear + 10))
}
```

The naming convention I create for the functions includes the two range components relative to the current date. A letter “M” means the range boundary is minus a number of years from the current date; “P” means the range is plus a number of years. If the boundary should be the current year, a zero is used. Therefore, the `isM5_P10Date()` function performs range checking for boundaries between 5 years before and 10 years after the current year.

Before performing any range checking, each function makes sure there is some value to validate. If the field entry is empty, the function returns `true`. This is fine here because dates are not required when the data is unknown.

Next, the functions get the current four-digit year. The code here had to work originally with browsers that did not have the `getFullYear()` method available yet. Therefore, the Y2K fix described in Chapter 36 was built into the application:

```
function getTheYear() {
    var thisYear = (new Date()).getYear()
    thisYear = (thisYear < 100)? thisYear + 1900: thisYear
    return thisYear
}
```

The final call from the range validations is to a common `isDate()` function, which handles not only the date range validation but also the validation for valid dates (for example, making sure that September has only 30 days). Listing 43-14 shows this monster-sized function. Because of the length of this function, I interlace commentary within the code listing.

Listing 43-14: Primary Date Validation Function

```
// date field validation (called by other validation functions that specify
minYear/maxYear)
function isDate(minYear,maxYear,minDays,maxDays) {
    var inputStr = gField.value
```

To make it easier to work with dates supplied with delimiters, I first convert hyphen delimiters to slash delimiters. The pre-regular expression `replaceString()` function is the same one described in Chapter 34; it is located in the utility functions part of the `validations.js` file.

```
    // convert hyphen delimiters to slashes
    while (inputStr.indexOf("-") != -1) {
        inputStr = replaceString(inputStr,"-","/")
    }
```

For validating whether the gross format is OK, I check whether zero or two delimiters appear. If the value contains only one delimiter, then the overall formatting is not acceptable. The error alert shows models for acceptable date-entry formats.

```
    var delim1 = inputStr.indexOf("/")
    var delim2 = inputStr.lastIndexOf("/")
    if (delim1 != -1 && delim1 == delim2) {
        // there is only one delimiter in the string
        alert("The date entry is not in an acceptable format.\n\nYou can enter
dates in the following formats: mmddyyyy, mm/dd/yyyy, or mm-dd-yyyy.  (If the
month or date data is not available, enter \'01\' in the appropriate
location.)")
        gField.focus()
        gField.select()
        return false
    }
```

If there are two delimiters, I tear apart the string into components for month, day, and year. Because two-digit entries can begin with zeros, I make sure the `parseInt()` functions specify base-10 conversions.

```
    if (delim1 != -1) {
        // there are delimiters; extract component values
        var mm = parseInt(inputStr.substring(0,delim1),10)
        var dd = parseInt(inputStr.substring(delim1 + 1,delim2),10)
        var yyyy = parseInt(inputStr.substring(delim2 + 1, inputStr.length),10)
```

For no delimiters, I tear apart the string and assume two-digit entries for the month and day and two or four digits for the year.

```
    } else {
        // there are no delimiters; extract component values
        var mm = parseInt(inputStr.substring(0,2),10)
        var dd = parseInt(inputStr.substring(2,4),10)
        var yyyy = parseInt(inputStr.substring(4,inputStr.length),10)
    }
```

The parseInt() functions reveal whether any entry is not a number by returning NaN, so I check whether any of the three values is not a number. If so, then an alert signals the formatting problem and supplies acceptable models.

```
    if (isNaN(mm) || isNaN(dd) || isNaN(yyyy)) {
        // there is a non-numeric character in one of the component values
        alert("The date entry is not in an acceptable format.\n\nYou can enter
dates in the following formats: mmddyyyy, mm/dd/yyyy, or mm-dd-yyyy.")
        gField.focus()
        gField.select()
        return false
    }
```

Next, I perform some gross range validation on the month and date to make sure that months are entered from 1 to 12 and dates from 1 to 31. I take care of aligning exact month lengths later.

```
    if (mm < 1 || mm > 12) {
        // month value is not 1 thru 12
        alert("Months must be entered between the range of 01 (January) and 12
(December).")
        gField.focus()
        gField.select()
        return false
    }
    if (dd < 1 || dd > 31) {
        // date value is not 1 thru 31
        alert("Days must be entered between the range of 01 and a maximum of 31
(depending on the month and year).")
        gField.focus()
        gField.select()
        return false
    }

    // validate year, allowing for checks between year ranges
    // passed as parameters from other validation functions
```

Before getting too deep into the year validation, I convert any two-digit year within the specified range to its four-digit equivalent.

```
    if (yyyy < 100) {
        // entered value is two digits, which we allow for 1930-2029
        if (yyyy >= 30) {
            yyyy += 1900
        } else {
            yyyy += 2000
        }
    }

    var today = new Date()
```

I designed this function to work with a pair of year ranges or date ranges (so many days before and/or after today). If the function is passed date ranges, then the first two parameters must be passed as null. This first batch of code works with the date ranges (because the minYear parameter is null).

```
    if (!minYear) {
        // function called with specific day range parameters
        var dateStr = new String(monthDayFormat(mm) + "/" + monthDayFormat(dd) +
        "/" + yyyy)
        var testDate = new Date(dateStr)
        if (testDate.getTime() < (today.getTime() + (minDays * 24 * 60 * 60 *
1000))) {
            alert("The most likely range for this entry begins " + minDays +
            " days from today.")
        }
        if (testDate.getTime() > today.getTime() + (maxDays * 24 * 60 * 60 *
1000)) {
            alert("The most likely range for this entry ends " + maxDays +
            " days from today.")
        }
```

You can also pass hard-wired, four-digit years as parameters. The following branch compares the entered year against the range specified by those passed year values.

```
    } else if (minYear && maxYear) {
        // function called with specific year range parameters
        if (yyyy < minYear || yyyy > maxYear) {
            // entered year is outside of range passed from calling function
            alert("The most likely range for this entry is between the years " +
minYear + " and " + maxYear + ".  If your source data indicates a date outside
this range, then enter that date.")
        }
    } else {
```

For year parameters passed as positive or negative year differences, I begin processing by getting the four-digit year for today's date. Then I compare the entered year against the passed range values. If the entry is outside the desired range, an alert reveals the preferred year range within which the entry should fall. But the function does not return any value here because an out-of-range value is not critical for this application.

```
        // default year range (now set to (this year - 100) and (this year +
25))
        var thisYear = today.getYear()
        if (thisYear < 100) {
        thisYear += 1900
        }
        if (yyyy < minYear || yyyy > maxYear) {
            alert("It is unusual for a date entry to be before " + minYear + "
or after " + maxYear + ". Please verify this entry.")
        }
    }
```

One more important validation is to make sure that the entered date is valid for the month and year. Therefore, the various date components are passed to functions to check against month lengths, including the special calculations for the varying length of February. Listing 43-15 shows these functions. The alert messages they display are smart enough to inform the user what the maximum date is for the entered month and year.

```
    if (!checkMonthLength(mm,dd)) {
        gField.focus()
        gField.select()
        return false
    }
    if (mm == 2) {
        if (!checkLeapMonth(mm,dd,yyyy)) {
            gField.focus()
            gField.select()
            return false
        }
    }
```

The final task is to reassemble the date components into a format that the database wants for its date storage and stuff it into the form field. If the user enters an all-number or hyphen-delimited date, it is automatically reformatted and displayed as a slash-delimited, four-digit-year date.

```
    // put the Informix-friendly format back into the field
    gField.value = monthDayFormat(mm) + "/" + monthDayFormat(dd) + "/" + yyyy
    return true
}
```

A utility function invoked multiple times in the previous function converts a single-digit month or day number to a string that might have a leading zero:

```
// convert month or day number to string,
// padding with leading zero if needed
function monthDayFormat(val) {
    if (isNaN(val) || val == 0) {
        return "01"
    } else if (val < 10) {
        return "0" + val
    }
    return "" + val
}
```

Listing 43-15: **Functions to Check Month Lengths**

```
// check the entered month for too high a value
function checkMonthLength(mm,dd) {
    var months = new Array("","January","February","March","April","May","June",
"July","August","September","October","November","December")
    if ((mm == 4 || mm == 6 || mm == 9 || mm == 11) && dd > 30) {
        alert(months[mm] + " has only 30 days.")
        return false
    } else if (dd > 31) {
        alert(months[mm] + " has only 31 days.")
        return false
    }
    return true
}
```

```
// check the entered February date for too high a value
function checkLeapMonth(mm,dd,yyyy) {
    if (yyyy % 4 > 0 && dd > 28) {
        alert("February of " + yyyy + " has only 28 days.")
        return false
    } else if (dd > 29) {
        alert("February of " + yyyy + " has only 29 days.")
        return false
    }
    return true
}
```

This is a rather extensive date-validation routine, but it demonstrates how thorough you must be when a database relies on accurate entries. The more prompting and assistance you can give to users to ferret out problems with invalid entries, the happier those users will be.

Cross-confirmation fields

The final validation type that I cover here is probably not a common request, but it demonstrates how the dispatch mechanism created at the outset expands so easily to accommodate this enhanced client request. The situation is that some fields (mostly dates in this application) are deemed critical pieces of data because this data triggers other processes from the database. As a further check to ensure entry of accurate data, a number of values are set up for entry twice in separate fields — and the fields have to match exactly. In many ways, this mirrors the two passes you are often requested to make when you set a password: enter two copies and let the computer compare them to make sure you typed what you intended to type.

I established a system that places only one burden on the many programmers working on the forms: while you can name the primary field anything you want (to help alignment with database column names, for example), you must name the secondary field the same plus `"_xcfm"` — which stands for *cross-confirm*. Then, pass the `isConfirmed` validation name to the `validate()` function after the date range validation name, as follows:

```
onChange="parent.validate(window, this, 'isM5_P10Date','isConfirmed')"
```

In other words, after the entered value is initially checked against a required date range, the `isConfirmed()` validation function compares the fully vetted, properly formatted date in the current field against its parallel entry.

Listing 43-16 shows the one function in `validations.js` that handles the confirmation in both directions. After assigning a copy of the entry field value to the `inputStr` variable, the function next sets a Boolean flag (`primary`) that lets the rest of the script know if the entry field is the primary or secondary field. If the string `"_xcfm"` is missing from the field name, then the entry field is the primary field.

For the primary field branch, the script assembles the name of the secondary field and compares the content of the secondary field's value against the `inputStr` value. If they are not the same, the user is entering a new value into the primary field, and the script empties the secondary field to force reentry to verify that the user enters the proper data.

For the secondary field entry branch, the script assembles a reference to the primary field by stripping away the final five characters of the secondary field's name. I can use the `lastIndexOf()` string method instead of the longer way involving the string's length; but after experiencing so many platform-specific problems with `lastIndexOf()` in Navigator, I decided to play it safe. Finally, the two values are compared, with an appropriate alert displayed if they don't match.

Listing 43-16: Cross-Confirmation Validation

```
// checks an entry against a parallel, duplicate entry to
// confirm that correct data has been entered
// Parallel field name must be the main field name plus "_xcfm"
function isConfirmed() {
    var inputStr = gField.value
    // flag for whether field under test is primary (true) or confirmation field
    var primary = (gField.name.indexOf("_xcfm") == -1)
    if (primary) {
        // clear the confirmation field if primary field is changed
        var xcfmField =
window.frames[gFrame.name].document.forms[0].elements[gField.name + "_ xcfm"]
        var xcfmValue = xcfmField.value
        if (inputStr != xcfmValue) {
            xcfmField.value = ""
            return true
        }
    } else {
        var xcfmField =
window.frames[gFrame.name].document.forms[0].elements[gField.name.substring(0,(g
Field.name.length-5))]
var xcfmValue = xcfmField.value
        if (inputStr != xcfmValue) {
            alert("The main and confirmation entry field contents do not match.
Both fields must have EXACTLY the same content to be accepted by the database.")
            gField.focus()
            gField.select()
            return false
        }
    }
    return true
 }
```

Last-minute check

Every validation event handler is designed to return `true` if the validation succeeds. This comes in handy for the batch validation that performs one final check of the entries triggered by the form's `onSubmit` event handler. This event handler calls a `checkForm()` function and passes the form control object as a parameter. That parameter helps create a reference to the form element that is passed to each validation function.

Because successful validations return `true`, you can nest consecutive validation tests so that the most nested statement of the construction is `return true` because all validations have succeeded. The form's `onSubmit` event handler is as follows:

```
onSubmit="return checkForm(this)"
```

And the following code fragment is an example of a `checkForm()` function. A separate `isDateFormat()` validation function called here checks whether the field contains an entry in the proper format — meaning that it has likely survived the range checking and format shifting of the real-time validation check.

```
function checkForm(form) {
    if (parent.validate(window, form.birthdate, "isDateFormat")) {
        if (parent.validate(window, form.phone, "isPhone")) {
            if (parent.validate(window, form.name, "isNotEmpty")) {
                return true
            }
        }
    }
    return false
}
```

If any one validation fails, the field is given focus and its content is selected (controlled by the individual validation function). In addition, the `checkForm()` function returns `false`. This, in turn, cancels the form submission.

Try it out

Listing 43-17 is a definition for a frameset that not only loads the validation routines described in this section, but also loads a page with a form that exercises the validations in real-time and batch mode just prior to submission. The form appears earlier in this chapter in Figure 43-1.

Listing 43-17: **Frameset for Trying validation.js**

```
<HTML>
<HEAD>
<TITLE>GiantCo Contractor Database</TITLE>
<SCRIPT LANGUAGE="JavaScript" SRC="validation.js"></SCRIPT>
<SCRIPT LANGUAGE="JavaScript">
function blank() {
    return "<HTML><BODY BGCOLOR='lightsteelblue'></BODY></HTML>"
}
</SCRIPT>
</HEAD>
    <FRAMESET FRAMEBORDER COLS="20%,80%">
        <FRAME NAME="toc" SRC="javascript:parent.blank()">
        <FRAME NAME="entries" SRC="lst43-18.htm">
    </FRAMESET>
</FRAMESET>
</HTML>
```

The application scenario for the form is the entry of data into a company's contractor database. Some fields are required, and the date field must be cross-confirmed with a second entry of the same data. If the form passes its final validation prior to submission, the form reloads and you see a readout of the form data that would have been submitted from the previous form had the ACTION been set to a server CGI program URI.

Plan for Data Validation

I devoted this entire chapter to the subject of data validation because it represents the one area of error checking that almost all JavaScript authors should be concerned with. If your scripts (client-side or server-side) perform processing on user entries, you want to prevent script errors at all costs.

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CHAPTER 44

Scripting Java Applets and Plug-ins

✦ ✦ ✦ ✦

In This Chapter

Communicating with Java applets from scripts

Accessing scripts and objects from Java applets

Controlling scriptable plug-ins

✦ ✦ ✦ ✦

Netscape was the first to implement the facility enabling JavaScript scripts, Java applets, and plug-ins to communicate with each other under one technology umbrella, called LiveConnect (first implemented in NN3). Microsoft met the challenge and implemented a large part of that technology for IE4/Windows, but of course without using the Netscape-trademarked name for the technology. The name is a convenient way to refer to the capability, so you find it used throughout this chapter applying to both NN and IE browsers that support such facilities. This chapter focuses on the scripting side of LiveConnect: approaching applets and plug-ins from scripts and accessing scripts from Java applets.

Except for the part about talking to scripts from inside a Java applet, I don't assume you have any knowledge of Java programming. The primary goal here is to help you understand how to control applets and plug-ins (including ActiveX controls in IE/Windows) from your scripts. If you're in a position to develop specifications for applets, you also learn what to ask of your Java programmers. But if you are also a Java applet programmer, you learn the necessary skills to get your applets in touch with HTML pages and scripts.

LiveConnect Overview

Before you delve too deeply into the subject, you should be aware that LiveConnect features are not available in all modern browsers, much to the chagrin of many. The following browsers do not support this technology:

✦ IE/Macintosh (at least through Version 5)

✦ NN4.6 (due to an oversight when the version was released)

✦ NN6.0 (work is afoot to include it in later versions)

Such a broad swath of browsers not supporting the feature (especially the IE for Macintosh, which has been factory-installed as the default browser on millions of Macs), makes it difficult to design a public Web application that relies on LiveConnect features. Design your pages accordingly.

The internal mechanisms that allow scripts to communicate with applets and plug-ins are quite different for NN and IE. NN3 and NN4 relied exclusively on the Java virtual machine (JVM) that shipped with most OS platform versions of the browsers. In NN4+, the JVM doesn't load until it is needed, sometimes causing a brief delay in initial execution. For the most part, though, the underlying Java engine is invisible to the scripter (you) and certainly to the visitors of your sites. At most, visitors see statusbar messages about applets loading and running.

IE/Windows, on the other hand, has its own internal architecture for communicating between processes. To Windows, most processes are treated as components that have properties and methods accessible to other components.

Whether you use the technology to communicate with a Java applet or an ActiveX control, the advantage to you as an author is that LiveConnect extends the document object model to include objects and data types that are not a part of the HTML world. HTML, for instance, does not have a form element that displays real-time stock ticker data; nor does HTML have the capability to treat a sound file like anything more than a URL to be handed off to a helper application. With LiveConnect, however, your scripts can treat the applet that displays the stock ticker as an object whose properties and methods can be modified after the applet loads; scripts can also tell the sound when to play or pause by controlling the plug-in that manages the incoming sound file.

Why Control Java Applets?

A question I often hear from experienced Java programmers is, "Why bother controlling an applet via a script when you can build all the interactivity you want into the applet itself?" This question is valid if you come from the Java world, but it takes a viewpoint from the HTML and scripting world to fully answer it.

Java applets exist in their own private rectangles, remaining largely oblivious to the HTML surroundings on the page. Applet designers who don't have extensive Web page experience tend to regard their applets as the center of the universe rather than as components of HTML pages.

As a scripter, on the other hand, you may want to use those applets as powerful components to spiff up the overall presentation. Using applets as prewritten objects enables you to make simple changes to the HTML pages — including the geographic layout of elements and images — at the last minute, without having to rewrite and recompile Java program code. If you want to update the look with an entirely new graphical navigation or control bar, you can do it directly via HTML and scripting.

When it comes to designing or selecting applets for inclusion into my scripted page, I prefer using applet interfaces that confine themselves to data display, putting any control of the data into the hands of the script, rather than using onscreen buttons in the applet rectangle. I believe this setup enables much greater last-minute flexibility in the page design — not to mention consistency with HTML form element interfaces — than putting everything inside the applet rectangle.

A Little Java

If you plan to look at a Java applet's scripted capabilities, you can't escape having to know a little about Java applets and some terminology. The discussion goes more deeply into object orientation than you have seen with JavaScript, but I'll try to be gentle.

Java building blocks classes

One part of Java that closely resembles JavaScript is that Java programming deals with objects, much the way JavaScript deals with a page's objects. Java objects, however, are not the familiar HTML objects but rather more basic building blocks, such as tools that draw to the screen and data streams. But both languages also have some non-HTML kinds of objects in common: strings, arrays, numbers, and so on.

Every Java object is known as a class — a term from the object-orientation world. When you use a Java compiler to generate an applet, that applet is also a class, which happens to incorporate many Java classes, such as strings, image areas, font objects, and the like. The applet file you see on the disk is called a class file, and its file extension is `.class`. This file is the one you specify for the CODE attribute of an `<APPLET>` tag.

Java methods

Most JavaScript objects have methods attached to them that define what actions the objects are capable of performing. A string object, for instance, has the `toUpperCase()` method that converts the string to all uppercase letters. Java classes also have methods. Many methods are predefined in the base Java classes embedded inside the virtual machine. But inside a Java applet, the author can write methods that either override the base method or deal exclusively with a new class created in the program. These methods are, in a way, like the functions you write in JavaScript for a page.

Not all methods, however, are created the same. Java lets authors determine how visible a method is to outsiders. The types of methods that you, as a scripter, are interested in are the ones declared as public methods. You can access such methods from JavaScript via a syntax that falls very much in line with what you already know. For example, a common public method in applets stops an applet's main process. Such a Java method may look such as this:

```
public void stop() {
    if(thread != null) {
        thread.stop();
        thread = null;
    }
}
```

The `void` keyword simply means that this method does not return any values (compilers need to know this stuff). Assuming that you have one applet loaded in your page, the JavaScript call to this applet method is

```
document.applets[0].stop()
```

Listing 44-1 shows how all this works with the `<APPLET>` tag for a scriptable digital clock applet example. The script includes calls to two of the applet's methods: to stop and to start the clock.

Listing 44-1: **Stopping and Starting an Applet**

```
<HTML>
<HEAD>
<TITLE>A Script That Could Stop a Clock</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function pauseClock() {
    document.clock1.stop()
}
function restartClock() {
    document.clock1.start()
}
</SCRIPT>
<BODY>
<H1>Simple control over an applet</H1>
<HR>
<APPLET CODE="ScriptableClock.class" NAME="clock1" WIDTH=500 HEIGHT=45>
<PARAM NAME=bgColor VALUE="Green">
<PARAM NAME=fgColor VALUE="Blue">
</APPLET>
<P>
<FORM NAME="widgets1">
<INPUT TYPE="button" VALUE="Pause Clock" onClick="pauseClock()">
<INPUT TYPE="button" VALUE="Restart Clock" onClick="restartClock()">
</FORM>
</BODY>
</HTML>
```

The syntax for accessing the method (in the two functions) is just like JavaScript in that the references to the applet's methods include the applet object (`clock1` in the example), which is contained by the `document` object.

Java applet "properties"

The Java equivalents of JavaScript object properties are called *public instance variables*. These variables are akin to JavaScript global variables. If you have access to some Java source code, you can recognize a public instance variable by its public keyword:

```
public String fontName
```

Java authors must specify a variable's data type when declaring any variable. That's why the `String` data type appears in the preceding example.

Your scripts can access these variables with the same kind of syntax that you use to access JavaScript object properties. If the `fontName` variable in `ScriptableClock.class` had been defined as a public variable (it is not), you could access or set its value directly, as shown in the following example.

```
var theFont = document.applets[0].fontName
document.applets[0].fontName = "Courier"
```

Accessing Java fields

In a bit of confusing lingo, public variables and methods are often referred to as *fields*. These elements are not the kind of text entry fields that you see on the screen; rather, they're like slots (another term used in Java) where you can slip in your requests and data. Remember these terms, because they may appear from time to time in error messages as you begin scripting applets.

Scripting Applets in Real Life

Because the purpose of scripting an applet is to gain access to the inner sanctum of a compiled program, the program should be designed to handle such rummaging around by scripters. If you can't acquire a copy of the source code or don't have any other documentation about the scriptable parts of the applet, you may have a difficult time knowing what to script and how to do it.

Although the applet's methods are reflected as properties in an applet object, writing a `for...in` loop to examine these methods tells you perhaps too much. Figure 44-1 shows a partial listing of such an examination of the ScriptableClock applet. This applet has only public methods (no variables), but the full listing shows the dozens of fields accessible in the applet. What you probably won't recognize, unless you have programmed in Java, is that within the listing are dozens of fields belonging to the Java classes that automatically become a part of the applet during compilation. From this listing, you have no way to distinguish the fields defined or overridden in the applet code from the base Java fields.

fieldName	fieldValue
	[JavaMethod ScriptableClock.]
getInfo	[JavaMethod ScriptableClock.getInfo]
setColor	[JavaMethod ScriptableClock.setColor]
setFont	[JavaMethod ScriptableClock.setFont]
setTimeZone	[JavaMethod ScriptableClock.setTimeZone]
paint	[JavaMethod ScriptableClock.paint]
run	[JavaMethod ScriptableClock.run]
stop	[JavaMethod ScriptableClock.stop]
start	[JavaMethod ScriptableClock.start]
init	[JavaMethod ScriptableClock.init]
destroy	[JavaMethod ScriptableClock.destroy]
play	[JavaMethod ScriptableClock.play]
getParameterInfo	[JavaMethod ScriptableClock.getParameterInfo]
getAppletInfo	[JavaMethod ScriptableClock.getAppletInfo]
getAudioClip	[JavaMethod ScriptableClock.getAudioClip]

Figure 44-1: Partial listing of fields from ScriptableClock

Getting to scriptable methods

If you write your own applets or are fortunate enough to have the source code for an existing applet, the safest way to modify the applet variable settings or the running processes is through applet methods. Although setting a public variable value may enable you to make a desired change, you don't know how that change may impact other parts of the applet. An applet designed for scriptability should have a number of methods defined that enable you to make scripted changes to variable values.

To view a sample of an applet designed for scriptability, open the Java source code file for Listing 44-2 from the CD-ROM. A portion of that program listing is shown in the following example.

Listing 44-2: Partial Listing for ScriptableClock.java

```
/*
    Begin public methods for getting
    and setting data via LiveConnect
*/
public void setTimeZone(String zone) {
    stop();
    timeZone = (zone.startsWith("GMT")) ? true : false;
    start();
}

public void setFont(String newFont, String newStyle, String newSize) {
    stop();
    if (newFont != null && newFont != "")
        fontName = newFont;
    if (newStyle != null && newStyle != "")
        setFontStyle(newStyle);
    if (newSize != null && newSize != "")
        setFontSize(newSize);
    displayFont = new Font(fontName, fontStyle, fontSize);
    start();
}

public void setColor(String newbgColor, String newfgColor) {
    stop();
    bgColor = parseColor(newbgColor);
    fgColor = parseColor(newfgColor);
    start();
}

public String getInfo() {
    String result = "Info about ScriptableClock.class\r\n";
    result += "Version/Date: 1.0d1/2 May 1996\r\n";
    result += "Author: Danny Goodman (dannyg@dannyg.com)\r\n";
    result += "Public Variables:\r\n";
    result += "   (None)\r\n\r\n";
    result += "Public Methods:\r\n";
    result += "   setTimeZone(\"GMT\" | \"Locale\")\r\n";
    result += "   setFont(\"fontName\",\"Plain\" |\"Bold\" | \"Italic\",
\"fontSize\")\r\n";
    result += "   setColor(\"bgColorName\", \"fgColorName\")\r\n";
    result += "       colors: Black, White, Red, Green, Blue, Yellow\r\n";
    return result;
}
/*
    End public methods for scripted access.
*/
```

The methods shown in Listing 44-2 are defined specifically for scripted access. In this case, they safely stop the applet thread before changing any values. The last method is one I recommend to applet authors. The method returns a small bit of documentation containing information about the kind of methods that the applet likes to have scripted and what you can have as the passed parameter values.

Now that you see the amount of scriptable information in this applet, look at Listing 44-3, which takes advantage of that scriptability by providing several HTML form elements as user controls for the clock. The results are shown in Figure 44-2.

Listing 44-3: **A More Fully Scripted Clock**

```
<HTML>
<HEAD>
<TITLE>Clock with Lots o' Widgets</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">

function setTimeZone(popup) {
    var choice = popup.options[popup.selectedIndex].value
    document.clock2.setTimeZone(choice)
}

function setColor(form) {
    var bg =
form.backgroundColor.options[form.backgroundColor.selectedIndex].value
    var fg =
form.foregroundColor.options[form.foregroundColor.selectedIndex].value
    document.clock2.setColor(bg, fg)
}

function setFont(form) {
    var fontName = form.theFont.options[form.theFont.selectedIndex].value
    var fontStyle = form.theStyle.options[form.theStyle.selectedIndex].value
    var fontSize = form.theSize.options[form.theSize.selectedIndex].value
    document.clock2.setFont(fontName, fontStyle, fontSize)
}
function getAppletInfo(form) {
    form.details.value = document.clock2.getInfo()
}
function showSource() {
    var newWindow = window.open("ScriptableClock.java","",
    "WIDTH=450,HEIGHT=300,RESIZABLE,SCROLLBARS")
}

</SCRIPT>
</HEAD>
<BODY>
<APPLET CODE="ScriptableClock.class" NAME="clock2" WIDTH=500 HEIGHT=45>
<PARAM NAME=bgColor VALUE="Black">
<PARAM NAME=fgColor VALUE="Red">
</APPLET>
```

Continued

Listing 44-3 *(continued)*

```
<P>
<FORM NAME="widgets2">
Select Time Zone:
<SELECT NAME="zone" onChange="setTimeZone(this)">
    <OPTION SELECTED VALUE="Locale">Local Time
    <OPTION VALUE="GMT">Greenwich Mean Time
</SELECT><P>
Select Background Color:
<SELECT NAME="backgroundColor" onChange="setColor(this.form)">
    <OPTION VALUE="White">White
    <OPTION SELECTED VALUE="Black">Black
    <OPTION VALUE="Red">Red
    <OPTION VALUE="Green">Green
    <OPTION VALUE="Blue">Blue
    <OPTION VALUE="Yellow">Yellow
</SELECT>
Select Color Text Color:
<SELECT NAME="foregroundColor" onChange="setColor(this.form)">
    <OPTION VALUE="White">White
    <OPTION VALUE="Black">Black
    <OPTION SELECTED VALUE="Red">Red
    <OPTION VALUE="Green">Green
    <OPTION VALUE="Blue">Blue
    <OPTION VALUE="Yellow">Yellow
</SELECT><P>
Select Font:
<SELECT NAME="theFont" onChange="setFont(this.form)">
    <OPTION SELECTED VALUE="TimesRoman">Times Roman
    <OPTION VALUE="Helvetica">Helvetica
    <OPTION VALUE="Courier">Courier
    <OPTION VALUE="Arial">Arial
</SELECT><BR>
Select Font Style:
<SELECT NAME="theStyle" onChange="setFont(this.form)">
    <OPTION SELECTED VALUE="Plain">Plain
    <OPTION VALUE="Bold">Bold
    <OPTION VALUE="Italic">Italic
</SELECT><BR>
Select Font Size:
<SELECT NAME="theSize" onChange="setFont(this.form)">
    <OPTION VALUE="12">12
    <OPTION VALUE="18">18
    <OPTION SELECTED VALUE="24">24
    <OPTION VALUE="30">30
</SELECT><P>
<HR>
<INPUT TYPE="button" NAME="getInfo" VALUE="Applet Info..."
onClick="getAppletInfo(this.form)">
<P>
<TEXTAREA NAME="details" ROWS=11 COLS=70></TEXTAREA>
```

```
</FORM>
<HR>
</BODY>
</HTML>
```

Very little of the code here controls the applet — only the handful of functions near the top. The rest of the code makes up the HTML user interface for the form element controls. After you open this document from the CD-ROM, be sure to click the Applet Info button to see the methods that you can script and the way that the parameter values from the JavaScript side match up with the parameters on the Java method side.

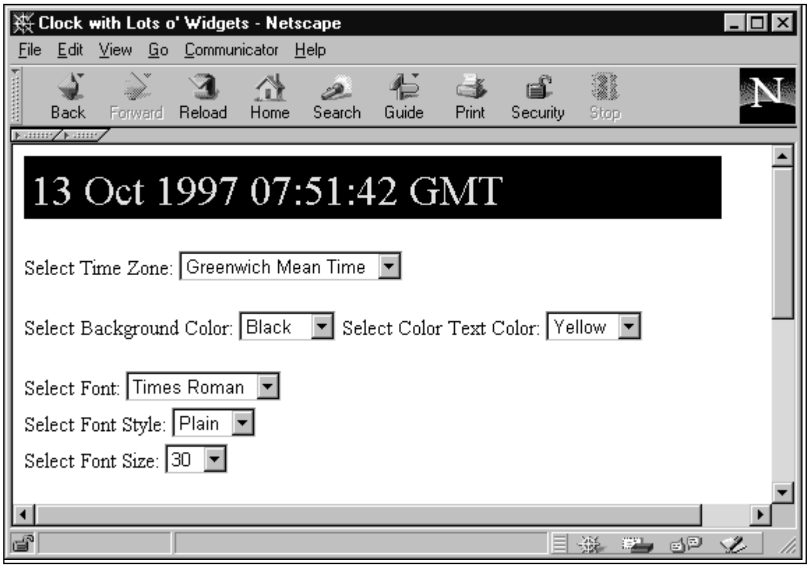

Figure 44-2: Scripting more of the ScriptableClock applet

Applet limitations

Because of concerns about security breaches via LiveConnect, Netscape clamps down on some powers that would be nice to have via a scripted applet. The most noticeable barrier is the one that prevents applets from accessing the network under scripted control. Therefore, even though a Java applet has no difficulty reading or writing text files from the server, such capabilities — even if built into an applet of your own design — won't be carried out if triggered by a JavaScript call to the applet.

Some clever hacks used to be posted on the Web, but they were rather cumbersome to implement and may no longer work on more modern browsers. You can also program the Java applet to fetch a text file after it starts up and then script the access of that value from JavaScript (as described in the following section). Signed scripts (Chapter 46) and applets can break through these security barriers after the user has given explicit permission to do so.

Faceless applets

Until LiveConnect came along, Java applets were generally written to show off data and graphics — to play a big role in the presentation on the page. But if you prefer to let an applet do the heavy algorithmic lifting for your pages while the HTML form elements and images (or Dynamic HTML facilities of newer browsers) do the user interface, you essentially need what I call a *faceless applet*.

The method for embedding a faceless applet into your page is the same as embedding any applet: Use the `<APPLET>` tag. But specify only 1 pixel for both the `HEIGHT` and `WIDTH` attributes (0 has strange side effects). This setting creates a dot on the screen, which, depending on your page's background color, may be completely invisible to page visitors. Place it at the bottom of the page, if you like.

To show how nicely this method can work, Listing 44-4 provides the Java source code for a simple applet that retrieves a specific text file and stores the results in a Java variable available for fetching by the JavaScript shown in Listing 44-5. The HTML even automates the loading process by triggering the retrieval of the Java applet's data from an `onLoad` event handler.

Listing 44-4: **Java Applet Source Code**

```
import java.net.*;
import java.io.*;

public class FileReader extends java.applet.Applet implements Runnable {

    Thread thread;
    URL url;
    String output;
    String fileName = "Bill of rights.txt";

    public void getFile(String fileName) throws IOException {
        String result, line;
        InputStream connection;
        DataInputStream dataStream;
        StringBuffer buffer = new StringBuffer();

        try {
            url = new URL(getDocumentBase(),fileName);
        }
        catch (MalformedURLException e) {
            output = "AppletError " + e;
        }

        try {
            connection = url.openStream();
            dataStream = new DataInputStream(new
BufferedInputStream(connection));

            while ((line = dataStream.readLine()) != null) {
                buffer.append(line + "\n");
            }
            result = buffer.toString();
        }
```

```
        catch (IOException e) {
            result = "AppletError: " + e;
        }
        output = result;
    }

    public String fetchText() {
        return output;
    }

    public void init() {
    }

    public void start() {
        if (thread == null) {
            thread = new Thread(this);
            thread.start();
        }
    }
    public void stop() {
        if (thread != null) {
        thread.stop();
            thread = null;
        }
    }

    public void run(){
        try {
            getFile(fileName);
        }
        catch (IOException e) {
            output = "AppletError: " + e;
        }
    }
}
```

All the work of actually retrieving the file is performed in the `getFile()` method (which runs immediately after the applet loads). Notice that the name of the file to be retrieved, `Bill of Rights.txt`, is stored as a variable near the top of the code, making it easy to change for a recompilation, if necessary. You can also modify the applet to accept the file name as an applet parameter, specified in the HTML code. Meanwhile, the only hook that JavaScript needs is the one public method called `fetchText()`, which merely returns the value of the output variable, which in turn holds the file's contents.

This Java source code must be compiled into a Java class file (already compiled and included on the CD-ROM as `FileReader.class`) and placed in the same directory as the HTML file that loads this applet. Also, no explicit pathname for the text file is supplied in the source code, so the text file is assumed to be in the same directory as the applet.

Listing 44-5: HTML Asking Applet to Read Text File

```
<HTML>
<HEAD>
<TITLE>Letting an Applet Do The Work</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function getFile(form) {
    var output = document.readerApplet.fetchText()
    form.fileOutput.value = output
}
function autoFetch() {
    var output = document.readerApplet.fetchText()
    if (output != null) {
        document.forms[0].fileOutput.value = output
        return
    }
    var t = setTimeout("autoFetch()",1000)
}
</SCRIPT>
</HEAD>
<BODY onLoad="autoFetch()">

<H1>Text from a text file...</H1>
<FORM NAME="reader">
<INPUT TYPE="button" VALUE="Get File" onClick="getFile(this.form)">
<P>
<TEXTAREA NAME="fileOutput" ROWS=10 COLS=60 WRAP="hard"></TEXTAREA>
<P>
<INPUT TYPE="Reset" VALUE="Clear">
</FORM>
<APPLET CODE="FileReader.class" NAME="readerApplet" WIDTH=1 HEIGHT=1>
</APPLET>
</BODY>
</HTML>
```

Because an applet is usually the last detail to finish loading in a document, you can’t use an applet to generate the page immediately. At best, an HTML document can display a pleasant welcome screen while the applet finishes loading itself and running whatever it does to prepare data for the page’s form elements. In IE4+, the page can then be dynamically constructed out of the retrieved data; for NN4, you can create a new layer object, and use `document.write()` to install content into that layer. Notice in Listing 44-5 that the `onLoad` event handler calls a function that checks whether the applet has supplied the requested data. If not, then the same function is called repeatedly in a timer loop until the data is ready and the textarea can be set. The `<APPLET>` tag is located at the bottom of the Body, set to 1 pixel square — invisible to the user. No user interface exists for this applet, so you have no need to clutter up the page with any placeholder or bumper sticker.

Figure 44-3 shows the page generated by the HTML and applet working together. The Get File button is merely a manual demonstration of calling the same applet method that the `onLoad` event handler calls.

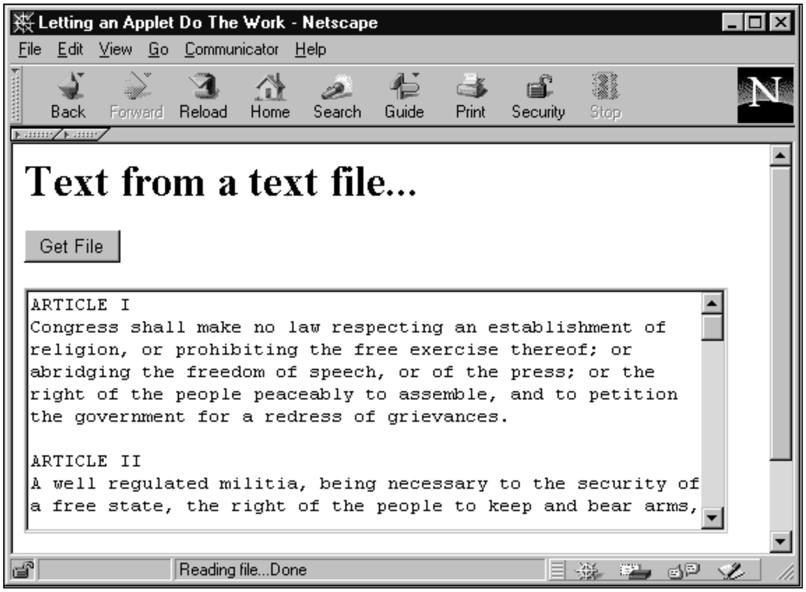

Figure 44-3: The page with text retrieved from a server file

A faceless applet may be one way for Web authors to hide what may otherwise be JavaScript code that is open to any visitor's view. For example, if you want to deliver a small data collection lookup with a document, but don't want the array of data to be visible in the JavaScript code, you can create the array and lookup functionality inside a faceless applet. Then use form controls and JavaScript to act as query entry and output display devices (or dynamically generate a table in IE4+). Because the parameter values passed between JavaScript and Java applets must be string, numeric, or Boolean values, you won't be able to pass arrays without performing some amount of conversion either within the applet or the JavaScript code (JavaScript's *`string`*`.split()` and *`array`*`.join()` methods help a great deal here).

Data type conversions

The example in this chapter does not pass any parameters to the applet's methods, but you are free to do so. You need to pay attention to the way in which values are converted to Java data types. JavaScript strings and Boolean values are converted to Java String and Boolean objects. All JavaScript numbers, regardless of their subtype (that is, integer or floating-point number), are converted to Float objects. Therefore, if a method must accept a numeric parameter from a script, the parameter variable in the Java method must be defined as a Float type.

The distinction between JavaScript string values and string objects can impact data being passed to an applet. If an applet method requires a string object as a parameter, you may have to explicitly convert a JavaScript string value (for example, a string from a text field) to a string object via the `new String()` constructor (Chapter 34).

You can also pass references to objects, such as form control elements. Such objects get wrapped with a `JSObject` type (see discussion about this class later in the chapter). Therefore, parameter variables must be established as type `JSObject` (and the `netscape.javascript.JSObject` class must be imported into the applet).

Applet-to-Script Communication

The flip side of scripted applet control is having an applet control script and HTML content in the page. Before you undertake this avenue in page design, you must bear in mind that any calls made from the applet to the page are hard-wired for the specific scripts and HTML elements in the page. If this level of tight integration and dependence suits the application, the link up will be successful.

Note The discussion of applet-to-script communication assumes you have experience writing Java applets. I use Java jargon quite freely in this discussion.

What your applet needs

NN3 and NN4 come with a zipped set of special class files tailored for use in LiveConnect. In NN3, the file is named `java_30` or `java_301`, the latter one being the latest version; in NN4, the file is named `java40.jar`. For NN6, the class files are located in an archive called `jaws.jar` (Windows) or `MRJPlugin.jar` (Mac). Use the file search facility of the OS to locate the relevant file on your system. Microsoft versions of these class files are also included in IE4+, buried in one of the large `.zip` files in the Windows\Java\Packages directory (the files you need are in one of the multi-megabyte `.zip` files, whose gibberish names change from version to version — open each with an unzip utility and look for the two packages mentioned next). The browser must see these class files (and have both Java and JavaScript enabled in the preferences screens) for LiveConnect to work.

These zipped class library files contain two vital classes in a `netscape` package (yes, even in IE):

```
netscape.javascript.JSObject
netscape.javascript.JSException
```

Both classes must be imported to your applet via the Java `import` compiler directive:

```
import netscape.javascript.*;
```

When the applet runs, the LiveConnect-aware browser knows how to find the two classes, so that the user doesn't have to do anything special as long as the supporting files are in their default locations.

Perhaps the biggest problem applet authors have with LiveConnect is importing these class libraries for applet compilation. Your Java compiler must be able to see these class libraries for compilation to be successful. The prescribed method is to include the path to the zipped class file (either the Netscape `.jar` archive or Microsoft `.zip` file) in the class path for the compiler.

Problems frequently occur when the Java compiler you use (perhaps inside an integrated development environment, such as Cafe) doesn't recognize either of the Netscape files as a legitimate zipped class file. You can make your compilation life simpler if you extract the `netscape` package from the `.jar` or `.zip` file, and place it in the same directory in which your compiler looks for the basic Java classes. For example, although the precise details may change in newer versions, Cafe stores the default Java class files inside zipped collections whose class paths (in Windows) are

```
C:\CAFE\BIN\..\JAVA\LIB\CLASSES.ZIP
C:\CAFE\BIN\..\JAVA\LIB\SYMCLASS.ZIP
```

These two class paths are inserted into new projects by default. Extract the two `netscape.javascript` class files and store them in the same LIB directory as CLASSES.ZIP and SYMCLASS.ZIP. In other words, in the LIB directory is a directory named `netscape`; inside the `netscape` directory is another directory named `javascript`; inside the `javascript` directory are the `JSObject.class` and `JSException.class` files. Then I add the following class path to the project's class path setting:

```
C:\CAFE\BIN\..JAVA\LIB\
```

This path instructs Cafe to start looking for the `netscape` package (which contains the `javascript` package, which, in turn, contains the class files) in that directory.

Depending on the unzipping utility and operating system you use, you may have to force the utility to recognize `.jar` files as zip archive files. If necessary, instruct the utility's file open dialog box to locate all file types in the directory. Both files will open as zipped archives. Sort the long list of files by name. Then select and extract only the two class files into the same directory as your compiler's Java class files. The utility should take care of creating the package directories for you.

What your HTML needs

As a security precaution, an `<APPLET>` tag requires one extra attribute to give the applet permission to access the HTML and scripting inside the document. That attribute is the single word `MAYSCRIPT`, and it can go anywhere inside the `<APPLET>` tag, as follows:

```
<APPLET CODE="myApplet.class" HEIGHT="200" WIDTH="300" MAYSCRIPT>
```

Permission is not required for JavaScript to access an applet's methods or properties, but if the applet initiates contact with the page, this attribute is required.

About JSObject class

The portal between the applet and the HTML page that contains it is the `netscape.javascript.JSObject` class. This object's methods let the applet contact document objects and invoke JavaScript statements. Table 44-1 shows the object's methods and one static method.

Table 44-1 JSObject Class Methods

Method	*Description*
`call(String functionName, Object args[])`	Invokes JavaScript function, argument(s) passed as an array
`eval(String expression)`	Invokes a JavaScript statement
`getMember(String elementName)`	Retrieves a named object belonging to a container
`getSlot(Int index)`	Retrieves indexed object belonging to a container
`getWindow(Applet applet)`	Static method retrieves applet's containing window
`removeMember(String elementName)`	Removes a named object belonging to a container
`setMember(String elementName, Object value)`	Sets value of a named object belonging to a container
`setSlot(int index, Object value)`	Sets value of an indexed object belonging to a container
`toString()`	Returns string version of `JSObject`

Just as the `window` object is the top of the document object hierarchy for JavaScript references, the `window` object is the gateway between the applet code and the scripts and document objects. To open that gateway, use the `JSObject.getWindow()` method to retrieve a reference to the document window. Assign that object to a variable that you can use throughout your applet code. The following code fragment shows the start of an applet that assigns the window reference to a variable named `mainwin`:

```
import netscape.javascript.*;

public class myClass extends java.applet.Applet {
    private JSObject mainwin;

    public void init() {
    mainwin = JSObject.getWindow(this);
    }
}
```

If your applet will be making frequent trips to a particular object, you may want to create a variable holding a reference to that object. To accomplish this, the applet needs to make progressively deeper calls into the document object hierarchy with the `getMember()` method. For example, the following sequence assumes `mainwin` is a reference to the applet's document window. Eventually the statements set a form's field object to a variable for use elsewhere in the applet:

```
JSObject doc = (JSObject) mainwin.getMember("document");
JSObject form = (JSObject) doc.getMember("entryForm");
JSObject phonefld = (JSObject) form.getMember("phone");
```

Another option is to use the Java `eval()` method to execute an expression from the point of view of any object. For example, the following statement gets the same field object from the preceding fragment:

```
JSObject phonefld = mainwin.eval("document.entryForm.phone");
```

As soon as you have a reference to an object, you can access its properties via the `getMember()` method, as shown in the following example, which reads the `value` property of the text box, and casts the value into a Java `String` object:

```
String phoneNum = (String) phonefld.getMember("value");
```

Two `JSObject` class methods let your applet execute arbitrary JavaScript expressions and invoke object methods: the `eval()` and `call()` methods. Use these methods with any `JSObject`. If a value is to be returned from the executed statement, you must cast the result into the desired object type. The parameter for the `eval()` method is a string of the expression to be evaluated by JavaScript. Scope of the expression depends on the object attached to the `eval()` method. If you use the `window` object, the expression would exist as if it were a statement in the document script (not defined inside a function).

Using the `call()` method is convenient for invoking JavaScript functions in the document, although it requires a little more preparation. The first parameter is a string of the function name. The second parameter is an array of arguments for the function. Parameters can be of mixed data types, in which case the array would be of type `Object`. If you don't need to pass a parameter to the function call, you can define an array of a single empty string value (for example, `String` *`arg`*`[] = {""}`) and pass that array as the second parameter.

Data type conversions

The strongly typed Java language is a mismatch for loosely typed JavaScript. As a result, with the exception of Boolean and string objects (which are converted to their respective JavaScript objects), you should be aware of the way LiveConnect adapts data types to JavaScript.

Any Java object that contains numeric data is converted to a JavaScript number value. Because JavaScript numbers are IEEE doubles, they can accommodate just about everything Java can throw its way.

If the applet extracts an object from the document and then passes that `JSObject` type back to JavaScript, that passed object is converted to its original JavaScript object type. But objects of other classes are passed as their native objects wrapped in JavaScript "clothing." JavaScript can access the applet object's methods and properties as if the object were a JavaScript object. Finally, Java arrays are converted to the same kind of JavaScript array created via the `new Array()` constructor. Elements can be accessed by integer index values (not named index values). All other JavaScript array properties and methods apply to this object as well.

Example applet-to-script application

To demonstrate several techniques for communicating from an applet to both JavaScript scripts and document objects, I present an applet that displays two simple buttons (see Figure 44-4). One button generates a new window, spawned from the main window, filling the window with dynamically generated content from the applet. The second button communicates from the applet to that second window by invoking a JavaScript function in the document. One last part of the demonstration shows the applet changing the value of a text box when the applet starts up.

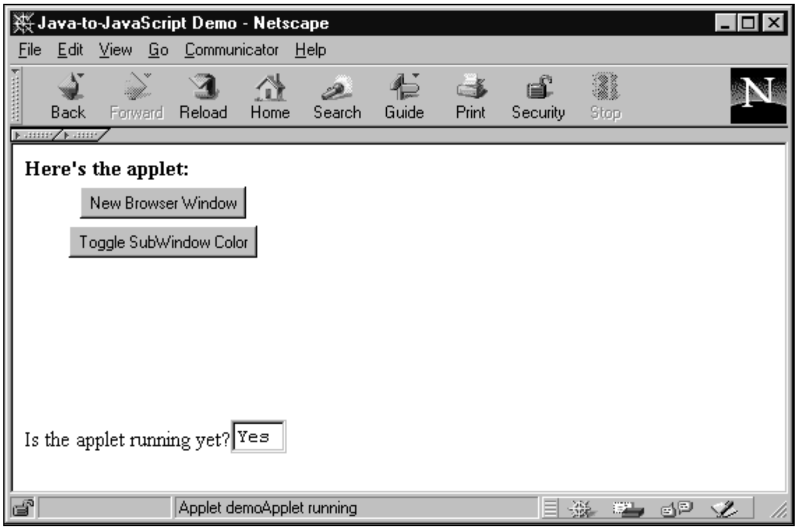

Figure 44-4: The applet displays two buttons seamlessly on the page.

Listing 44-6 shows the source code for the Java applet. For backward compatibility, it uses the JDK 1.02 event-handling model.

Because the applet generates two buttons, the code begins by importing the `AWT` interface builder classes. I also import the `netscape.javascript` package to get the `JSObject` class. The name of this sample class is `JtoJSDemo`. I declare four global variables: two for the windows, two for the applet button objects.

Listing 44-6: **Java Applet Source Code**

```
import java.awt.*;
import netscape.javascript.*;

public class JtoJSDemo extends java.applet.Applet {
    private JSObject mainwin, subwin;
    private Button newWinButton, toggleButton;
    void doNewWindow() {
        subwin = (JSObject)
mainwin.eval("window.open('','fromApplet','HEIGHT=200,WIDTH=200')");
        subwin.eval("document.write('<HTML><BODY BGCOLOR=white>Howdy from the
applet!</BODY></HTML>')");
        subwin.eval("document.close()");
    }
```

The applet's `init()` method establishes the user interface elements for this simple applet. A white background is matched in the HTML with a white document background color, making the applet appear to blend in with the page. I use this opportunity to set the `mainwin` variable to the browser window that contains the applet.

```
public void init() {
    setBackground(Color.white);
    newWinButton = new Button("New Browser Window");
    toggleButton = new Button("Toggle SubWindow Color");
    this.add(newWinButton);
    this.add(toggleButton);
    mainwin = JSObject.getWindow(this);
}
```

As soon as the applet starts, it changes the `value` property of a text box in the HTML form. Because this is a one-time access to the field, I elected to use the `eval()` method from the point of view of the main window, rather than build successive object references through the object hierarchy with the `getMember()` method.

```
public void start() {
    mainwin.eval("document.indicator.running.value = 'Yes'");
}
```

Event handling is quite simple in this application. A click of the first button invokes `doNewWindow()`; a click of the second invokes `toggleColor()`. Both methods are defined later in the applet.

```
public boolean action(Event evt, Object arg) {
    if (evt.target instanceof Button) {
        if (evt.target == newWinButton) {
            doNewWindow();
        } else if (evt.target == toggleButton) {
            toggleColor();
        }
    }
    return true;
}
```

One of the applet's buttons calls the `doNewWindow()` method defined here. I use the `eval()` method to invoke the JavaScript `window.open()` method. The string parameter of the `eval()` method is exactly like the statement that appears in the page's JavaScript to open a new window. The `window.open()` method returns a reference to that subwindow, so that the statement here captures the returned value, casting it as a `JSObject` type for the `subwin` variable. That `subwin` variable can then be used as a reference for another `eval()` method that writes to that second window. Notice that the object to the left of the `eval()` method governs the recipient of the `eval()` method's expression. The same is true for closing the writing stream to the subwindow.

Note

Unfortunately, the IE4+ implementation of JSObject does not provide a suitable reference to the external window after it is created. Therefore, the window does not receive its content or respond to color changes in this example. Due to other anomalies with subwindows, I advise against using LiveConnect powers with multiple windows in IE4+.

The second button in the applet calls the toggleColor() method. In the HTML document, a JavaScript function named toggleSubWindowColor() takes a window object reference as an argument. Therefore, I first assemble a one-element array of type JSObject consisting of the subwin object. That array is the second parameter of the call() method, following a string version of the JavaScript function name being called.

```
    void toggleColor() {
        if (subwin != null) {
            JSObject arg[] = {subwin};
            mainwin.call("toggleSubWindowColor", arg);
        }
    }
}
```

Now onto the HTML that loads the above applet class and is the recipient of its calls. The document is shown in Listing 44-7. One function is called by the applet. A text box in the form is initially set to “No” but gets changed to “Yes” by the applet after it has finished its initialization. The only other item of note is that the <APPLET> tag includes a MAYSCRIPT attribute to allow the applet to communicate with the page.

Listing 44-7: **HTML Document Called by Applet**

```
<HTML>
<HEAD><TITLE>Java-to-JavaScript Demo</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function toggleSubWindowColor(wind) {
    if (wind.closed) {
        alert("The subwindow is closed.  Can't change it's color.")
    } else {
        wind.document.bgColor = (wind.document.bgColor == "#ffffff") ? "red" :
"white"
    }
}
</SCRIPT>
</HEAD>

<BODY BGCOLOR="#FFFFFF">
<B>Here's the applet:</B><BR>
```

```
<APPLET CODE="JtoJSDemo.class" NAME="demoApplet" HEIGHT=150 WIDTH=200 MAYSCRIPT>
</APPLET>

<FORM NAME="indicator">
Is the applet running yet?<INPUT TYPE="text" NAME="running" SIZE="4" VALUE="No">
</FORM>
</BODY>
</HTML>
```

Scripting Plug-ins

Controlling a plug-in (or Windows ActiveX control in IE) from JavaScript is much like controlling a Java applet. But you have more browser-specific concerns to worry about, even at the HTML level. Not all plug-ins are scriptable, of course, nor do all browsers permit such scripting, as described at the start of this chapter. Yet even when you have found the right combination of browser version(s) and plug-in(s), you must also learn what the properties and/or methods of the plug-in are so that your scripts can control them. For common plug-in duties, such as playing audio, the likelihood that all users will have the same audio playback plug-in installed in a particular browser brand and operating system is perhaps too small to entrust your programming to a single plug-in. If, on the other hand, you are using a plug-in that works only with a special data type, then your page need check only that the plug-in is installed (and that it is the desired minimum version).

In this section of the chapter, you'll begin to understand the HTML issues and then examine two separate audio playback examples. One example lets users change tunes being played back; the other arrives with five sounds, each of which is controlled by a different onscreen interface element. Both of these audio playback examples employ a library that has been designed to provide basic audio playback interfaces to the three most popular scriptable audio playback plug-ins:

- ✦ Windows Media Player 6.4
- ✦ Apple QuickTime 4.1 or later
- ✦ Netscape LiveAudio (for NN3 and NN4)

The main goal of the library is to act as an API (Application Programming Interface) between your scripts and the three plug-ins. Your scripts issue one command, and the library figures out which plug-in is installed and how that particular command must be communicated to the installed plug-in. Additional verification takes place in the initialization routine to verify that a valid plug-in is installed in the user's browser.

The HTML side

Depending on the browser and operating system that you're using, one of two tags can be used to put the plug-in's powers into the page. With the plug-in embedded within the page (even if you don't see it), the plug-in becomes part of the document's object model, which means that your scripts can address it.

Using EMBED

The preferred way to embed such content into a page for NN (all OSes) and IE/Mac is to use the `<EMBED>` tag. Even though the W3C HTML standard does not recognize the EMBED element, it has been a part of browser implementations since the first embeddable media. The element is also a bit of a chameleon, because beyond a common set of recognized attributes, such as the `SRC` attribute that points to the content file to be loaded into the plug-in, its attributes are extensible to include items that apply only to a given plug-in. Uncovering the precise lists of attributes and values for a plug-in is not always easy, and frequently requires digging deeply into the developer documentation of the plug-in's producer. It is not unusual for a page author to anticipate that multiple plug-ins could play a particular kind of data (as is the case in the audio examples later in this chapter). Therefore, a single EMBED element may include attributes that apply to more than one plug-in. You have to hope that the plug-ins' developers chose unique names for their attributes or that like-named attributes mean the same thing in multiple plug-ins. Any attributes that a plug-in doesn't recognize are ignored.

Typical behavior for a plug-in is to display some kind of controller or other panel in a rectangle associated with the media. You definitely need to specify the `HEIGHT` and `WIDTH` attribute values of such an EMBED element if it is to display visual media (some video plug-ins let you hide the controls, while still showing the viewing area). For audio, however, you can specify a one-pixel value for both dimensions, and leave the controls to your HTML content. Browsers that recognize style sheets can also set EMBED elements to be invisible.

As an example of what an EMBED element may look like, the following is adapted from Listing 44-9. The example includes attributes that apply to QuickTime and LiveAudio and is formatted here for ease of readability.

```
<EMBED NAME="jukebox"
    HEIGHT=1
    WIDTH=1
    SRC="Beethoven.aif"
    HIDDEN=TRUE
    AUTOSTART=FALSE
    AUTOPLAYT=FALSE
    ENABLEJAVASCRIPT=TRUE
    MASTERSOUND>
</EMBED>
```

After the page loads and encounters this tag, the browser reaches out to the server and loads the sound file into the plug-in, where it sits quietly until the plug-in is instructed to play it.

IE/Windows OBJECT

In the IE/Windows camp, the preferred way to get external media into the document is to load the plug-in (ActiveX control) as an object via the `<OBJECT>` tag. The OBJECT element is endorsed by the W3C HTML standard. In many ways the `<OBJECT>` tag works like the `<APPLET>` tag in that aside from specifying attributes that load the plug-in, additional nested PARAM elements let you make numerous settings to the plug-in while it loads, including the name of the file to pre-load. As with a plug-in's attributes, an object's parameters are unique to the object and are documented (somewhere) for every object intended to be put into an HTML page.

IE/Windows has a special (that is, far from intuitive) way it refers to the plug-in program: through its class ID (also known as a GUID). You must know this long string of numbers and letters in order to embed the object into your page. If you are having difficulty getting this information from a vendor, see Chapter 32 for tips on how to hunt for the information yourself. There, you also discover how to find out what parameters apply to an object.

The following example is an OBJECT element that loads the Windows Media Player 6.*x* plug-in (ActiveX control) into a page. The example is adapted from Listing 44-9.

```
<OBJECT ID="jukebox" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="Beethoven.aif">
<PARAM NAME="AutoStart" VALUE="false">
</OBJECT>
```

When you compare the EMBED and OBJECT approaches, you can see many similar properties and values, which are just expressed differently (for example, attributes versus PARAM elements).

Using EMBED and OBJECT together

Because a public Web page must usually appeal to a broad range of browsers, you should design such a page to work with as many browsers as possible. For the convenience of your scripting (and especially if you use the audio playback API described later in this chapter), referring to a plug-in object by the same identifier is helpful, whether it is loaded via an EMBED or OBJECT element.

To the rescue comes a handy behavior of the OBJECT element. It is designed in such a way that you can nest the associated EMBED element inside the OBJECT element's tag set. If the browser doesn't know about the OBJECT element, that element is ignored, but the EMBED element is picked up. Similarly, if the browser that knows about the OBJECT element fails to load the plug-in identified in its attributes, the nested EMBED elements also get picked up. Therefore, you can combine the OBJECT and EMBED elements as shown in the following example, which combines the two previous examples:

```
<OBJECT ID="jukebox" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="Beethoven.aif">
<PARAM NAME="AutoStart" VALUE="false">
    <EMBED NAME="jukebox"
        HEIGHT=1
        WIDTH=1
        SRC="Beethoven.aif"
        HIDDEN=TRUE
        AUTOSTART=FALSE
        AUTOPLAYT=FALSE
        ENABLEJAVASCRIPT=TRUE
        MASTERSOUND>
    </EMBED>
</OBJECT>
```

Notice that the identifier assigned to the `ID` of the OBJECT element and to the `NAME` of the EMBED element are the same. Because only one of these two elements will be valid in the document, you have no conflict of like-named elements.

Validating the plug-in

As described at length in Chapter 32, you may need to validate the installation of a particular plug-in before the external media will play. This validation is even more vital if you want to control the plug-in from scripts, because you must have the right controlling vocabulary for each scriptable plug-in.

The coordination of plug-in and data type is not a big issue in IE/Windows, because your OBJECT element explicitly loads a known plug-in, even if the computer is equipped to play the same data type through a half-dozen different ActiveX controls. But in NN (and IE/Mac, although plug-ins are not scriptable there at least through Version 5), the association of a plug-in with a particular MIME type (data type of the incoming media) is perhaps a bit too automatic. It is not uncommon for plug-in installation programs to gobble up the associations of numerous MIME types. Knowledgeable users, who can fathom the nether worlds of browser preferences, can manually change these associations, but your scripts cannot direct a browser to use a specific plug-in to play your media unless the plug-in is already enabled for your media's MIME type. The more common and open your media's MIME type is (particularly audio and video), the more of a potential problem this presents to you. *Caveat scriptor.*

With these warnings in mind, review the approaches to checking the presence of a plug-in and its enabled status by way of the `mimeTypes` and `plugIns` objects described in Chapter 32. You see some of the routines from that chapter put to use in a moment.

The API approach

In this section, you see one version of an API that can be used to accomplish simple audio playback activities in a page through three different plug-in technologies (Windows Media Player 6, Apple QuickTime, and Netscape LiveAudio). Your scripts issue one command (for example, `play(1)`), and the API sends the precise command to the plug-in being used in the user's browser. At the same time, the API has its own initialization routine, which it uses not only to validate the plug-in being used, but alerts users of ill-equipped browsers with a relevant message about why their browser can't get the most out of the page.

This API is far from the be-all, end-all library, although you will see that it does quite a bit as-is. The code is offered as a starting point for your further development. Such development may take the shape of adding more operations to the API or adding capabilities for additional scriptable plug-ins. For example, while the API as shown supports Windows Media Player 6, Microsoft continues to upgrade the Player to new versions (with new GUIDs for your OBJECT tags) that have new command vocabularies. There is no reason that the API cannot be extended for new generations of Windows Media Player, while maintaining backward compatibility for the Version 6 generation.

You can find the complete API code on the CD-ROM within the folder of example listings for this chapter. The API file is named `DGAudioAPI.js`. Check out the following high points of this library.

Loading the library

Adding the library to your page is no different from any external .js library file. Include the following tag in the HEAD of your page:

```
<SCRIPT LANGUAGE="JavaScript" SRC="DGAudioAPI.js"></SCRIPT>
```

Except for two global variable initializations, no immediate code runs from the library. All of its activity is invoked from event handlers or other script statements in the main page.

Initializing the library

The first job for the library is to validate that your sounds have one of the three known plug-in technologies available. Before the library can do this, all loading of the OBJECT or EMBED elements must be concluded so that the objects exist for the initialization routine to examine. Therefore, use the onLoad event handler in the BODY to invoke the initAudioAPI() function. Parameters to be passed to this function are vital pieces of information.

Parameter values consist of one or more two-element arrays. The first value is a string of the identifier, which is assigned to the OBJECT and EMBED elements (recall that they are the same identifiers); the second value is a string of the MIME type. Getting the desired value may take some trial and error if you aren't familiar with MIME type terminology. Use the Edit/Preferences/Applications dialog box window listings in NN as a guide in finding the name of a MIME type based on the file name extension of the media file.

The following is an excerpt from Listing 44-9, which shows how the jukebox player object is initialized for the audio/x-aiff MIME type (all sound files for examples in this chapter have the .aif file name extension):

```
onLoad="initAudioAPI(['jukebox', 'audio/x-aiff'])"
```

Notice how the square bracket literal array syntax is used both to create the array of two values while passing them as parameters to the function. NN uses the MIME type to make sure that the plug-in that fired up as a result of the EMBED element is enabled for the MIME type.

As you see in Listing 44-10 (much later in this chapter), the initAudioAPI() function lets you initialize multiple player objects, each one with its own MIME type, if necessary. Each object and MIME type pair are passed as their own array. For example, the following initializes the library for two different embedded plug-in objects, although both have the same MIME type:

```
onLoad="initAudioAPI(['cNatural','audio/x-aiff'],['cSharp','audio/x-aiff'])"
```

When the function receives multiple arrays, it loops through them, performing the initializations in sequence. The initAudioAPI() function follows:

```
function initAudioAPI() {
    var args = initAudioAPI.arguments
    var id, mime
    for (var i = 0; i < args.length; i++) {
        // don't init any more if browser lacks scriptable sound
        if (OKToTest) {
            id = args[i][0]
            mime = args[i][1]
```

```
            players[id] = new API(id, mime)
            players[id].type = setType(id, mime)
        }
    }
}
```

Notice that parameter variables are not explicitly declared for the function, but are, instead, retrieved via the `arguments` property of the function. The global `OKToTest` flag, initialized to true when the library loads, is set to false if the validation of a plug-in fails. The conditional construction here prevents multiple alerts from appearing when multiple plug-in and MIME type parameters are passed to the initialization function.

Sound player API objects

One of the jobs of the initialization routine is to create a player object for each plug-in identifier. The object's constructor is as follows:

```
// AudioAPI object constructor
function API(id, mime) {
    this.id = id
    this.type = ""  // values can be "isLA","isMP","isQT"
    this.mimeType = mime
    this.play = API_play
    this.stop = API_stop
    this.pause = API_pause
    this.rewind = API_rewind
    this.load = API_load
    this.getVolume = API_getVolume
    this.setVolume = API_setVolume
}
```

The object becomes a convenient place to preserve properties for each sound controller, including which type of plug-in it uses (described in a moment). But the bulk of the object is reserved for assigning methods — the methods that your main page's scripts invoke to play and stop the player, adjust its volume, and so on. The method names to the left of the assignment statements in the object constructor are the names your scripts use; the functions in the library (for example, `API_play()`) are the ones that send the right command to the right plug-in.

Each of these objects (even if there is only one for the page) is maintained in a hash table-like array (named `players[]`) in the library. The plug-in object's identifier is the string index for the array entry. This provides the gateway to your page's scripts. For example, if you initialize the library with a single identifier, `jukebox`, you access the methods of the library's jukebox-related player object through the array and the identifier:

```
players["jukebox"].rewind()
```

Plug-in checking

One more part of the initialization routine inside the library is a call to the `setType()` function, which ultimately assigns a value to the `players[]` object `type` property. For a valid plug-in, the value of the `type` property can be `isLA` (LiveAudio), `isMP` (Windows Media Player), `isQT` (QuickTime), or an empty string. Listing 44-8 shows code for the `setType()` function and some supporting functions.

Listing 44-8: setType() and Supporting Functions from DGAudioAPI.js

```
function setType(id, mime) {
    var type = ""
    var errMsg = "This browser is not equipped for scripted sound.\n\n"
    var OS = getOS()
    var brand = getBrand()
    var ver = getVersion(brand)
    if (brand == "IE") {
        if (ver > 4) {
            if (document.all(id) && document.all(id).HasError) {
                errMsg = document.all(id).ErrorDescription
            } else {
                if (OS == "Win") {
                    if (document.all(id) && document.all(id).CreationDate != "") {
                        return "isMP"
                    } else {
                        errMsg += "Expecting Windows Media Player Version 6.4."
                    }
                } else {
                    errMsg += "Only Internet Explorer for Windows is supported."
                }
            }
        } else {
            errMsg += "Only Internet Explorer 4 or later for Windows is
supported."
        }
    } else if (brand == "NN") {
        if ((ver >= 3 && ver < 4.6) || (ver >= 4.7 && ver < 6)) {
            if (mimeAndPluginReady(mime, "LiveAudio")) {
                return "isLA"
            }
            if (mimeAndPluginReady(mime, "QuickTime")) {
                qtVer = parseFloat(document.embeds[id].GetPluginVersion(), 10)
                if (qtVer >= 4.1) {
                    return "isQT"
                } else {
                    errMsg += "QuickTime Plugin 4.1 or later is required."
                }
            } else {
                errMsg += "Sound control requires QuickTime Plugin 4.1 "
                errMsg += "(or later) or LiveAudio "
                errMsg += "enabled for MIME type: \'" + mime + "\'."
            }
        } else {
            errMsg += "Requires Navigator 3.x, 4.0-4.5, or 4.7-4.9."
        }
    } else {
        errMsg += "This page is certified only for versions of Internet Explorer"
```

Continued

Listing 44-8 *(continued)*

```
        errMsg == "and Netscape Navigator."
    }
    alert(errMsg)
    OKToTest = false
    return type
}

function getOS() {
    var ua = navigator.userAgent
    if (ua.indexOf("Win") != -1) {
        return "Win"
    }
    if (ua.indexOf("Mac") != -1) {
        return "Mac"
    }
    return "Other"
}

function getBrand() {
    var name = navigator.appName
    if (name == "Netscape") {
        return "NN"
    }
    if (name.indexOf("Internet Explorer") != -1) {
        return "IE"
    }
    return "Other"
}

function getVersion(brand) {
    var ver = navigator.appVersion
    var ua = navigator.userAgent
    if (brand == "NN") {
        if (parseInt(ver, 10) < 5) {
            return parseFloat(ver, 10)
        } else {
            // get full version for NN6+
            return parseFloat(ua.substring(ua.lastIndexOf("/")+1))
        }
    }
    if (brand == "IE") {
        var IEOffset = ua.indexOf("MSIE ")
        return parseFloat(ua.substring(IEOffset + 5, ua.indexOf(";", IEOffset)))
    }
    return 0
}
```

The `setType()` function is an extensive decision tree that uses clues from the `navigator.userAgent` and `navigator.appVersion` properties to determine what environment is currently running. For each environment, plug-in detection takes place to verify that either the desired Windows ActiveX object is installed in IE or that one of the acceptable plug-ins is running in NN. All of the detection code is taken from Chapter 32. One of the advantages of such a detailed decision tree is that if a decision branch fails, it is for a reasonably specific reason — enough detail to advise the user intelligently about why the current browser can't do what the page author wants it to do.

Invoking methods

Establishing the `players[]` object type is a critical operation of this library, because all subsequent operation depends on the type being set. For example, to perform the action of rewinding the sound to the beginning, your script invokes the following statement:

```
players["jukebox"].rewind()
```

This, in turn invokes the library's `API_rewind()` function:

```
function API_rewind() {
    switch (this.type) {
        case "isLA" :
            document.embeds[this.id].stop()
            document.embeds[this.id].start_at_beginning()
            break
        case "isQT" :
            document.embeds[this.id].Stop()
            document.embeds[this.id].Rewind()
            break
        case "isMP" :
            if (document.embeds[this.id]) {
                document.embeds[this.id].Stop()
                document.embeds[this.id].CurrentPosition = 0
            } else {
                document.all(this.id).Stop()
                document.all(this.id).CurrentPosition = 0
            }
            break
        default:
    }
}
```

Each of the three plug-ins covered in this API has an entirely different way to perform (or simulate) a rewinding of the current sound to the beginning. The `type` property of the `players[]` object invoked by your script determines which branch of the `switch` statement to follow. For each plug-in type, the appropriate document object model reference and the plug-in-specific property or method is accessed. The identifier passed as a parameter to the initialization routine continues to play a role, providing the identifier to the actual DOM object that is the plug-in controller (for example, an index to the `document.embeds[]` array).

The library contains a function just as the one you just saw for each of the seven methods assigned to `players[]` objects. They remain invisible to the user and to you as well, because you work only with the simpler `players[]` object method calls, regardless of plug-in.

Note

If the Windows Media Player detects a problem with the audio hardware, it doesn't always reflect the error in the object until after all `onLoad` event handler functions finish executing. This weirdness prevents the error checking from being performed where it should be, in the `setType()` function. Therefore, error checking for this possibility is performed in the API branch that commands the Media Player to play the currently loaded sound.

Extending the library

Adding more plug-in types to the library requires modification in two areas. The first is to the `setType()` function's decision tree. You have to determine where in the tree the plug-in is best detected. For another Windows Media Player, for instance, it would be along the same branch that looks for the Version 6 player.

You then need to locate the properties and methods of the new plug-in for basic operations covered in the library (play, stop, and so on). For each of the action functions, you add another case for your newly defined type. Your main Web page scripts should not require any modification (although your OBJECT and/or EMBED tag attributes may change to accommodate the new plug-in).

Building a jukebox

The first example that utilizes the `DGAudioAPI.js` library is a jukebox that provides an interface (admittedly not pretty—that's for you to whip up) for selecting and controlling multiple sound files with a single plug-in tag set. The assumption for this application is that only one sound at a time need be handy for immediate playing.

Listing 44-9 shows the code for the jukebox. All sound files specified in the example are in the same folder as the listing on the companion CD-ROM (the AIFF-format files sound better in some plug-ins than others, so don't worry about the audio quality of these demo sounds).

Listing 44-9: A Scripted Jukebox

```
<HTML>
<HEAD>
<TITLE>Oldies but Goody's</TITLE>
<SCRIPT LANGUAGE="JavaScript" SRC="DGAudioAPI.js"></SCRIPT>
<SCRIPT>
// make sure currently selected tune is preloaded
function loadFirst(id) {
    var choice = document.forms[0].musicChoice
    var sndFile = choice.options[choice.selectedIndex].value
    players[id].load(sndFile)
}
// swap tunes
function changeTune(id, choice) {
    players[id].load(choice.options[choice.selectedIndex].value)
}
// control and display volume setting
function raiseVol(id) {
    var currLevel = players[id].getVolume()
    currLevel += Math.ceil(Math.abs(currLevel)/10)
    players[id].setVolume(currLevel)
```

```
    displayVol(id)
}
function lowerVol(id) {
    var currLevel = players[id].getVolume()
    currLevel -= Math.floor(Math.abs(currLevel)/10)
    players[id].setVolume(currLevel)
    displayVol(id)
}
function displayVol(id) {
    document.forms[0].volume.value = players[id].getVolume()
}
</SCRIPT>
</HEAD>

<BODY onLoad="initAudioAPI(['jukebox', 'audio/x-aiff']); loadFirst('jukebox');
displayVol('jukebox')">
<FORM>
<TABLE BORDER=2 ALIGN="center">
<CAPTION ALIGN=top><FONT SIZE=+3>Classical Piano Jukebox</FONT></CAPTION>
<TR><TD COLSPAN=2 ALIGN=center>
<SELECT NAME="musicChoice" onChange="changeTune('jukebox', this)">
    <OPTION VALUE="Beethoven.aif" SELECTED>Beethoven's Fifth Symphony (Opening)
    <OPTION VALUE="Chopin.aif">Chopin Ballade #1 (Opening)
    <OPTION VALUE="Scriabin.aif">Scriabin Etude in D-sharp minor (Finale)
</SELECT></TD></TR>
<TR><TH ROWSPAN=4>Action:</TH>
<TD>
    <INPUT TYPE="button" VALUE="Play"
onClick="players['jukebox'].play(parseInt(this.form.frequency[
this.form.frequency.selectedIndex].value))">
<SELECT NAME="frequency">
<OPTION VALUE=1 SELECTED>Once
<OPTION VALUE=2>Twice
<OPTION VALUE=3>Three times
<OPTION VALUE=TRUE>Continually
</SELECT></TD></TR>
<TR><TD>
    <INPUT TYPE="button" VALUE="Stop" onClick="players['jukebox'].stop()">
</TD></TR>
<TR><TD>
    <INPUT TYPE="button" VALUE="Pause" onClick="players['jukebox'].pause()">
</TD></TR
<TR><TD>
    <INPUT TYPE="button" VALUE="Rewind" onClick="players['jukebox'].rewind()">
</TD></TR>
<TR><TH ROWSPAN=3>Volume:</TH>
<TD>Current Setting:<INPUT TYPE="text" SIZE=10 NAME="volume"
onFocus="this.blur()"></TD></TR>
<TR><TD>
    <INPUT TYPE="button" VALUE="Higher" onClick="raiseVol('jukebox')">
</TD></TR>
<TR><TD>
    <INPUT TYPE="button" VALUE="Lower" onClick="lowerVol('jukebox')">
```

Continued

Listing 44-9 *(continued)*

```
</TD></TR>
</TABLE>
</FORM>

<OBJECT ID="jukebox" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="AutoStart" VALUE="false">
    <EMBED NAME="jukebox" HEIGHT=2 WIDTH=2 SRC="Beethoven.aif"
              HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
               ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>

</BODY>
</HTML>
```

You can see the user interface in Figure 44-5. One SELECT element contains a list of three possible choices. Most of the interface, however, consists of buttons that ultimately invoke methods of the current plug-in.

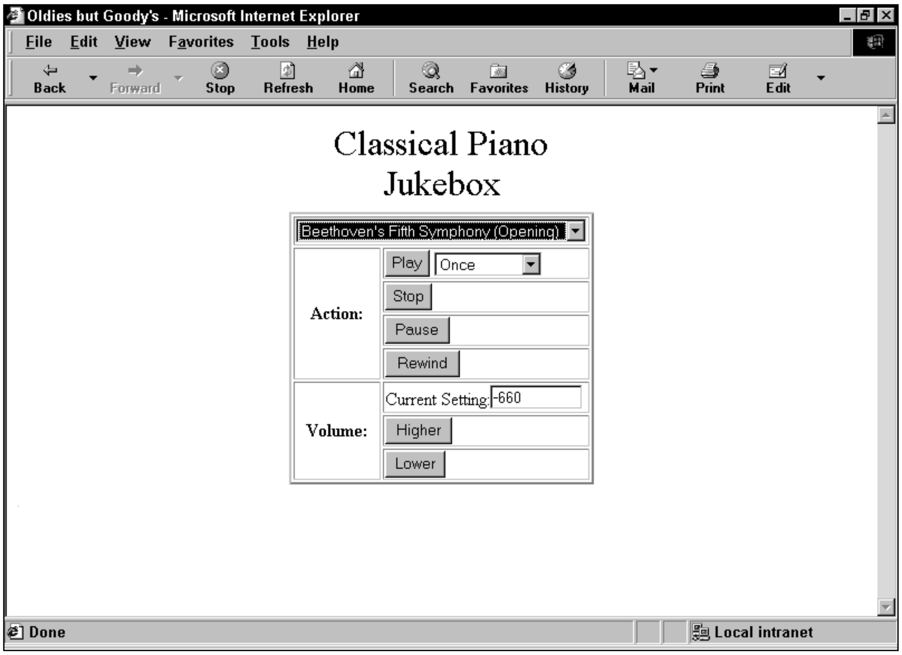

Figure 44-5: The jukebox page

Two functions are invoked by the `onLoad` event handler besides the initialization routine of the library. The `loadFirst()` function finds out which of the items in the SELECT element is chosen when the page loads, and it makes sure that the file is pre-loaded into the plug-in. This functionality is provided in case the user makes a choice and should use the Back button or history to return to the page. In some browsers, the SELECT element will be set to its most recent setting, so the `loadFirst()` function simply gets everything ready.

The second `onLoad` function call is to `displayVol()`. This function works its way through the library to read the volume setting of the plug-in and displays the resulting value in a text box in the form. Not all plug-ins use the same scale or numbering system for their volume controls. Windows Media Player 6, for instance, uses very large negative numbers, while QuickTime and LiveAudio are on different, positive scales. The other volume-related functions simply increase or decrease the current setting by 10 percent in response to clicking the associated buttons in the interface.

All functions defined for this page are designed to be as generalizable as possible. Thus, the identifier of the plug-in is passed as a parameter to each. If another plug-in were added to this page, the same functions could be used without modification, provided calls to the functions passed the identifier of the other plug-in.

All of the button controls are pretty straightforward except the Play button's `onClick` event handler. It invokes the `players[id].play()` method, but that method requires a parameter of how many times the sound should be played. In this user interface, a SELECT element controls that information. Getting the value of the selected item creates a lengthy reference, but that's what is taking up so much space in the parameter slot of the `play()` method call.

Embedding multiple sounds

The final example of embedded media serves as a base on which you can build a page that needs to play multiple sounds without the user explicitly loading them. For example, you may have buttons generate different sounds after users click them (I'm not recommending this interface, but that won't necessarily stop you). Figure 44-6 shows you the simple five-key piano keyboard. The page loads five different sounds into the page, one for each note (actual piano sounds in this case). Each sound was recorded for about four seconds, so that you can get the action of attack and delay, just like a real piano. If you mouse down on a key, the sound plays for up to four seconds (getting softer all the time) or until you mouse up on the key (the attack time on the sample sounds on the CD-ROM is not instantaneous, so you may have to hold a key down for a fraction of a second to start the sound). The colors of the keys also change slightly to provide further user feedback to the action.

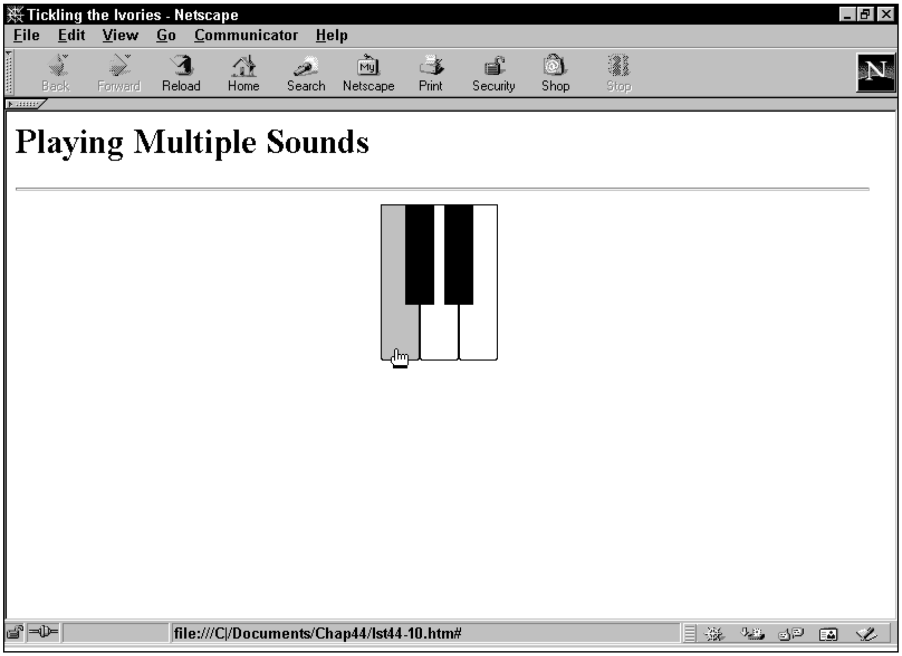

Figure 44-6: Controller for five sounds

Thanks to the `DGAudioAPI.js` library, very little code in this page is associated with the sounds. Far more is involved with the image swaps and the loading of the five plug-ins. Listing 44-10 shows the code for the page.

Listing 44-10: **Scripting Multiple Sounds**

```
<HTML>
<HEAD>
<TITLE>Tickling the Ivories</TITLE>
<STYLE TYPE="text/css">
OBJECT {visibility:hidden}
</STYLE>
<SCRIPT LANGUAGE="JavaScript" SRC="DGAudioAPI.js"></SCRIPT>
<SCRIPT>
// pre-cache 10 images
var onImages = new Array()
onImages["c"] = new Image(35, 140)
onImages["c"].src = "whiteDown.gif"
onImages["d"] = new Image(35, 140)
onImages["d"].src = "whiteDown.gif"
onImages["e"] = new Image(35, 140)
onImages["e"].src = "whiteDown.gif"
onImages["cHalf"] = new Image(26, 90)
onImages["cHalf"].src = "blackDown.gif"
onImages["dHalf"] = new Image(26, 90)
onImages["dHalf"].src = "blackDown.gif"
```

```
var offImages = new Array()
offImages["c"] = new Image(35, 140)
offImages["c"].src = "whiteUp.gif"
offImages["d"] = new Image(35, 140)
offImages["d"].src = "whiteUp.gif"
offImages["e"] = new Image(35, 140)
offImages["e"].src = "whiteUp.gif"
offImages["cHalf"] = new Image(26, 90)
offImages["cHalf"].src = "blackUp.gif"
offImages["dHalf"] = new Image(26, 90)
offImages["dHalf"].src = "blackUp.gif"

// swap images (on)
function imgOn(img) {
    if (document.images) {
        // handle NN4 layers that hold images
        if (document.layers) {
            if (img.length == 1) {
                document.ivories.document.images[img].src = onImages[img].src
            } else {
                document.ivories.document.layers["ivory" +
img].document.images[img].src = onImages[img].src
            }
        } else {
            document.images[img].src = onImages[img].src
        }
    }}
// swap images (off)
function imgOff(img) {
    if (document.images) {
        // handle NN4 layers that hold images
        if (document.layers) {
            if (img.length == 1) {
                document.ivories.document.images[img].src = offImages[img].src
            } else {
                document.ivories.document.layers["ivory" +
img].document.images[img].src = offImages[img].src
            }
        } else {
            document.images[img].src = offImages[img].src
        }
    }
}

// play a note (mousedown)
function playNote(id) {
    players[id].rewind()
    players[id].play(1)
}
```

Continued

Listing 44-10 *(continued)*

```
// stop playing (mouseup)
function stopNote(id) {
    players[id].stop()
    players[id].rewind()
}
</SCRIPT>
</HEAD>

<BODY onLoad="initAudioAPI(['cNatural','audio/x-aiff'],['cSharp','audio/x-
aiff'],['dNatural','audio/x-aiff'],['dSharp','audio/x-aiff'],['eNatural',
'audio/x-aiff'])">
<H1>Playing Multiple Sounds</H1>
<HR>
<TABLE ALIGN="center">
<TR><TD>
<DIV ID="ivories" STYLE="position:relative">
<A HREF="#" onMouseDown="playNote('cNatural');imgOn('c');return false"
            onMouseUp="imgOff('c');stopNote('cNatural')"><IMG
            NAME="c" SRC="whiteUp.gif"
            HEIGHT="140" WIDTH="35" BORDER=0></A><A HREF="#"
            onMouseDown="playNote('dNatural');imgOn('d');return false"
            onMouseUp="imgOff('d');stopNote('dNatural')"><IMG
            NAME="d" SRC="whiteUp.gif"
            HEIGHT="140" WIDTH="35" BORDER=0></A><A HREF="#"
            onMouseDown="playNote('eNatural');imgOn('e');return false"
            onMouseUp="imgOff('e');stopNote('eNatural')"><IMG
            NAME="e" SRC="whiteUp.gif"
            HEIGHT="140" WIDTH="35" BORDER=0></A>
<SPAN ID="ivorycHalf" STYLE="position:absolute; left:22px">
<A HREF="#" onMouseDown="playNote('cSharp');imgOn('cHalf');return false"
            onMouseUp="imgOff('cHalf');stopNote('cSharp')"><IMG
            NAME="cHalf" SRC="blackUp.gif"
            HEIGHT="90" WIDTH="26" BORDER=0></A></SPAN>
<SPAN ID="ivorydHalf" STYLE="position:absolute; left:57px">
<A HREF="#" onMouseDown="playNote('dSharp');imgOn('dHalf');return false"
            onMouseUp="imgOff('dHalf');stopNote('dSharp')"><IMG
            NAME="dHalf" SRC="blackUp.gif"
            HEIGHT="90" WIDTH="26" BORDER=0></A></SPAN>
</DIV>
</TD>
</TR>
</TABLE>
<OBJECT ID="cNatural" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="c.aif">
<PARAM NAME="AutoStart" VALUE="false">
<PARAM NAME="BufferingTime" VALUE="30">
    <EMBED NAME="cNatural" HEIGHT=2 WIDTH=2 SRC="c.aif"
            HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
              ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>
```

```
<OBJECT ID="cSharp" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="cSharp.aif">
<PARAM NAME="AutoStart" VALUE="false">
<PARAM NAME="BufferingTime" VALUE="30">
    <EMBED NAME="cSharp" HEIGHT=2 WIDTH=2 SRC="cSharp.aif"
            HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
              ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>

<OBJECT ID="dNatural" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="d.aif">
<PARAM NAME="AutoStart" VALUE="false">
<PARAM NAME="BufferingTime" VALUE="30">
    <EMBED NAME="dNatural" HEIGHT=2 WIDTH=2 SRC="d.aif"
            HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
              ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>

<OBJECT ID="dSharp" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="dSharp.aif">
<PARAM NAME="AutoStart" VALUE="false">
<PARAM NAME="BufferingTime" VALUE="30">
    <EMBED NAME="dSharp" HEIGHT=2 WIDTH=2 SRC="dSharp.aif"
            HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
              ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>

<OBJECT ID="eNatural" WIDTH="1" HEIGHT="1"
CLASSID="CLSID:22d6f312-b0f6-11d0-94ab-0080c74c7e95"
CODEBASE="#Version=6,0,0,0">
<PARAM NAME="FileName" VALUE="e.aif">
<PARAM NAME="AutoStart" VALUE="false">
<PARAM NAME="BufferingTime" VALUE="30">
    <EMBED NAME="eNatural" HEIGHT=2 WIDTH=2 SRC="e.aif"
            HIDDEN=TRUE AUTOSTART=FALSE AUTOPLAY=FALSE
              ENABLEJAVASCRIPT=TRUE MASTERSOUND>
    </EMBED>
</OBJECT>
</BODY>
</HTML>
```

Perhaps the trickiest part of this entire demonstration lies in the way the keyboard art and user interface are created. Because the white keys are not rectangular, the black key art is dropped atop the white keys by way of positioned elements (which become layer objects in NN4). The visual reward is worth the extra pain of managing references to the images within NN4 layers.

When you use the page, you may notice a slight delay in getting the sound to be heard after pressing down on a key. On older, slower machines, this delay is even more noticeable. Take this behavior into account when designing interactive sound.

Scripting Java Classes Directly

LiveConnect, as implemented in NN3 and NN4, allows scripts to access Java classes as if they were part of the JavaScript environment. Because you need to know your way around Java before programming Java classes directly from JavaScript, I won't get into too much detail in this book. Fortunately, the designers of JavaScript have done a good job of creating JavaScript equivalents for the most common Java language functionality, so there is not a strong need to access Java classes on a daily basis.

To script Java classes, it helps to have a good reference guide to the classes built into Java. Though intended for experienced Java programmers, *Java in a Nutshell* (O'Reilly & Associates, Inc.) offers a condensed view of the classes, their constructors, and their methods.

Java's built-in classes are divided into major groups (called *packages*) to help programmers find the right class and method for any need. Each package focuses on one particular aspect of programming, such as classes for user interface design in application and applet windows, network access, and basic language constructs, such as strings, arrays, and numbers. References to each class (object) defined in Java are "dot" references, just as in JavaScript. Each item following a dot helps zero-in on the desired item. As an example, consider one class that is part of the base language class. The base language class is referred to as

```
java.lang
```

One of the objects defined in `java.lang` is the `String` object, whose full reference is

```
java.lang.String
```

To access one of its methods, you use an invocation syntax with which you are already familiar:

```
java.lang.String.methodName([parameters])
```

To demonstrate accessing Java from JavaScript, I call upon one of Java's `String` object methods, `java.lang.String.equalsIgnoreCase()`, to compare two strings. Equivalent ways are available for accomplishing the same task in JavaScript (for example, comparing both strings in their `toUpperCase()` or `toLowerCase()` versions), so don't look to this Java demonstration for some great new powers along these lines.

Before you can work with data in Java, you have to construct a new object. Of the many ways to construct a new `String` object in Java, you use the one that accepts the actual string as the parameter to the constructor:

```
var mainString = new java.lang.String("TV Guide")
```

At this point, your JavaScript variable, `mainString`, contains a reference to the Java object. From here, you can call this object's Java methods directly:

```
var result = mainString.equalsIgnoreCase("tv Guide")
```

Even from JavaScript, you can use Java classes to create objects that are Java arrays and access them via the same kind of array references (with square brackets) as JavaScript arrays. In a few cases, you can use Java classes to obtain additional information about the user environment, such as the user's IP address (but not e-mail address). The process involves a couple of Java class calls, as follows:

```
var localHost = java.net.InetAddress.getLocalHost()
var IP = localhost.getHostAddress()
```

The more you work with these two languages, the more you see how much Java and JavaScript have in common.

✦ ✦ ✦

CHAPTER 45

Debugging Scripts

✦ ✦ ✦ ✦

In This Chapter

Identifying the type of error plaguing a script

Interpreting error messages

Preventing problems before they occur

✦ ✦ ✦ ✦

One of the first questions that an experienced programmer asks about a programming environment is what support is there for debugging code. Even the best coders in the world make mistakes when they draft programs. Sometimes, the mistakes are a mere slip of a finger on the keyboard; other times, they result from not being careful with expression evaluation or object references. The cause of the mistake is not the issue: finding the mistake and getting help to fix it is.

Some debugging tools are available for the latest browsers. For the most part, they have come from the browser makers themselves, or they are tied very closely to a particular authoring environment. Some of these tools are very quirky; others require significant investments in authoring environments. Discussion about debugging tools in this chapter, however, focuses on simple tools provided on the companion CD-ROM. By understanding the true meaning of error messages and working out the problem with the tools provided here, you should be able to overcome your bugs.

Syntax versus Runtime Errors

As a page loads into a JavaScript-enabled browser, the browser attempts to create an object model out of the HTML and JavaScript code in the document. Some types of errors crop up at this point. These are mostly syntax errors, such as failing to include a closing brace after a function's statements. Such errors are structural in nature, rather than about values or object references.

Runtime errors involve failed connections between function calls and their functions, mismatched data types, and undeclared variables located on the wrong side of assignment operators. Such runtime errors can occur as the page loads if the script lines run immediately as the page loads. Runtime errors located in functions won't crop up until the functions are called — either as the page loads or in response to user action.

Because of the interpreted nature of JavaScript, the distinction between syntax and runtime errors blurs. But as you work through whatever problem halts a page from loading or a script from running, you have to be aware of differences between true errors in language and your errors in logic or evaluation.

Error Message Notification

As the browsers have evolved through several generations, the ways in which script errors are reported to the user (and to you as the author) have also changed. The biggest changes came in IE4/Windows and NN4.5. Prior to those versions, script errors always displayed some kind of alert dialog box with information about the error. Because these alerts could confuse non-technical users, the newer browsers (except for IE/Mac) are much more subtle about the presence of errors. In fact the notification mechanism is so subtle, that it is easy to miss the fact that a script error has occurred. Even if you do notice, you must then exercise your mouse a bit more to view the details.

When a script error occurs in IE4+/Windows, the statusbar displays a yellow alert icon plus a brief text message indicating that an error has occurred. A syntax error that occurs while the page loads usually signifies that the page has loaded, but with errors. A runtime error's message simply indicates that an error occurred. To view details about the error, you must double-click the yellow icon in the statusbar. The default appearance of the error message alert dialog box window includes a button named Show Details. Clicking this button expands the window to reveal whatever details the browser is reporting about the error. If you leave the window expanded, the next time it opens, it will also be expanded. It is a good idea for scripters to also check the box that forces the browser to show the error dialog box whenever an error occurs. This is simply a shortcut to manually double-clicking the statusbar error icon.

Netscape console windows

For NN4 browsers starting with NN4.5, a user receives error notification through a message in the statusbar. The instructions there indicate how to view the error details: If you type

```
javascript:
```

into the toolbar's Location box or into the dialog box that lets you open a new page, an entirely new, non-modal window appears. This window is called the Communicator Console. In contrast to the one message per window approach of IE, the Communicator Console window continues to record all script errors in sequence (in a scrolling frame), even when the Console window is closed. You can keep this window open all the time, and simply bring it to the front whenever you need to view errors. If you are developing on a large video monitor, you can let the Console window stick out to the right of the browser window. If an error occurs, not only does the message appear in the browser statusbar, but you'll also see the scrollbar of the Console window's top frame appear — an even more explicit indication that an error occurred (assuming you click the Clear Console button every time you are ready to try another test run).

Netscape changed the name of the window for NN6, now calling it the JavaScript Console. Opening this window is less cryptic than before: Choose Tasks/Tools/ JavaScript Console from the menu bar. NN6 does not provide notification of errors in the statusbar, so it is up to you to be vigilant for something running amok. This is all the more reason to keep the JavaScript Console window open while you are writing and debugging your scripts. Even if things appear to be OK, periodically check the Console window to be sure.

Multiple error messages

The modality of IE error message alert dialog boxes tends to force just one message to appear. In other words, when the first error occurs, the browser stops recording further errors. In NN, however, it is not uncommon for multiple errors to be listed (or, in older versions, multiple error windows to show up). But you need to understand how to treat these multiple errors to get to the root of the problem.

The usual reaction is to look at the last message to appear in the sequence. That, however, is usually the error message least likely to lead you to the true problem. Error messages are dumped to the NN Console window in the order in which they occur. This means that the first error in the list is the most important error message of them all. More than likely, the first error points to a problem that throws off the rest of the script, thus triggering all of the other error messages. For example, if a statement that initializes a variable has a syntax error in it, all other statements that rely on that variable will fail, because the variable appears to be undefined.

When you encounter multiple errors, don’t start any serious debugging until you locate the first error message. You must tackle this one before any others. The solution to the first one may cause the other errors to go away. This is all the more reason, when authoring in NN4.5+, to keep the Console window open, and clear it before loading any page or executing any scripts.

Error Message Details

Error reporting comes in three flavors depending on the browser: NN, IE/ Windows, IE/Mac. One of these groups may be better (that is, more accurate and explicit) at reporting some kinds of errors than the other groups. By and large, however, you can count on error details to include three basic clues to help you track down the error: the file in which the error occurred, the location of the error within the source code, and a textual description of the error.

Error file name

Although IE/Mac error messages do not explicitly reveal the name of the file whose source code contains the error, in practice, only the NN browsers do the best job of telling the truth. Of course, when the script and HTML are all on one page, it doesn’t require a brain surgeon to know that the error occurs from that page’s source code. But if you link in external `.js` libraries, the NN browsers provide the URL to the `.js` file. IE/Windows, on the other hand, indicates the HTML page that loads the external library, making it difficult to know precisely where the error is.

Error location

All browsers provide a source code line number and character position where the error supposedly occurs. For self-contained pages with no dynamically created content, the reporting tends to be accurate (also see the IE "Object expected" error message details described later in this chapter), but the accuracy is much closer in NN browsers than IE. And if your page links in an external library, the line number provided by IE/Windows and IE/Mac is practically useless. The sense you get is that the lines of the `.js` file become embedded within the main page's script, but how that is supposed to help an author find the precise problem line is a mystery—even the most feature-laden text editor knows only how to display line numbers for a single document.

NN browsers, however, not only point to the correct `.js` file, but to the line number within that file. You are much more likely to get to the root of a problem, especially in an external `.js` file, through NN error messages.

Line number reporting has improved with each browser generation, but anomalies still exist. Perhaps the most egregious is the tendency for IE to report a problem at a line number whose source code is HTML with an event handler. The problem, it turns out, will be somewhere in the function being invoked by the event handler. Another possibility in all browsers is that the line number being reported is below the line that contains the problem. Consider the following simple source code listing (with line numbers from the source code editor) that intentionally contains a syntax error:

```
1:    <HTML>
2:    <HEAD>
3:    <SCRIPT LANGUAGE="JavaScript">
4:    function tarzan() {
5:        var x = 1
6:
7:    function jane() {
8:        var y = 3
9:    }
10:   </SCRIPT>
11:   </HEAD>
12:   <BODY>
13:   Hello.
14:   </BODY>
15:   </HTML>
```

When you load this page into browsers, all of them report a problem with a missing right brace (NN is a bit more explicit with its message, indicating that a right brace is missing after a function body). But where do the browsers point to the error? By looking at the code as a human, you can see that the missing brace belongs in Line 6. But now examine the code from the point of view of a script interpreter engine: It sees the opening brace on Line 4, and then a new function declaration starting on Line 7. To the interpreter, this means that the `jane()` function is probably nested inside the `tarzan()` function, and it is the `tarzan()` function that is lacking the right brace following the `jane()` function. Therefore, the error line number comes in at Line 10 (although IE5/Mac reports Line 9). Your scripts won't likely be this simple, so the distance between the reported error line number and the location of the actual problem can be substantial and difficult to spot without using some of the tips and tools described later in this chapter.

IE sometimes has a nasty habit of identifying the location of the problem at Line 1, Character 1. All this means is that you need to put your detective skills to work that much harder. Common causes for this behavior are references to HTML objects that don't exist (or there is a mismatch between the identifier of the element and your script reference to it) and errors that affect global functions or window methods. To find the genuine problem line, you can use tracing techniques described later in this chapter.

Error message text

Because so many permutations exist of the potential errors you can make in scripts and the ways the JavaScript interpreters in different browsers regard these errors, presenting hard-and-fast solutions to every JavaScript error message is impossible. What I can do, however, is list the most common and head-scratch-inducing error messages and relate the kinds of non-obvious problems that can trigger such messages.

"Object expected"

This error message is often one of the least helpful that you see in IE. The line number associated with the message typically points to a line in the source code that invokes a function. If you define event handlers as attributes of element tags, the line number being reported may correspond to the line containing that HTML tag.

The most obvious problem is that the function being invoked is not regarded as a valid function in the page (the "object" referred to here is the function object). This problem can be the result of an HTML or script error earlier in the document. The problem can also be the result of some error in the function itself that failed to let the interpreter treat the function as a genuine function object. Most typically, these kinds of problems are detected as syntax errors while the page loads (for example, an imbalanced set of parentheses or braces), but not always.

As a first-strike tactic, you need to determine if the function is being invoked at all. By placing an alert in the first line of the function and triggering the function, you can see if script execution is reaching that point. If that works okay, then move the alert downward through the function to find out where the error is actually being triggered. The line before the alert that fails is the likely culprit.

"Expected <something>"

This message usually points straight at the problem line. Most of the "things" that the statement expects are self-explanatory. If a right parenthesis is missing from a pair, that is the "thing" shown to be expected. Detecting in the message the difference between a brace and parenthesis isn't always easy, so look at the message carefully. Not quite as intuitive is when the message says "Expected identifier". This error refers to an expression that typically is trying to use a reserved word as a variable name. Look into Appendix B for a list of reserved words, none of which you may use as names of things or variables.

"<Something> is undefined"

This message is fairly easy to understand, yet at times difficult to diagnose. For variable names, the message usually means that you have an uninitialized variable name sitting in the position of a right-hand operand or a unary operand. This variable name has not been declared or assigned with any value prior to this erroneous statement. Perhaps you're attempting to use a variable name that has been initialized only as a local variable in another function. You may also have intended the right-hand value to be a string, but you forgot to enclose it in quotes, forcing JavaScript to look upon it as a reference to something. Another possibility is that you misspelled the name of a previously declared variable. JavaScript rightly regards this item as a new, undeclared variable. Misspellings, you will recall, include errors in upper- and lowercase in the very case-sensitive JavaScript world.

If the item is a function name, you may have to perform a bit of detective work. Though the function may be defined properly, a problem in the script above the function (for example, imbalanced braces) makes JavaScript fail to see the function. In other cases, you may be trying to invoke a function in another window or frame but forgot to include the reference to that distant spot in the call to the function.

A less likely case, but a confusing one to diagnose, is when you are assembling string versions of function calls or array references out of literal strings and variable values. The following simplified example is assembling a string that is a function call to be triggered by `setTimeout()`:

```
function doA() {
    var x = "joe"
    setTimeout("doB(" + x + ")", 5000)
}
```

Even though the value of `x` is a string when it is concatenated to the call to the `doB()` function, the value gets evaluated as if it were a variable name. An error crops up saying that "joe is undefined". Because you want to pass the value of `x` as a parameter, you must nest its value inside a pair of quotes, as follows:

```
function doA() {
    var x = "joe"
    setTimeout("doB('" + x + "')", 5000)
}
```

The difference in the code is extremely subtle, but absolutely necessary.

"<Something> is not a function"

As with the preceding one, this error message can be one of the most frustrating, because when you look at the script, it appears as though you have clearly defined a function by that name, and you're simply having an event handler or other running statement call that function. The first problems to look for are mismatched case of letters in the calling statement and function and the reuse of a variable or HTML object name by the function name.

This latter item is a no-no — it confuses JavaScript into thinking that the function doesn't exist, even though the object name doesn't have parentheses appended to it and the function does. I've also seen this error appear when other problems existed in the script above the function named in the error message, and the named function was the last one in a script.

In NN, this message appears when you attempt to invoke a function that is not implemented for a particular object. For example, if you attempt to use a W3C DOM method in NN4, the error reports that the method you tried to invoke "is not a function."

"Object doesn't support this property or method"

This IE message reports that a valid object does not provide support for a method you just attempted to invoke. In practice, this message rarely appears as the result of referencing an object's nonexistent property, because the language allows for extending an object's list of properties by assignment. If you do a lot of development in IE5+ for Windows, you may see a lot of this message when testing the page in IE5 for the Macintosh, whose complement of implemented object methods is somewhat smaller.

"Unterminated string literal"
"Unterminated string constant"

NN is far more helpful with this type of message, because along with the error message, it displays the code fragment that tripped the error. You will see the beginning (or all) of the string that is the culprit. If you simply forgot to close a string quote pair, the error most frequently appears when you try to concatenate strings or nest quoted strings. Despite the claim that you can nest alternating double and single quotes, I often have difficulties using this nesting method beyond the second nested level (single quotes inside a double-quoted string). At different times, I've gotten away with using a pair of `\"` inline quote symbols for a third layer. If that syntax fails, I break up the string so that nesting goes no deeper than two layers. If necessary, I even back out the most nested string and assign it to a variable in the preceding line — concatenating it into the more complex string in the next line.

In the Windows 3.1 versions of Navigator, you may also see this error if a string value is longer than about 250 characters. But you can divide such a string into smaller segments and concatenate these strings later in the script with the add-by-value (+=) operator.

And in all versions of Navigator through NN4, avoid statements in scripts that extend for more than 255 characters. If you use a text editor that counts the column number as you type, use this measure as a guide for long statements. Break up long statements into shorter lines.

"Missing } after function body"
"Expected }"

This error usually is easy to recognize in a simple function definition because the closing brace is missing at the end of the function. But when the function includes additional nested items, such as `if...else` or `for` loop constructions, you begin dealing with multiple pairs of braces within the function. The JavaScript interpreter doesn't always determine exactly where the missing brace belongs, and thus it simply defaults to the end of the function. This location is a natural choice, I guess, because from a global perspective of the function, one or more of the right braces that ripple down to the end of the function usually are missing.

In any case, this error message means that a brace is missing somewhere in a function above the referenced line number. Do an inventory count for left and right braces and see whether a discrepancy occurs in the counts. One of those nested constructions is probably missing a closing brace. Some programmer-oriented text editors also include tools for finding balanced pairs of braces and parentheses.

"<Something> is not a number"

The variable name singled out in this error message is most likely a string or null value. The line of JavaScript that trips it up has an operator that demands a number. When in doubt about the data type of a variable destined for a math operation, use the `parseInt()` or `parseFloat()` functions to convert strings to numbers.

I have also encountered this error when it provides no clue about what isn't a number — the error message simply says, "is not a number." The root of the problem ended up having nothing to do with numbers. A structural imbalance in the script triggered this bogus error message.

"<Something> has no property named . . ." "<Something> has no properties"

When a statement trips this error message, an object reference has usually gone awry in an assignment or comparison expression. You probably attempted to reference a property of an object, but something is wrong with the object reference, or you're trying to retrieve a property that doesn't exist for that object. If the reference is an extended one, you may have to dig to find the precise problem with the reference. Consider the following two statements that attempt to access the `value` property of a button named `calcMe`:

```
document.forms.calcme.value
document.forms[0].calcme.value
```

The NN errors for these two statements would read "document.forms.calcme has no properties" and "document.forms[0].calcme has no properties". Causes for the two errors are quite different. The obvious problem with them both may seem to be that the button's name is incorrectly referenced as `calcme` instead of `calcMe`. That, indeed, is the error for the second statement. But a more fundamental problem also plagues the first statement: the `document.forms` reference (a valid object, returning an array of forms) needs an array index in this instance, because it needs to look into a particular form for one of its objects. Unfortunately, both error messages look alike at first glance, and you cannot tell from them which statement has two errors and which has one.

But what you can do when this kind of error appears is use the reference that is returned with the error message to check your work. Start verifying the accuracy of your references from left to right. Later in this chapter, you see how to use the embeddable Evaluator tool to verify the existence of object references.

"<Something> is null or not an object"

This message is the IE version of the previous NN error message. A big difference is that the reference returned as part of the error message includes the complete reference. Therefore, a reference to a nonexistent calcme button in a form yields the error message "'document.forms[0].calcme.value' is null or not an object". Your first instinct is to be suspicious of the `value` property part of the reference. The detective work to find the problem is the same as in the NN version: verify the reference piece by piece, working from left to right. Again, the embeddable Evaluator can assist in this task.

"<Something> has no property indexed by [i]"

Look carefully at the object reference in this error message. The last item has an array index in the script, but the item is not an array value type. Users commonly make this mistake within the complex references necessary for radio buttons and SELECT options. Make sure that you know which items in those lengthy references are arrays and which are simply object names that don't require array values.

"<Something> can't be set by assignment"

This error message tells you either that the property shown is read-only or that the reference points to an object, which must be created via a constructor function rather than by simple assignment.

"Test for equality (= =) mistyped as assignment (=)? Assuming equality test."

The first time I received this error, I was amazed by JavaScript's intelligence. I had, indeed, meant to use the equality comparison function (==) but had entered only a single equal sign. JavaScript is good at picking out these situations where Boolean values are required. In NN6, this message has been demoted to just a warning rather than an error.

"Function does not always return a value"

Often while designing deeply nested `if...else` constructions, your mind follows a single logic path to make sure that a particular series of conditions is met, and that the function returns the desired values under those conditions. What is easy to overlook is that there may be cases in which the decision process may "fall through" all the way to the bottom without returning any value, at which point the function must indicate a value that it returns, even if it is a 0 or empty (but most likely a Boolean value). JavaScript checks the organization of functions to make sure that each condition has a value returned to the calling statement. The error message doesn't tell you where you're missing the return statement, so you have to do a bit of logic digging yourself.

"Access disallowed from scripts at <URL> to documents at <URL>" "Access is denied"

These messages (NN and IE versions, respectively) indicate that a script in one frame or window is trying to access information in another frame or window that has been deemed a potential security threat. Such threats include any location object property or other information about the content of the other frame when the other frame's document comes from a protocol, server, or host that is different from the one serving up the document doing the fetching.

Even the best of intentions can be thwarted by these security restrictions. For example, you may be developing an application that blends data in cooperation with another site. Security restrictions, of course, don't know that you have a cooperative agreement with the other Web site, and you have no workaround for accessing a completely different domain unless you use signed scripts for NN (see Chapter 46) or an IE user has browser security levels set dangerously loose.

Another possible trigger for these errors is that you are using two different servers in the same domain or different protocols (for example, using `https:` for the secure part of your commerce site, while all catalog info uses the `http:` protocol). If the two sites have the same domain (for example, `giantco.com`) but different server names or protocols, you can set the `document.domain` properties of documents so that they recognize each other as equals. See Chapter 46 for details on these issues and the restrictions placed on scripts that mean well, but that can be used for evil purposes.

IE, especially Windows versions, frequently clamps down too severely on inter-window and inter-frame communication. Don't be surprised to encounter security problems trying to communicate between a main window and another window whose content is dynamically generated by scripts in the main window. This error can be incredibly frustrating. Sometimes, serving the main page from a server (instead of reading it from a local hard disk) can solve the problem, but not always. You are safest if the content of both windows or frames are HTML documents served from the same server and domain.

"Lengthy JavaScript still running. Continue?"

Although not a genuine error message, this NN3 alert dialog box provides a safeguard against inadvertent infinite loops and intentional ones triggered by JavaScript tricksters. Instead of permanently locking up the browser, NN3 — after processing a large number of rapidly executing script cycles — asks the user whether the scripts should continue. This error was not adopted in later versions of NN or ever implemented in IE.

"Unspecified error"

This completely unhelpful IE error message is not a good sign because it means that whatever error is occurring is not part of the well-traveled decision tree that the browser uses to report errors. All is not lost, however. That the browser has not crashed means that you can still attempt to get at the root of the problem through various tracing tactics described later in this chapter.

"Uncaught exception"

You may encounter these messages in NN6, although usually not as a result of your scripts unless you are using some of the browser's facilities to dive into inner workings of the browser. These messages are triggered by the browser's own programming code, and indicate a processing error that was not properly wrapped inside error trapping mechanisms. The details associated with such an error point to NN6's own source code modules and internal routines. If you can repeat the error and can do so in a small test case page, you are encouraged to submit a report to `http://bugzilla.mozilla.org`, the bug tracking site for the engine inside NN6.

"Too many JavaScript errors"

You may see this message in NN if it detects a runaway train generating errors uncontrollably. This message was far more important in the days of separate error windows, because a buggy repeat loop could cause NN to generate more error windows than it could do safely.

Sniffing Out Problems

It doesn't take many error-tracking sessions to get you in the save-switch-reload mode quickly. Assuming that you know this routine (described in Chapter 3), the following are some techniques I use to find errors in my scripts when the error messages aren't being helpful in directing me right to the problem.

Check the HTML tags

Before I look into the JavaScript code, I review the document carefully to make sure that I've written all my HTML tags properly. That includes making sure that all tags have closing angle brackets and that all tag pairs have balanced opening and closing tags. Digging deeper, especially in tags near the beginning of scripts, I make sure that all tag attributes that must be enclosed in quotes have the quote pairs in place. A browser may be forgiving about sloppy HTML as far as layout goes, but the JavaScript interpreter isn't as accommodating. Finally, I ensure that the `<SCRIPT>` tag pairs are in place (they may be in multiple locations throughout my document) and that the `LANGUAGE="JavaScript"` attribute value has both of its quotes.

View the source

Your success in locating bugs by viewing the source in the browser varies widely with the kind of content on the page and the browser you use. Very frequently, authors place perhaps too much importance to what they see in the source window.

For a straight, no-frame HTML page, viewing the source provides a modicum of comfort by letting you know that the entire page has arrived from the server. Some versions of NN might flash a questionable HTML construction, but don't expect miracles.

Note: NN4 exhibits a notorious bug in the source view if your HTML tags include `STYLE` attributes for element-specific style sheets. You may "see double" in these lines, whereby the `STYLE` attribute appears to be repeated (although usually beginning with "TTYLE...") in what looks to be gibberish. This problem is a bug in the source viewer and does not accurately represent what the browser-rendering engine is using as source code.

Examining the source code for framesetting documents or individual frames, you must first give focus to the desired element. For an individual frame, click in the frame, and then right-click (or click and hold on the Mac) on the frame's background to get the contextual menu. One of the items should indicate a source view of the frame. To view the framesetter's source, press the Tab key until the Address/Location field of the browser is selected. Then choose to view the source from the Edit menu.

Where the source view would be most helpful, but often fails, is to display dynamically generated HTML. Your best chance will be for pages whose entire content is generated by script. This is about the only place you can appreciate the difference between `document.write()` and `document.writeln()`, because the latter puts carriage returns after the end of each string passed as a parameter to the method. The result is a more readable source view. Most recent browsers, with the exception of NN6, display the HTML as written by your script. NN4 does this in a window whose URL indicates the `wysiwyg:` protocol — an internal indication of dynamically generated content.

But when only part of the page is generated by script, few browsers combine the hard-wired and dynamic code in the source view. Instead, you see only the hard-wired HTML and scripts. To work around this for IE4+ and NN6, you can use the embeddable Evaluator and read the `innerHTML` property of any elements you want.

Intermittent scripts

Without question, the most common bug in Navigator 2.0*x* is the one that makes scripts behave intermittently. Buttons, for example, won't fire `onClick` event handlers unless the page is reloaded. Or, as a result of the same bug, sometimes a script runs and sometimes it doesn't. The problem here is that NN2 requires all `<IMG>` tags to include `HEIGHT` and `WIDTH` attributes, even when the images are not scripted. Because doing so is good HTML practice anyway (it helps the browser's layout performance and is technically required according to the formal HTML specification), if you include these attributes without fail throughout your HTML documents, you won't be plagued by intermittent behavior.

Scripts not working in tables

Tables have been a problem for scripts through NN3. The browser has difficulty when a `<SCRIPT>` tag is included inside a `<TD>` tag pair for a table cell. The workaround for this is to put the `<SCRIPT>` tag outside the table cell tag and use `document.write()` to generate the `<TD>` tag and its contents. I usually go one step further, and use `document.write()` to generate the entire table's HTML. This step is necessary only when executable statements are needed in cells (for example, to generate content for the cell). If a cell contains a form element whose event handler calls a function, you don't have to worry about this problem.

Timing problems

One problem category that is very difficult to diagnose is the so-called timing problem. There are no hard-and-fast rules that govern when you are going to experience such a problem. Very experienced scripters develop an instinct about when timing is causing a problem that has no other explanation.

A timing problem usually means that one or more script statements are executing before the complete action of an earlier statement has finished its task. JavaScript runs within a single thread inside the browser, meaning that only one statement can run at a time. But there are times when a statement invokes some browser service that operates in its own thread and therefore doesn't necessarily finish before the next JavaScript statement runs. If the next JavaScript statement relies on the previous statement's entire task having been completed, the script statement appears to fail, even though it actually runs as it should.

These problems crop up when scripts work with another browser window, and especially in IE for Windows (ironic in a way). In discussions in this book about form field validation, for example, I recommend that after an instructive alert dialog box notifies the user of the problem with the form, the affected text field should be given focus and its content selected. In IE/Windows, however, after the user closes the alert dialog box, the script statements that focus and select operate before the operating system has finished putting the alert away and refreshing the screen. The result is that the focused and selected text box loses its focus by the time the alert has finally disappeared.

The solution is to artificially slow down the statements that perform the focus and select operations. By placing these statements in a separate function, and invoking this function via the `window.setTimeout()` method, the browser catches its breath before executing the separate function—even when the delay parameter is set to zero. A similar delay is utilized when opening and writing to a new window, as shown in the example for `window.open()` in Chapter 16.

Reopen the file

If I make changes to the document that I truly believe should fix a problem, but the same problem persists after a reload, I reopen the file via the File menu. Sometimes, when you run an error-filled script more than once, the browser's internals get a bit confused. Reloading does not clear the bad stuff, although sometimes an unconditional reload (clicking Reload while holding Shift) does the job.

Reopening the file, however, clears the old file entirely from the browser's memory and loads the most recently fixed version of the source file. I find this situation to be especially true with documents involving multiple frames and tables and those that load external `.js` script library files. In severe cases, you may even have to restart the browser to clear its cobwebs, but this is less necessary in recent browsers. You should also consider turning off the cache in your development browser(s).

Find out what works

When an error message supplies little or no clue about the true location of a runtime problem, or when you're faced with crashes at an unknown point (even during document loading), you need to figure out which part of the script execution works properly.

If you have added a lot of scripting to the page without doing much testing, I suggest removing (or commenting out) all scripts except the one(s) that may get called by the document's `onLoad` event handler. This is primarily to make sure that the HTML is not way out of whack. Browsers tend to be quite lenient with bad HTML, so that this tactic won't necessarily tell the whole story. Next, add back the scripts in batches. Eventually, you want to find where the problem really is, regardless of the line number indicated by the error message alert.

To narrow down the problem spot, insert one or more alert dialog boxes into the script with a unique, brief message that you will recognize as reaching various stages (such as `alert("HERE-1")`). Start placing alert dialog boxes at the beginning of any groups of statements that execute and try the script again. Keep moving these dialog boxes deeper into the script (perhaps into other functions called by outer statements) until the error or crash occurs. You now know where to look for problems. See also an advanced tracing mechanism described later in this chapter.

Comment out statements

If the errors appear to be syntactical (as opposed to errors of evaluation), the error message may point to a code fragment several lines away from the problem. More often than not, the problem exists in a line somewhere above the one quoted in the error message. To find the offending line, begin commenting out lines one at a time (between reloading tests), starting with the line indicated in the error message. Keep doing this until the error message clears the area you're working on and points to some other problem below the original line (with the lines commented out, some value is likely to fail below). The most recent line you commented out is the one that has the beginning of your problem. Start looking there.

Check runtime expression evaluation

I've said many times throughout this book that one of the two most common problems scripters face is an expression that evaluates to something you don't expect (the other common problem is an incorrect object reference). In lieu of a debugger that would let you step through scripts one statement at a time while watching the values of variables and expressions, you have a few alternatives to displaying expression values while a script runs.

The simplest approaches to implement are an alert box and the statusbar. Both the alert dialog box and statusbar show you almost any kind of value, even if it is not a string or number. An alert dialog box can even display multiple-line values.

Because most expression evaluation problems come within function definitions, start such explorations from the top of the function. Every time you assign an object property to a variable or invoke a string, math, or date method, insert a line below that line with an `alert()` method or `window.status` assignment statement (`window.status = someValue`) that shows the contents of the new variable value. Do this one statement at a time, save, switch, and reload. Study the value that appears in the output device of choice to see if it's what you expect. If not, something is amiss in the previous line involving the expression(s) you used to achieve that value.

This process is excruciatingly tedious for debugging a long function, but it's absolutely essential for tracking down where a bum object reference or expression evaluation is tripping up your script. When a value comes back as being undefined or null, more than likely the problem is an object reference that is incomplete (for example, trying to access a frame without the `parent.frames[i]` reference), using the wrong name for an existing object (check case), or accessing a property or method that doesn't exist for that object.

When you need to check the value of an expression through a long sequence of script statements or over the lifetime of a repeat loop's execution, you are better off with a listing of values along the way. In the section "A Simple Trace Utility" later in this chapter, I show you how to capture trails of values through a script.

Using the embeddable Evaluator

As soon as a page loads or after some scripts run, the window contains objects whose properties very likely reveal a lot about the environment at rest (that is, not while scripts are running). Those values are normally disguised from you, and the only way to guarantee successful access to view those values is through scripting within the same window or frame. That's where the embeddable Evaluator comes in handy.

As you probably recall from Chapter 13 and the many example sections of Parts III and IV of this book, the code within the standalone Evaluator provides two text boxes for entry of expressions (in the top box) and object references (the bottom box). Results of expression evaluation and object property dumps are displayed in the Results textarea between the two input boxes. A compact version of The Evaluator is contained by a separate library version called `evaluator.js` (located in the Chapter 45 folder of listings on the companion CD-ROM). As you embark on any substantial page development project, you should link in the library with the following tag at the top of your HEAD section:

```
<SCRIPT LANGUAGE="JavaScript" SRC="evaluator.js"></SCRIPT>
```

Be sure to either have a copy of the `evaluator.js` file in the same directory as the document under construction or specify a complete file: URL to the library file on your hard drive for the SRC attribute.

Immediately above the closing BODY tag of your document, include the following:

```
<SCRIPT LANGUAGE="JavaScript">
printEvaluator()
</SCRIPT>
```

The `printEvaluator()` function draws a horizontal rule (HR) followed by the complete control panel of The Evaluator, including the codebase principle support for NN4+. From this control panel, you can reference any document object supported by the browser's object model or global variable. You can even invoke functions located in other scripts of the page by entering them into the top text box. Whatever references are available to other scripts on the page are also available to The Evaluator, including references to other frames of a frameset and even other windows (provided a reference to the newly opened window has been preserved as a global variable, as recommended in Chapter 16).

If you are debugging a page on multiple browsers, you can switch between the browsers and enter property references into The Evaluator on each browser and make sure all browsers return the same values. Or, you can verify that a DOM object and property are available on all browsers under test. If you are working on W3C DOM compatible browsers, invoke the `walkChildNodes()` function of The Evaluator to make sure that modifications your scripts make to the node tree are achieving the desired goals. Experiment with direct manipulation of the page's objects and node tree by invoking DOM methods as you watch the results on the page.

You should be aware of only two small cautions when you embed The Evaluator into the page. First, The Evaluator declares its own one-letter lowercase global variable names (`a` through `z`) for use in experiments. Your own code should therefore avoid one-letter global variables (but local variables, such as the `i` counter of a `for` loop, are fine provided they are initialized inside a function with a `var` keyword). Second, while embedding The Evaluator at the bottom of the page should have the least impact on the rest of your HTML and scripts, any scripts that rely on the length of the `document.forms` array will end up including the form that is part of The Evaluator. You can always quickly turn off The Evaluator by commenting out the `printEvaluator()` statement in the bottom script to test your page on its own.

The embeddable Evaluator is without question the most valuable and frequently used debugging tool in my personal arsenal. It provides x-ray vision into the object model of the page at any resting point.

Emergency evaluation

Using The Evaluator assumes that you thought ahead of time that you want to view property values of a page. But what if you haven't yet embedded The Evaluator, and you encounter a state that you'd like to check out without disturbing the currently loaded page?

To the rescue comes the `javascript:` URL and the Location/Address box in your browser's toolbar. By invoking the `alert()` method through this URL, you can view the value of any property. For example, to find out the content of the cookie for the current document, enter the following into the Location/Address box in the browser:

```
javascript: alert(document.cookie)
```

Object methods or script functions can also be invoked this way, but you must be careful to prevent return values from causing the current page to be eliminated. If the method or function is known to return a value, you can display that value in an alert dialog box. The syntax for a function call is:

```
javascript:alert(myFunction("myParam1"))
```

And if you want to invoke a function that does not necessarily return a value, you should also protect the current page by using the void operator, as follows:

```
javascript:void myFunction("myParam1")
```

A Simple Trace Utility

Single-stepping through running code with a JavaScript debugger is a valuable aid when you know where the problem is. But when the bug location eludes you, especially in a complex script, you may find it more efficient to follow a rapid trace of execution and viewing intermediate values along the way. The kinds of questions that this debugging technique addresses include:

- ✦ How many times is that loop executing?
- ✦ What are the values being retrieved each time through the loop?
- ✦ Why won't the while loop exit?
- ✦ Are comparison operators behaving as I'd planned in `if...else` constructions?
- ✦ What kind of value is a function returning?

A bonus feature of the embeddable Evaluator is a simple trace utility that lets you control where in your running code values can be recorded for viewing after the scripts run. The resulting report you get after running your script can answer questions like these and many more.

The trace() function

Listing 45-1 shows the `trace()` function that is built into the `evaluator.js` library file. By embedding the Evaluator into your page under construction, you can invoke the `trace()` function wherever you want to capture an interim value.

Listing 45-1: **trace() function**

```
function trace(flag, label, value) {
    if (flag) {
        var msg = ""
           if (trace.caller) {
            var funcName = trace.caller.toString()
            funcName = funcName.substring(9, funcName.indexOf(")") + 1)
            msg += "In " + funcName + ": "
        }
        msg += label + "=" + value + "\n"
        document.forms["ev_evaluator"].ev_output.value += msg
    }
}
```

The `trace()` function takes three parameters. The first, `flag`, is a Boolean value that determines whether the trace should proceed (I show you a shortcut for setting this flag later). The second parameter is a string used as a plain-language way for you to identify the value being traced. The value to be displayed is passed as the third parameter. Virtually any type of value or expression can be passed as the third parameter — which is precisely what you want in a debugging aid.

Only if the flag parameter is `true` does the bulk of the `trace()` function execute. The first task is to extract the name of the function from which the `trace()` function was called. Unfortunately, the `caller` property of a function is missing from NN6 (and ECMAScript), so this information is made part of the result only if the browser running the trace supports the property. By retrieving the rarely used `caller` property of a function, the script grabs a string copy of the entire function that has just called `trace()`. A quick extraction of a substring from the first line yields the name of the function. That information becomes part of the message text that records each trace. The message identifies the calling function followed by a colon; after that comes the label text passed as the second parameter plus an equals sign and the value parameter. The format of the output message adheres to the following syntax:

```
In <funcName>: <label>=<value>
```

The results of the trace — one line of output per invocation — are appended to the Results textarea in The Evaluator. It's a good idea to clear the textarea before running a script that has calls to `trace()` so that you can get a clean listing.

Preparing documents for trace.js

As you build your document and its scripts, you need to decide how granular you want tracing to be: global or function-by-function. This decision affects at what level you place the Boolean "switch" that turns tracing on and off.

You can place one such switch as the first statement in the first script of the page. For example, specify a clearly named variable and assign either `false` or zero to it so that its initial setting is off:

```
var TRACE = 0
```

To turn debugging on at a later time, simply edit the value assigned to `TRACE` from zero to one:

```
var TRACE = 1
```

Be sure to reload the page each time you edit this global value.

Alternatively, you can define a local `TRACE` Boolean variable in each function for which you intend to employ tracing. One advantage of using function-specific tracing is that the list of items to appear in the Results textarea will be limited to those of immediate interest to you, rather than all tracing calls throughout the document. You can turn each function's tracing facility on and off by editing the values assigned to the local `TRACE` variables.

Invoking trace()

All that's left now is to insert the one-line calls to `trace()` according to the following syntax:

```
trace(TRACE,<"label">,<value>)
```

By passing the current value of `TRACE` as a parameter, you let the library function handle the decision to accumulate and display the trace. The impact on your running code is kept to a one-line statement that is easy to remember. To demonstrate how to make the calls to `trace()`, Listing 45-2 shows a pair of related functions that convert a time in milliseconds to the string format "hh:mm". To help verify that values are being massaged correctly, the script inserts a few calls to `trace()`.

Listing 45-2: **Calling trace()**

```
function timeToString(input) {
   var TRACE = 1
   trace(TRACE,"input",input)
   var rawTime = new Date(eval(input))
   trace(TRACE,"rawTime",rawTime)
   var hrs = twoDigitString(rawTime.getHours())
   var mins = twoDigitString(rawTime.getMinutes())
   trace(TRACE,"result", hrs + ":" + mins)
   return hrs + ":" + mins
}

function twoDigitString(val) {
   var TRACE = 1
   trace(TRACE,"val",val)
   return (val < 10) ? "0" + val : "" + val
}
```

After running the script, the Results box in The Evaluator shows the following trace:

```
In  timeToString(input): input=976767964655
In  timeToString(input): rawTime=Wed Dec 13 20:26:04 GMT-0800 2000
In  twoDigitString(val): val=20
In  twoDigitString(val): val=26
In  timeToString(input): result=20:26
```

Having the name of the function in the trace is helpful in cases in which you might justifiably reuse variable names (for example, `i` loop counters). You can also see more clearly when one function in your script calls another.

One of the most valuable applications of the `trace()` function comes when your scripts accumulate HTML that gets written to other windows or frames, or replaces HTML segments of the current page. Because the source view may not display the precise HTML that you assembled, you can output it via the `trace()` function to the Results box. From there, you can copy the HTML and paste it into a fresh document to test in the browser by itself. You can also verify that the HTML content is being formatted the way that you want it.

Browser Crashes

Each new browser generation is less crash-prone than its predecessor, which is obviously good news for everyone. It seems that most crashes, if they occur, do so as the page loads. This can be the result of some ill-advised HTML, or something happening as the result of script statements that either run immediately as the page loads or in response to the `onLoad` event handler.

Finding the root of a crash problem is perhaps more time consuming because you must relaunch the browser each time (and in some cases, even reboot your computer). But the basic tactics are the same. Reduce the page's content to the barest minimum HTML by commenting out both scripts and all but HEAD and BODY tags. Then begin enabling small chunks to test reloading of the page. Be suspicious of META tags inserted by authoring tools. Their removal can sometimes clear up all crash problems. Eventually you will add something into the mix that will cause the crash. It means that you are close to finding the culprit.

Preventing Problems

Even with help of authoring and debugging tools, you probably want to avoid errors in the first place. I offer a number of suggestions that can help in this regard.

Getting structure right

Early problems in developing a page with scripts tend to be structural: knowing that your objects are displayed correctly on the page; making sure that your `<SCRIPT>` tags are complete; completing brace, parenthesis, and quoted pairs. I start writing my page by first getting down the HTML parts — including all form definitions. Because so much of a scripted page tends to rely on the placement and naming of interface elements, you will find it much easier to work with these items after you lay them out on the page. At that point, you can start filling in the JavaScript.

When you begin defining a function, repeat loop, or `if` construction, fill out the entire structure before entering any details. For example, when I define a function named `verifyData()`, I enter the entire structure for it:

```
function verifyData() {

}
```

I leave a blank line between the beginning of the function and the closing brace in anticipation of entering at least one line of code.

After I decide on a parameter to be passed and assign a variable to it, I may want to insert an `if` construction. Again, I fill in the basic structure:

```
function verifyData(form) {
    if (form.checkbox.checked) {

    }
}
```

This method automatically pushes the closing brace of the function lower, which is what I want — putting it securely at the end of the function where it belongs. It also ensures that I line up the closing brace of the `if` statement with that grouping. Additional statements in the `if` construction push down the two closing braces.

If you don't like typing or don't trust yourself to maintain this kind of discipline when you're in a hurry to test an idea, you should prepare a separate document that has templates for the common constructions: `<SCRIPT>` tags, function, `if`, `if...else`, `for` loop, `while` loop, and conditional expressions. Then if your editor and operating system support it, drag and drop the necessary segments into your working script.

Build incrementally

The worst development tactic you can follow is to write tons of code before trying any of it. Error messages may point to so many lines away from the source of the problem that it could take hours to find the true source of difficulty. The save-switch-reload sequence is not painful, so the better strategy is to try your code every time you have written a complete thought — or even enough to test an intermediate result in an alert dialog box — to make sure that you're on the right track.

Test expression evaluation

Especially while you are learning the ins and outs of JavaScript, you may feel unsure about the results that a particular string, math, or date method yields on a value. The longer your scripted document gets, the more difficult it will be to test the evaluation of a statement. You're better off trying the expression in a more controlled, isolated environment, such as The Evaluator. By doing this kind of testing in the browser, you save a great deal of time experimenting by going back and forth between the source document and the browser.

Build function workbenches

A similar situation exists for building and testing functions, especially generalizable ones. Rather than test a function inside a complex scripted document, drop it into a skeletal document that contains the minimum number of user interface elements that you need to test the function. This task gets difficult when the function is closely tied to numerous objects in the real document, but it works wonders for making you think about generalizing functions for possible use in the future. Display the output of the function in a text or textarea object or include it in an alert dialog box.

Testing Your Masterpiece

If your background strictly involves designing HTML pages, you probably think of testing as determining your user's ability to navigate successfully around your site. But a JavaScript-enhanced page — especially if the user enters input into fields or implements Dynamic HTML techniques — requires a substantially greater amount of testing before you unleash it to the online masses.

A large part of good programming is anticipating what a user can do at any point and then being sure that your code covers that eventuality. With multiframe windows, for example, you need to see how unexpected reloading of a document affects the relationships between all the frames — especially if they depend on each other. Users will be able to click Reload at any time or suspend document loading in the middle of a download from the server. How do these activities affect your scripting? Do they cause script errors based on your current script organization?

The minute you enable a user to type an entry into a form, you also invite the user to enter the wrong kind of information into that form. If your script expects only a numeric value from a field, and the user (accidentally or intentionally) types a letter, is your script ready to handle that "bad" data? Or no data? Or a negative floating-point number?

Just because you, as author of the page, know the "proper" sequence to follow and the "right" kind of data to enter into forms, your users will not necessarily follow your instructions. In days gone by, such mistakes were relegated to "user error." Today, with an increasingly consumer-oriented Web audience, any such faults rest solely on the programmer — you.

If I sound as though I'm trying to scare you, I have succeeded. I was serious in the early chapters of this book when I said that writing JavaScript is *programming*. Users of your pages are expecting the same polish and smooth operation (no script errors and certainly no crashes) from your site as from the most professional software publisher on the planet. Don't let them or yourself down. Test your pages extensively on as many browsers and as many operating systems as you can and with as wide an audience as possible before putting the pages on the server for all to see.

✦ ✦ ✦

CHAPTER 46

Security and Netscape Signed Scripts

✦ ✦ ✦ ✦

In This Chapter

Exploring browser security policies

Applying JavaScript to Navigator security mechanisms

Using Netscape signed scripts

✦ ✦ ✦ ✦

The paranoia levels about potential threats to security and privacy on the Internet are at an all-time high. As more people rely on e-mail and Web site content for their daily lives and transactions, the fears will only increase for the foreseeable future (an indeterminate number of Web Weeks). As a jokester might say, though, "I may be paranoid, but how do I know someone really isn't out to get me?" The answer to that question is that you don't know, and such a person may be out there.

But Web software developers are doing their darnedest to put up roadblocks to those persons out to get you — hence, the many levels of security that pervade browsers. Unfortunately, these roadblocks also get in the way of scripters who have completely honest intentions. Designing a Web site around these barriers is one of the greatest challenges that many scripters face.

Battening Down the Hatches

When Navigator 2 first shipped to the world (way back in February 1996), it was the first browser released to include support for Java applets and scripting — two entirely different but often confused technologies. It didn't take long for clever programmers in the Internet community to find the ways in which one or the other technology provided inadvertent access to client computer information (such as reading file directories) and Web surfer activities (such as histories of where you've been on the Net and even the passwords you may have entered to access secure sites).

JavaScript, in particular, was the avenue that many of these programmers used to steal such information from Web site visitors' browsers. The sad part is that the same features that provide the access to the information were intentionally made a part of the initial language to aid scripters who would put those features to beneficial use in controlled environments, such as intranets. But out in the Wild Wide Web, a scripter could capture a visitor's e-mail address by having the site's home page surreptitiously send a message to the site's author without the visitor even knowing it.

Word of security breaches of this magnitude not only circulated throughout the Internet, but also reached both the trade and mainstream press. As if the security issues weren't bad enough on their own, the public relations nightmare compounded the sense of urgency to fix the problem. To that end, Netscape released two revised editions of Navigator 2. The final release of that generation of browser, Navigator 2.02, took care of the scriptable security issues by turning off some of the scripted capabilities that had been put into the original 2.0 version. No more capturing visitors' browser histories; no more local file directory listings; no more silent e-mail. Users could even turn off JavaScript support entirely if they so desired.

The bottom line on security is that scripts are prevented from performing automated processes that invade the private property of a Web author's page or a client's browser. Thus, any action that may be suspect, such as sending an e-mail message, requires an explicit action on the part of the user — clicking a Submit button, in this case — to carry it out. Security restrictions must also prevent a Web site from tracking your activity beyond the boundaries of that Web site.

When Worlds Collide

If a script tries to do something that is not allowed or is a potential personal security breach, the browser reports the situation to the user. Figure 46-1, for instance, shows an IE/Windows warning a user gets from clicking a Submit button located in a form whose `ACTION` is set to a `mailto:` URL.

Another security error message often confuses scripters who don't understand the possible privacy invasions that can accrue from one window or frame having access to the URL information in another window or frame. In IE5/Windows, for example, an ominous error message — "Permission denied" — warns users of an attempt to access URL information from another frame if that URL is from a different Web site.

Despite the fact that a scripted Web site may have even loaded the foreign URL into the other frame, the security restrictions guard against unscrupulous usage of the ability to snoop in other windows and frames.

Figure 46-1: IE/Windows e-mail warning

The Java Sandbox

Much of the security model for JavaScript is similar to that originally defined for Java applets. Applets had a potentially dangerous facility of executing Java code on the client machine. That is a far cry from the original deployment of the World Wide Web as a read-only publishing medium on the Internet. Here were mini-programs downloaded into a client computer that, if unchecked, could have the same access to the system as a local software program.

Access of this type would clearly be unacceptable. Imagine the dismay caused by someone clicking a link that said "Free Money," only to have the linked page download an applet that read or damaged local disk files unbeknownst to the user. In anticipation of pranksters, the designers of Java and the Java virtual machine built in a number of safeguards to prevent applets from gaining access to local machines. This mechanism is collectively referred to as the sandbox, a restricted area in which applets can operate. Applets cannot extend their reach outside of the sandbox to access local file systems and many sensitive system preferences. Any applet runs only while its containing page is still loaded in the browser. When the page goes away, so does the applet, without being saved to the local disk cache.

JavaScript adopted similar restrictions. The language provided no read or write access to local files beyond the highly regulated cookie file. Moreover, because JavaScript works more closely with the browser and its documents than applets typically do, the language had to build in extra restrictions to prevent browser-specific privacy invasions. For example, it was not possible for a script in one window to monitor the user's activity in another window, including the URL of the other window, if the page didn't come from the same server as the first window. Sometimes the restrictions on the JavaScript side are even more severe than in Java. For example, while a Java applet is permitted to access the network anytime after the applet is loaded, an applet is prevented from reaching out to the Net if the trigger for that transaction comes from JavaScript via LiveConnect (see Chapter 44). Only partial workarounds are available.

Neither the Java nor JavaScript security blankets were fully bug-free at the outset. Some holes were uncovered by the languages' creators and others in the community. To their credit, Sun and Netscape (and Microsoft for that matter) are quick to plug any holes that are discovered. While the plugs don't necessarily fix existing copies of insecure browsers out there, it means that a Bad Guy can't count on every browser to offer the same security hole for exploitation. That generally makes the effort not worth the bother.

Security Policies

Netscape describes security mechanisms under the collective term *policies.* This usage of the word mirrors that of institutions and governments: A policy defines the way potentially insecure or invasive requests are handled by the browser or scripting language. NN4+ includes two different security policies: *same origin* and *signed* `script` policies. The same origin policy dates back to Navigator 2, although some additional rules have been added to that policy as Navigator has matured. The signed script policy started with NN4 and utilizes the state of the art in cryptographic signatures of executable code inside a browser, whether that code is a plug-in, a Java applet, or a JavaScript script. Because of the signed script facilities, NN4+ was designed to allow scripts to have wider range of control over the browser's interior working parts, provided the user granted permission for such activity (more about this later in the chapter). NN3 included a partially implemented prototype of another policy known as data tainting. Signed scripts supersede data tainting, so if you encounter any writings about data tainting, you can ignore them because the technology is not being further developed.

By and large, the same origin policy is in force inside IE3 and after. Precise details may not match up with NN one-for-one, but the most common features are identical. The signed script policy is implemented only in NN4+. While Microsoft offers digital signatures for some items that may be embedded within an HTML page (such as ActiveX controls and other components), scripts that are in an HTML page's source code or linked in as a `.js` library cannot be signed for IE. While everything you read in this chapter about signed scripts applies only to NN4+, you should find the next couple of sections informative even if you develop solely for IE.

The Same Origin Policy

The "origin" of the same origin policy means the protocol and domain of a source document. If all of the source files currently loaded in the browser come from the same server and domain, scripts in any one part of the environment can poke around the other documents. Restrictions come into play when the script doing the poking and the document being poked come from different origins. The potential security and privacy breaches this kind of access can cause put this access out of bounds within the same origin policy.

An origin is not the complete URL of a document. Consider the two popular URLs for Netscape's Web sites:

```
http://home.netscape.com
http://developer.netscape.com
```

The protocol for both sites is `http:`. Both sites also share the same domain name: `netscape.com`. But the sites run on two different servers: `home` and `developer` (at least this is how the sites appear to browsers accessing them; the physical server arrangement may be quite different).

If a frameset contains documents from the same server at `netscape.com`, and all frames are using the same protocol, then they have the same origin. Completely open and free access to information, such as `location` object properties, is available to scripts in any frame's document. But if one of those frames contains a document from the other server, their origins don't match. A script in a document from one server would display an "access disallowed" or "permission denied" error message if it tried to get the `location` property of that other document.

A similar problem occurs if you were creating a Web-based shopping service that displays the product catalog in one window and displays the order form from a secure server in another window. The order form, whose protocol might be `https:`, would not be granted access to the `location` object properties in a catalog page whose protocol is `http:`, even though both share the same server and domain name.

Setting the document.domain

When both pages in an origin-protected transaction are from the same domain (but different servers or protocols), you can instruct JavaScript to set the `document.domain` properties of both pages to the domain that they share. When this property is set to that domain, the pages are treated as if from the same origin. Making this adjustment is safe, because JavaScript doesn't allow setting the `document.domain` property to any domain other than the origin of the document making the setting. See the `document.domain` property entry in Chapter 18 for further details.

Origin checks

Scattered throughout the language reference chapters are notes about items that undergo what you now know to be *origin checks*. For the sake of convenience, I list them all here to help you get a better feeling for the kind of information that is protected. The general rule is that any object property or method that exposes a local file in a user's system or can trace Web surfing activity in another window or frame undergoes an origin check. Failure to satisfy the same origin rule yields an "access disallowed" or "permission denied" error message on the client's machine.

Window object checks

The document object models of windows and frames that don't share the same origin are not available to each other. Each separate origin window or frame is its own little world that has very little ability to communicate with another window or frame. IE sometimes takes this to the extreme, causing problems between a main window and a subwindow whose content is entirely dynamically generated from the main window's scripts.

Location object checks

All `location` object properties are restricted to same origin access. Of all same origin policy restrictions, this one seems to interfere with well-meaning page authors' plans when they want to provide a frame for users to navigate around the Web. Such access, however, would allow spying on your users.

Document object checks

A `document` object's properties are by necessity loaded with information about the content of that document. Just about every property other than the ones that specify color properties are off-limits if the origin of the target document is different from the one making the request:

```
anchors[]    lastModified
applets[]    length
cookie       links[]
domain       referrer
embeds       title
forms[]      URL
```

In addition, no normally modifiable `document` property can be modified if the origin check fails. This, of course, does not prevent you from using `document.write()` to write an entirely new page of content to the frame to replace a document from a different origin. But in IE4+ and W3C DOM browsers, scripts from one origin won't be able to modify (or even copy) partial content from a frame whose content comes from another origin.

NN4 layer object checks

While most of a NN4 layer's content is protected by the restrictions that apply to the `document` object inside, a layer object also has a potentially revealing `src` property. This is essentially similar to the `location.href` property of a frame. Thus the `src` property requires an origin check before yielding its information.

Form object checks

Form data is generally protected by the restriction to a document's `forms[]` array. But should a script in another window or frame also know the name of the form, that, too, won't enable access unless both documents come from the same origin.

Applet object checks

The same goes for named Java applets. A script cannot retrieve information about the class file name unless both documents are from the same origin (although the applet can be from anywhere).

LiveConnect access from a Java applet to JavaScript is not an avenue to other windows and frames from other origins. Any calls from the applet to the objects and protected properties described here undergo origin checks when those objects are in other frames and windows. The applet assumes the origin of the document that contains the applet, not the applet codebase.

Image object checks

While image objects are accessible from other origins, their `src` and `lowsrc` properties are not. These URLs could reveal some or all the URL info about the document containing them.

Linked script library checks

To prevent a network-based script from hijacking a local script library file, NN4+ prevents a page from loading a `file:` protocol library in the `SRC` attribute of a `<SCRIPT>` tag unless the main document also comes from a `file:` protocol source. If you are beginning to think that security engineers are a suspicious and paranoid lot, you are starting to get the idea. It's not easy to curb potential abuses of Bad Guys in a networked environment initially established for openness and free exchange of information among trusted individuals.

The Netscape Signed Script Policy

Just as there are excellent reasons to keep Web pages from poking around your computer and browser, there are equally good reasons to allow such access to a Web site you trust not to be a Bad Guy. To permit trusted access to the client machine and browser, Sun Microsystems and Netscape (in cooperation with other sources) have developed a way for Web application authors to identify themselves officially as authors of the pages and to request permission of the user to access well-defined parts of the computer system and browser.

The technology is called object *signing*. In broad terms, object signing means that an author can electronically lock down a chunk of computer code (whether it be a Java applet, a plug-in, or a script) with the electronic equivalent of a wax seal stamped by the author's signet ring. At the receiving end, a user is informed that a sealed chunk of code is requesting some normally protected access to the computer or browser. The user can examine the "seal" to see who authored the code and the nature of access being requested. If the user trusts the author not to be a Bad Guy, the user grants permission for that code to execute; otherwise the code does not run at all. Additional checks take place before the code actually runs. That electronic "seal" contains an encrypted, reduced representation of the code as it was locked by the author. If the encrypted representation cannot be re-created at the client end (it takes only a fraction of a second to check), it means the code has been modified in transit and will not run.

In truth, nothing prevents an author from being a Bad Guy, including someone you may normally trust. The point of the object signing system, however, is that a trail leads back to the Bad Guy. An author cannot use this technology to sneak into your computer or browser without your explicit knowledge and permission.

Signed objects and scripts

A special version of the signed object technology is the one that lets scripts be locked down by their author and electronically signed. Virtually any kind of script in a document can be signed: a linked `.js` library, scripts in the document, event handlers, and JavaScript entities. As described later in this chapter, you must prepare your scripts for being signed, and then run the entire page through a special tool that attaches your electronic signature to the scripts within that page.

What you get with signed scripts

If you sign your scripts and the user grants your page permission to do its job, signed scripts open up your application to a long list of capabilities, some of which border on acting like genuine local applications. Because the designers of NN4+ know that signed scripts are available to authors, a huge number of properties and actions are exposed to authors.

The most obvious power you get with signed scripts is freedom from the restrictions of the same origin policy. All object properties and methods that perform origin checks for access in other frames and windows become available to your scripts without any special interaction with the user beyond the dialog box that requests the one-time permission for the page.

Some operations that normally display warnings about impending actions — sending a form to a `mailto:` URL or closing the main browser window under script control — lose those warning dialog boxes if the user grants the appropriate permission to a signed script. Object properties considered private information, such as individual URLs stored in the history object and browser preferences, are opened up, including the possibility of altering browser preferences. Existing windows can have their chrome elements hidden. New windows can be set to be always raised or lowered, sized to very small sizes, or positioned offscreen. The `dragDrop` event of a window reveals its URL. All of these are powerful points of access, provided the user grants permission.

Again, however, I emphasize that these capabilities are accessible via Netscape's signed script policy only. Internet Explorer, at least through Version 5.5, does not support Netscape's signed script policy.

The Digital Certificate

Before you can sign a script or other object, you must apply for a digital certificate. A digital certificate (also called a digital ID) is a small piece of software that gets downloaded and bound to the developer's Navigator browser on a particular computer. Each downloaded digital certificate appears in the list of certificates under the "Mine" category in Navigator 6's Security Manager window (accessible through the Tasks menu). If you have not yet applied for a certificate, the list is empty. When you sign a page with the certificate, information about the certificate is included in the file generated by the signing tool.

Possession of a certificate makes you what is known as a principal. If a user loads a page that has signed "stuff" in it, a security alert advises the user that a Web site is requesting enhanced privileges.

Certificates are issued by organizations established as certificate authorities. A certificate authority (known as a CA for short), or a certificate server authorized by a CA, registers applicants and issues certificates to individuals and software developers. When you register for a certificate, the CA queries you for identification information, which it verifies as best it can. The certificate that is issued to you identifies you as the holder of the certificate. Under the "Authorities" category of the Security Manager window are the certificate authorities loaded into the browser when you installed the browser. These are organizations that issue certificates. The CA of the organization that issues your certificate must be listed for you to sign scripts.

How to get a certificate

You must visit a certificate vendor to obtain your certificate. The cost ranges from about $20 to many hundreds of dollars depending on the vendor and the type of certificate you want to obtain. One vendor that is aware of the needs of Netscape object signing is Thawte Digital Certificate Services (`www.thawte.com`). This CA offers a certificate expressly for developers performing Netscape object signing. Verisign (`www.verisign.com`) is also recommended.

Because one of the foundations of a certificate is the identity of the certificate owner, registration requires submitting documentation that proves the identity of your organization. Each CA has different requirements, so check the latest information at the CA's enrollment Web site. After the CA processes your application, the company sends you an e-mail message with a code number to pick up your certificate at the CA's Web site. The act of picking up the certificate is actually downloading the certificate into your browser. Therefore, be sure you are using the Navigator browser on the computer with which you will use to sign your pages.

Activating the codebase principal

If you want to try out the capabilities available to signed scripts from a server without purchasing a certificate (or without going through the signing process described later in this chapter during script development and debugging), you can set up your copy of Navigator to accept what is called a *codebase principal* in place of a genuine certificate. A codebase principal means that the browser accepts the source file as a legitimate principal, although it contains no identification as to the owner or certificate.

Depending on which version of Navigator you are running, if you set up your browser for codebase principals, you may not be able to verify a certificate that is presented to you when accessing someone else's Web site — even if it is a valid cryptographic certificate. Therefore, even though secure requests won't slip past you silently, your Navigator won't necessarily have the protective shield it normally does to identify certificate holders beyond the URL of the code. Enable codebase principals only on a copy of Navigator that doesn't venture beyond your development environment. To activate codebase principals for your copy of Navigator, follow these steps:

1. Quit Navigator.
2. Search your hard disk for a Navigator 4 support file named `prefs.js` or Navigator 6 support file named `all.js`.
3. Edit the version-specific file in a text editor as follows:

   a. For NN4, add the following line to the end of the `prefs.js` file:

   ```
   user_pref("signed.applets.codebase_principal_support", true);
   ```

   b. For NN6, change the codebase_principal preference in `all.js` from `false` to `true`:

   ```
   pref("signed.applets.codebase_principal_support", true);
   ```

4. Save the file.

To deactivate codebase principals, quit Navigator and then change the `true` setting of the affected line to `false`. Because Navigator 4 rebuilds the preference file upon quitting, the entry will be in alphabetical order rather than at the end of the file where you first entered it. This preferences setting does not affect your ability to sign scripts with your certificate as described in the rest of this article.

Signing Scripts

The process of signing scripts entails some new concepts for even experienced JavaScript authors. You must use a separate signing tool program. You must also prepare the page that bears scripts so that the tool and the object signing facilities of the browser can do their jobs.

Signing tool

Download the latest version of Netscape's SignTool from links you find at `http://developer.netscape.com:80/software/signedobj/jarpack.html` (you find different versions for a variety of Windows and Unix versions). This tool includes a utility program called a JAR Packager. A JAR file is a special kind of zipped file collection that has been designed to work with the Navigator security infrastructure. The letters of the name stand for Java ARchive, which is a file format standard developed primarily by Sun Microsystems in cooperation with Netscape and others.

A JAR file's extension is `.jar`, and when it contains signed script information, it holds at least one file, known as the *manifest*, or list of items zipped together in the file. Among the items in the manifest is certificate information and data (a hash value code) about the content of the signed items at the instant they were signed. In the case of a single page containing signed scripts, the JAR file contains only the certificate and hash values of the signed scripts within the document. If the document links in an external `.js` script library file, that library file is also packaged in the JAR file. Thus, a page with signed scripts occupies space on the server for the HTML file and its companion JAR file.

The SignTool program combines the JAR Packager with the script signing functions (originally a separate program called `zigbert.exe`). Follow links on the SignTool download page to the latest instructions on packaging and signing your finished files from the command line (there is no GUI for this tool). But before you reach that point, you need to compose your pages in a way that the security mechanism can protect your scripts.

Preparing scripts for signing

Signifying which items in a page are script items that require signing is up to the page author. It is important to remember that if you want to sign even one script element in a document, *every* script in the document must be signed. By "document," I mean an object model document. Because the content of an NN4-only `<LAYER>` tag exists in its own document, you don't have to sign its scripts if they don't require it, nor communicate with the signed scripts in the main document.

The first concept you have to master is recognizing what a script is. For signing purposes, a script is more than just the set of statements between a `<SCRIPT>` and `</SCRIPT>` tag boundary. An event handler — even one that calls a function living in a `<SCRIPT>` tag — is also a script that needs signing. So, too, is a JavaScript entity used to supply a value to an HTML tag attribute. Each one of these items is a script as far as script signing is concerned.

Your job is to mark up the file with special tag attributes that do two things: 1) help SignTool know what items to sign in a file; and 2) help the browser loading the signed document know what items to run through the hash routine again to compare against the values stored in the JAR file.

The ARCHIVE attribute

The first attribute goes in the first `<SCRIPT>` tag of the file, preferably near the very top of the document in the `<HEAD>` portion. This attribute is the `ARCHIVE` attribute, and its value is the name of the JAR file to be associated with the HTML file. For example

```
<SCRIPT LANGUAGE="JavaScript" ARCHIVE="myArchive.jar" ID="1">
```

You can add script statements to this tag or immediately end it with a `</SCRIPT>` tag.

SignTool utility uses the `ARCHIVE` attribute to assign a name to its archive output file. After the signed page loads into the visitor's browser, the attribute points to the file containing signed script information. Having more than one JAR archive file associated with a signed page is possible. Typically, such a situation calls for a second JAR archive overseeing a confined portion of the page. That second archive file may even be embedded in the primary archive file, allowing a script segment signed by one principal to be combined with scripts signed by a different principal.

The ID attribute

More perplexing to scripters coming to script signing for the first time is the ID attribute. The ID attribute is merely a label for each script. Each script must have a label that is unique among all labels specified for a JAR archive file.

As with the ARCHIVE attribute, the ID plays a dual role. When you run your page through SignTool, the utility scans the page for these ID attributes. When SignTool encounters one, it calculates a hash value (something like a checksum) on the content of the script. For a <SCRIPT> tag set, it is for the entire content of the tag set; for an event handler, it is for the event handler text. The hash value is associated with the ID attribute label and stored inside the JAR file. After the document loads into the client's browser, the browser also scans for the ID attributes and performs the same hash calculations on the script items. Then the browser can compare the ID/hash value pairs against the list in the JAR file. If they match, then the file has arrived without being modified by a Bad Guy (or a dropped bit in the network).

Most examples show ID attribute values to be numbers, but the attributes are actually strings. No sequence or relationship exists among ID attribute values: you can use the names of your favorite cartoon show characters, as long as no two ID attributes are given the same name. The only time the same ID attribute value may appear in a document is if another JAR file is embedded within the main JAR file. Even so, I recommend avoiding reusing names inside the same HTML file, no matter how many JAR files are embedded.

With one exception, each script item in a document must have its own ID attribute. The exception is a <SCRIPT> tag that specifies a SRC attribute for an external .js file. That file is part of the JAR file, so the browser knows it's a signed script.

For other <SCRIPT> tags, include the ID attribute anywhere within the opening tag, as follows:

```
<SCRIPT LANGUAGE="JavaScript" ID="3">
   statements
</SCRIPT>
```

For a function handler, the ID attribute comes after the event handler inside the object tag, as follows:

```
<INPUT TYPE="button" VALUE="Calculate" onClick="doCalc(this.form)" ID="bart">
```

And for a JavaScript entity, the ID attribute must be specified in an empty <SCRIPT> tag immediately before the tag that includes the entity for an attribute value, as follows:

```
<SCRIPT ID="20">
<INPUT TYPE="text" NAME="date" VALUE=&{getToday()};>
```

Listing 46-1 shows a skeletal structure of a document that references a single JAR file and includes five signed scripts: One external .js file and four script items in the document itself. The fetchFile() function invokes a function imported from access.js. Notice that the ARCHIVE attribute appears in the very first <SCRIPT> tag in the document. This also happens to be a tag that imports an external .js file, so that no ID attribute is required. If there were no external library file for this page, the ARCHIVE attribute would be located in the main <SCRIPT> tag, which also has the ID attribute. I arbitrarily assigned increasing numbers as the ID attribute values, but I could have used any identifiers. Notice, too, that each script has its own ID value. Just because an event handler invokes a function in a <SCRIPT> tag that has an ID value doesn't mean a relationship exists between the ID attribute values in the <SCRIPT> tag and in the event handler that invokes a function there.

Listing 46-1: Basic Signed Script Structure

```
<HTML>
<HEAD>
<TITLE>Signed Scripts Testing</TITLE>
<SCRIPT LANGUAGE="JavaScript" ARCHIVE="myArchive.jar" SRC="access.js"></SCRIPT>
<SCRIPT LANGUAGE="JavaScript" ID="1">
function fetchFile(form) {
   form.output.value = getFile()
}
function newRaisedWindow() {
   // statements for this function
}
</SCRIPT>
</HEAD>
<BODY>
A Source Code Example Only
<FORM>
<TEXTAREA NAME="output" COLS=60 ROWS=10 WRAP="virtual"></TEXTAREA><BR>
<INPUT TYPE="button" VALUE="Read File" onClick="this.form.output.value = '';
fetchFile(this.form);" ID="2"><BR>

<TEXTAREA NAME="input" COLS=60 ROWS=10 WRAP="virtual"> </TEXTAREA><BR>
<INPUT TYPE="button" VALUE="Save File" onClick="setFile(this.form.input.value);"
ID="3"><P>
<INPUT TYPE="button" VALUE="New Window..." onClick="newRaisedWindow();" ID="4">
</FORM>
</BODY>
</HTML>
```

Editing and moving signed scripts

The nature of the script signing process requires that even the slightest modification you make to a signed script source code requires re-signing the page. For this reason, enabling codebase principals while you create and debug your early code is a convenient alternative.

The rigid link between the hash value of a script element at both the signing and visitor loading times means that you must exercise care when shifting an HTML file that contains signed script elements between servers of differing operating systems. Windows, UNIX, and Macintosh have different ways of treating carriage returns. If you change the representation of an HTML source file when you move the source from, say, a Windows machine to a UNIX server, then the signature may no longer work. However, if you perform a purely binary transfer of the HTML files, every byte is the same, and the signature should work. This operating system-specific text representation affects only how files are stored on servers, not how various client platforms interpret the source code.

Accessing Protected Properties and Methods

For the browser to allow access to protected properties or methods, it must have its privileges enabled. Only the user can grant permission to enable privileges, but it is up to your code to request those privileges of the user.

Gaining privileges

NN4+ comes with some Java classes that allow signed scripts and other signed objects to display the privilege request alert windows, and then turn on the privileges if the user clicks the "OK" or "Grant" button. A lot of these classes show up in the `netscape.security` package, but scripters only work directly with one class and three of its methods:

```
netscape.security.PrivilegeManager.enablePrivilege(["targetName"])
netscape.security.PrivilegeManager.revertPrivilege(["targetName"])
netscape.security.PrivilegeManager.disablePrivilege(["targetName"])
```

The `enablePrivilege()` method is the one that displays the security alert for the user. In NN4, the specific target named as a parameter influenced the details of the security alert message; for NN6, the security alert is generic (and far less intimidating).

If the user grants the privilege, script processing continues with the next statement. But if the user denies access, then processing stops, and the `PrivilegeManager` class throws a Java exception that gets displayed as a JavaScript error message. Later in this chapter I show you how to gracefully handle the user's denial of access.

Enabling a privilege in JavaScript is generally not as risky as enabling a Java applet. The latter can be more easily hijacked by an alien class to piggyback on the trusted applet's privileges. Even though the likelihood of such activity taking place in JavaScript is very low, turning privileges off after the statement that requires privileges is always a good idea. Use the `revertPrivilege()` method to temporarily turn off the privilege; another statement that enables the same privilege target will go right ahead without asking the user again. Disable privileges only when the script requiring privileged access won't be run again until the page reloads.

Specifying a target

Rather than opening blanket access to all protected capabilities in one blow, the Netscape security model defines narrow capabilities that are opened up when privileges are granted. Each set of capabilities is called a target. Netscape defines dozens of different targets, but not all of them are needed to access the kinds of methods and properties available to JavaScript. You will likely confine your targets to the nine discussed here.

Because NN4's security alerts provided (at times excruciating) detail about the nature of the privilege being requested by the Web site, targets had various risk levels and categories. These concerns are less of an issue in NN6, but they are provided here for your more complete understanding of the mechanisms beneath the Privilege Manager.

Each target has associated with it a risk level (low, medium, or high) and two plain-language descriptions about the kinds of actions the target exposes to code. This information appears in the NN4 security privilege dialog box that faces a user the first time a particular signature requests privileges. All of the targets related to scripted access are medium or high risk, because they tend to open up local hard disk files and browser settings.

Netscape has produced two categories of targets: primitive and macro. A *primitive target* is the most limited target type. It usually confines itself to either reading or writing of a particular kind of data, such as a local file or browser preference. A *macro target* usually combines two or more primitive targets into a single target to simplify the user experience when your scripts require multiple kinds of access. For example, if your script must both read and write a local file, it could request privileges for each direction, but the user would be presented with a quick succession of two similar-looking security dialog boxes. Instead, you can use a macro target that combines both reading and writing into the privilege. The user sees one security dialog box, which, in NN4, explains that the request is for both read and write access to the local hard disk.

Likely targets for scripted access include a combination of primitive and macro targets. Table 46-1 shows the most common script-related targets and the information that appears in the security dialog box.

For each call to `netscape.security.PrivilegeManager.enablePrivilege()`, you specify a single target name as a string, as in

```
netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserRead")
```

This specification allows you to enable, revert, and disable individual privileges as required in your script.

Table 46-1 Scripting-Related Privilege Targets

Target Name		
Risk	***Short Description***	***Long Description***
`UniversalBrowserAccess`		
High	Reading or modifying browser data	Reading or modifying browser data that may be considered private, such as a list of Web sites visited or the contents of Web forms you may have filled in. Modifications may also include creating windows that look like they belong to another program or positioning windows anywhere on the screen.

Risk	*Short Description*	*Long Description*
`UniversalBrowserRead`		
Medium	Reading browser data	Access to browser data that may be considered private, such as a list of Web sites visited or the contents of Web page forms you may have filled in.
`UniversalBrowserWrite`		
High	Modifying the browser	Modifying the browser in a potentially dangerous way, such as creating windows that may look like they belong to another program or positioning windows anywhere on the screen.
`UniversalFileAccess`		
High	Reading, modifying, or deleting any of your files	This form of access is typically required by a program such as a word processor or a debugger that needs to create, read, modify, or delete files on hard disks or other storage media connected to your computer.
`UniversalFileRead`		
High	Reading files stored in your computer	Reading any files stored on hard disks or other storage media connected to your computer.
`UniversalFileWrite`		
High	Modifying files stored in your computer	Modifying any files stored on hard disks or other storage media connected to your computer.
`UniversalPreferencesRead`		
Medium	Reading preferences settings	Access to read the current settings of your preferences.
`UniversalPreferencesWrite`		
High	Modifying preferences settings	Modifying the current settings of your preferences.
`UniversalSendMail`		
Medium	Sending e-mail messages on your behalf	

Blending Privileges into Scripts

The implementation of signed scripts in Navigator protects scripters from many of the potential hazards that Java applet and plug-in developers must watch for. The chance that a privilege enabled in a script can be hijacked by code from a Bad Guy is very small. Still, exercising safe practices in case you someday work with other kinds of signed objects is good practice.

Keep the window small

Privilege safety is predicated on limiting exposure according to two techniques. The first technique is to enable only the level of privilege required for the protected access your scripts need. For example, if your script only needs to read a normally protected `document` object property, then enable the `UniversalBrowserRead` target rather than the wider `UniversalBrowserAccess` macro target.

The second technique is to keep privileges enabled only as long as the scripts need them enabled. If a statement calls a function that invokes a protected property, enable the privilege for that property in the called function, not at the level of the calling statement. If a privilege is enabled inside a function, the browser automatically reverts the privilege at the end of the function. Even so, if the privilege isn't needed all the way to the end of the function, you should explicitly revert it after you are through with the privilege.

Think of the users

One other deployment concern focuses more on the user's experience with your signed page. You should recognize that the call to the Java `PrivilegeManager` class is a LiveConnect call from JavaScript in NN4. Because the Java virtual machine does not start up automatically when Navigator 4 does, a brief delay occurs the first time a LiveConnect call is made in a session (the statusbar displays "Starting Java..."). Such a delay may interrupt the user flow through your page if, for example, a click of a button needs access to a privileged property. Therefore, consider gaining permission for protected access as the page loads. Execute an `enablePrivilege()` and `revertPrivilege()` method in the very beginning. If Java isn't yet loaded into the browser, the delay is added to the other loading delays for images and the rest of the page. Thereafter, when privileges are enabled again for a specific action, neither the security dialog box nor the startup delay get in the way for the user.

Also remember that users don't care for security dialog boxes to interrupt their navigation. If your page utilizes a couple of related primitive targets, at the outset enable the macro target that encompasses those primitive targets. The user gets one security dialog box covering all potential actions in the page. Then let your script enable and revert each primitive target as needed.

Example

To demonstrate signed scripts in action, I show a page that accesses a typical target that allows the script to open an always-raised new window. No error checking occurs for the user's denial of privilege in this example. Therefore, if you experiment with this page (either with codebase principals turned on or signing them yourself), you will see the JavaScript error that displays the Java exception. Error detection is covered later in the chapter.

Accessing a protected window property

Listing 46-2 is a small document that contains one button. The button calls a function that opens a new window with the NN-proprietary `alwaysRaised` parameter turned on. Setting protected `window.open()` parameters in NN4+ requires the `UniversalBrowserWrite` privilege target. Inside the function, the privilege is enabled only for the creation of the new window. For this simple example, I do not enable the privilege when the document loads.

Listing 46-2: Creating an alwaysRaised Window

```
<HTML>
<HEAD>
<TITLE>Simple Signed Script</TITLE>
<SCRIPT LANGUAGE="JavaScript" ARCHIVE="myJar.jar" ID="1">
function newRaisedWindow() {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    var newWindow = window.open("","","HEIGHT=100,WIDTH=300,alwaysRaised")
    netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserWrite")
    var newContent = "<HTML><BODY><B>It\'s good to be the King!</B>"
    newContent += "<FORM><CENTER><INPUT TYPE='button' VALUE='OK'"
    newContent += "onClick='self.close()'></CENTER></FORM></BODY></HTML>"
    newWindow.document.write(newContent)
    newWindow.document.close()
}
</SCRIPT>
</HEAD>
<BODY>
<B>This button generates an always-raised new window.</B>
<FORM>
<INPUT TYPE="button" VALUE="New 'Always Raised' Window"
onClick="newRaisedWindow()" ID="2">
</BODY>
</HTML>
```

Listing 46-2 has two script items that need signing: the `<SCRIPT>` tag and the event handler for the button. Also, the `ARCHIVE` attribute points to the JAR file that contains the script signature. Note that this example file is not signed, and therefore does not include a companion JAR archive on the companion CD-ROM.

Handling Privilege Manager Errors

The change between the ways NN4 and NN6 allows scripts to intercept errors causes no small problem if you need to serve both browser versions. The primary reason you want to handle errors is that when a user denies access to advanced privileges, the `PrivilegeManager` generates an error. While the error is not destructive in any way, and it appears only in the JavaScript Console window (NN4.5+), accounting for such factors is good coding practice. Unfortunately, the mechanism that works for NN4 doesn't work in NN6; the mechanism that works in NN6 cannot even be placed in a page that loads into NN4 without generating syntax errors. The bottom line is that you need to serve up different pages for NN4 and NN6 until such time as the NN4 installed base drops away.

For NN4, you can define an `onerror()` function that looks for the specific error message thrown by the `PrivilegeManager` class through LiveConnect. That function looks as the following:

```
function onerror(msg, URL, lineNum) {
    var errorMsg = msg
    if (msg.indexOf("ForbiddenTargetException") != -1) {
        errorMsg = "You have elected not to grant privileges to this script."
    }
    alert(errorMsg)
    return true
}
```

Of course, you don't have to display any message, but it may be a good place to advise users about what they're missing by not granting privilege.

For NN6, you can use the native `try...catch` exception handling, which means that the calls to the `enablePrivilege()` method of the `PrivilegeManager` class must be wrapped inside a `try` block. The function from Listing 46-2 is modified as follows:

```
function newRaisedWindow() {
    try {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    }
    catch(err) {
        alert("You have elected not to grant privileges to this script.")
        return
    }
    var newWindow = window.open("","","HEIGHT=100,WIDTH=300,alwaysRaised")
    netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserWrite")
    var newContent = "<HTML><BODY><B>It\'s good to be the King!</B>"
    newContent += "<FORM><CENTER><INPUT TYPE='button' VALUE='OK'"
    newContent += "onClick='self.close()'></CENTER></FORM></BODY></HTML>"
    newWindow.document.write(newContent)
    newWindow.document.close()
    return
}
```

Signed Script Miscellany

In this last section of the chapter, I list some of the more esoteric issues surrounding signed scripts. Three in particular are: 1) how to allow unsigned scripts in other frames, windows, or layers to access signed scripts; 2) how to make sure your signed scripts are not stolen and reused; and 3) special notes about international text characters.

Exporting and importing signed scripts

JavaScript provides an escape route that lets you intentionally expose functions from signed scripts for access by unsigned pages. If such a function contains a trusted privilege without careful controls on how that privilege is used, a page that is not as well intentioned as yours could hijack the trust.

The command for exposing this function is export. The following example exports a function named `fileAccess()`:

```
export fileAccess
```

A script in another window, frame, or layer can use the import command to bring that function into its own set of scripts:

```
import fileAccess
```

Even though the function is now also a part of the second document, it executes within the context of the original document, whose signed script governs the privilege. For example, if you exported a function that did nothing but enable a file access privilege, a Bad Guy who studies your source code could write a page that imports that function into a page that now has unbridled file access.

If you wish to share functions from signed scripts in unsigned pages loaded into your own frames or layers, avoid exporting functions that enable privileges. Other kinds of functions, if hijacked, can't do the same kind of damage as a privileged function can.

Locking down your signed pages

Speaking of hijacking scripts, it would normally be possible for someone to download your HTML and JAR archive files and copy them to another site. When a visitor comes to that other site and loads your copied page and JAR file, your signature is still attached to the scripts. While this may sound good from a copyright point of view, you may not want your signature to appear as coming from someone else's Web server. You can, however, employ a quick trick to ensure that your signed scripts work only on your server. By embedding the domain of the document in the code, you can branch execution so that scripts work only if the file comes from your server.

The following script segment demonstrates one way to employ this technique:

```
<SCRIPT LANGUAGE="JavaScript1.2" ARCHIVE="myPage.jar" ID="1">
if (document.URL.match(/^http:\/\/www.myDomain.com\//)) {
    privileges statements execute only from my server
}
</SCRIPT>
```

This technique works only if you specify JavaScript 1.2 as the script language. Even though this branching code is visible in the HTML file, the hash value of your code is saved and signed in the archive. If someone modifies the HTML, the hash value that is recalculated when a visitor loads the page won't match the JAR file manifest, and the script signature fails.

International characters

While international characters are fine for HTML content, they should not be used in signed scripts. The problem is that international characters are often converted to other character sets for display. This conversion invalidates the signature, because the signed and recalculated hash values don't match. Therefore, do not put international characters in any signable script item. If you must include such a character, you can escape it or, in NN4, put such scripts in unsigned layers.

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CHAPTER 47

Cross-Browser Dynamic HTML Issues

In This Chapter

Introducing Dynamic HTML

The common denominator of DHTML functionality across browsers

Upgrading to modern compatibility techniques

Level 4 browsers and later — NN4+ and IE4+ — were the first browsers to include World Wide Web technologies that gave page authors far more control over the display and interactive behavior of Web page content. Lumped together under the heading of Dynamic HTML (DHTML), these technologies dramatically extended the simple formatting of standard HTML that page authors had used for years. These days, scripters and designers coming to Web development for the first time take DHTML capabilities for granted; they are probably unaware that plain ol' HTML is little more than a specification to format static text and images on a page.

A lot of what the user gets with DHTML had previously been accomplished only via Java applets and plug-ins, such as Shockwave. Not that DHTML eliminates these technologies from the Web author's arsenal (DHTML doesn't do sound or video, for example), but because DHTML can accomplish much more of what authors look for in assembling page content and layout without the long downloads of applets or plug-in content, it becomes an attractive way for nonprogrammers to spice up Web applications.

Perhaps categorizing DHTML authors as "nonprogrammers" is not quite right. DHTML also adds significantly to the vocabulary required to incorporate dynamic content into pages. Suddenly HTML becomes a lot more programming than simply adding tags to existing content. And if you want to do dynamic positioning of elements, be prepared to put your JavaScript skills to use.

What Is DHTML?

You can practically find as many definitions of Dynamic HTML as there are people to ask. This is especially true if you ask Netscape and Microsoft. Each company defines DHTML in terms of the support its browser has for a variety of technologies. My definition covers a broad range, because DHTML is not really any one “thing.” Instead it is an amalgam of several technologies, each of which has a standards effort in varying stages of readiness. The key technologies are as follows: Cascading Style Sheets; Document Object Model (DOM); and client-side scripting. To this list I also admit recent advances in Extensible Markup Language (XML), which opens the door to author-generated, page-specific HTML extensions that don’t rely on standards bodies or browser support. It will help your authoring skills if you have a little historical perspective on how the Web arrived at DHTML.

For many years, the HTML standard was intended for the rendering of static content — not much more than an electronic version of a printed page. The most interactive part of a page was a form, which included buttons to click and text boxes to fill in. But for anything to change on the page, the content had to be served up again from the host computer.

Client-side scripting, as first implemented through JavaScript in NN2, opened the way for HTML pages to not only contain some “smarts,” but also control individual pieces of content on the page without fetching a modified page from the server. At first, only form elements were scriptable. Soon thereafter, images could be swapped, although the rectangular space for the image was fixed when the page loaded. More dynamism accrued to pages in NN4 by way of the layer, which acted like a borderless, transparent or opaque window that could contain its own HTML document content and be positioned anywhere on the page, including overlapping content on the main page or other layers. A layer’s entire content could be modified without touching the rest of the page or other layers.

But the real breakthrough in dynamism came in IE4, whose rendering engine permitted any element to be modified, inserted, or removed on the fly, while the rest of the page reflowed its content quickly and automatically in response to the change. At the same time, an accepted standard for style sheets (Cascading Style Sheets) opened the way for scripts to modify the look of content already on the page. Text could change colors when a cursor rolled atop it by either adjusting the style sheet property associated with the text or changing the style sheet rule that applies to the text.

Development activity at both Netscape and Microsoft eventually led to a standard for the Document Object Model as a way for scripts to control HTML content directly. Unfortunately, the browser makers frequently implemented first, and then tried to establish their implementations as standards. Sometimes the implementations were not as complete as the standards became, leaving the browsers in states that only partially implement the standards, while paying homage to legacy implementations. Netscape used the occasion of developing an entirely new code base for what became NN6 to try to sever some ties with the past. In many respects that browser represents the state of the standard art as implemented so far. Newest versions of IE, on the other hand, must try to cater to both the legacy implementation and the standards, creating a massive DOM implementation with significant overlap in functionality with different syntaxes. Thus, the result of proprietary explorations and industry standards is a choice of modern browsers that permit a wide range of dynamic activity on content that reaches the browser. Browsers that had started life as sleepy renderers of a tiny HTML vocabulary have grown into powerful front ends for server applications, if not self-contained applications of a sort that execute entirely on the client computer.

Standards for CSS, DOM, and ECMA scripting have been well covered earlier in this book. The purpose of this chapter is to demonstrate approaches to accommodating the sometimes vast differences in specific implementations of these technologies (including browser-specific variations) to produce content that runs on as many DHTML-capable browsers as possible. Most of the problems, as you are well aware from Chapters 15 and 31, are caused by page authors trying to develop for essentially three different document object models: NN4, IE4+, and W3C DOM (as implemented in IE5+ and NN6).

Striving for Compatibility

With as many as three object models to support (you can, of course, elect to support only a subset of browsers if you like) you should look for ways to minimize your pain. If the NN4 object model is in your mix, you will very likely experience moments of sheer torture, as you try to get even the CSS-supported HTML to behave as it does in browsers of the other object models. Thankfully, the NN4 browser's installed base is shrinking, but for some page authors, it can't disappear quickly enough.

Two keys to survival are among the object models: knowing each DOM's limitations and finding common denominators.

In the area of DHTML limitations, NN4 is the clear winner. Compared to the automatic content reflowing of IE4+ and NN6, the NN4 object model is painfully static. For example, dynamically changing the color of a chunk of text in response to a rollover is a difficult task in NN4 requiring the careful positioning of a layer atop main page text; and making any inline modification to content (other than swapping an image of the same size) is completely out of the question. Between the IE4+ and W3C DOMs, the biggest differences fall more along operating system and browser brand lines. Microsoft takes advantage of the integration of the IE browser and the Windows operating system to such an extent that it can provide IE services that work only on Windows versions of IE. IE/Mac users are out of luck (for data binding or text filters, for instance), as are NN6 users.

Looking for areas of commonality — or at least gaining a clear understanding of where the models diverge — can be a tedious, yet personally rewarding pursuit. For example, one of the biggest problems facing designers for all three DOMs is the way scripts must reference elements that are to be moved or hidden (something that all three object models can do). NN4 requires references that take the layer object structure into account; IE4+ has the Microsoft syntax of `document.all`, which provides a reference avenue to any element whose `ID` attribute is set; and the W3C DOM (as implemented in IE5+ and NN6) users a finger-twisting (albeit now industry standard) `document.getElementById()` method to obtain a reference to any ID'd element.

As soon as your script has a valid reference to an element, the next step is to read or write some property, or invoke some method of that object that governs the element's position (and possibly other style) attributes. Here, again, the object models diverge, but not quite as severely. NN4 has a singular implementation that provides properties and methods of positioned elements (`layer` objects) directly; the IE4+ and W3C DOMs, on the other hand, work their positioning magic through the `style` property of a positioned element. In some cases the "last-dot" property names are identical across all three models (for example, `document.myLayer.zIndex`, `document.all.`

myLayer.style.zIndex, and document.getElementById("myLayer").style.zIndex). Building a reference to reach that last dot, though, is where some of your hard work must go.

Each DOM also has its own event model. Whereas IE5+ overlaps its DOM features with both the IE4+ and to some extent the W3C DOM, the event models don't follow the same lines of implementation. As of IE5.5/Windows and IE5/Mac, IE does not implement any of the W3C DOM event model, although NN6 does.

The bottom line, then, is letting your scripts decide how to perform actions based on the browser version is not a good idea. Instead, the scripts should be smart enough to act based on the capabilities of the browser that is currently running the script. As you see in the rest of this chapter, it is possible to develop fairly sophisticated DHTML into a page and make it work with all three DOMs without one iota of browser version detection.

Working Around Incompatibilities

To create DHTML for multiple DOMs, you must find ways to accommodate incompatible object references and occasionally incompatible property names. Scripting gives you several alternatives to working your way around these potential problems. Some of the approaches you can take are now passe, but they are described here partly for the sake of historical reference, but also because you will see many instances of these approaches taken in legacy DHTML applications from the days when authors had to worry about only two DOMS (NN4 and IE4). The real "meat" of this discussion comes later, when you learn more about object detection and custom APIs.

Old-fashioned compatibility tricks

In a simpler time (until late 2000), it was possible to write cross-browser DHTML applications that had to run on only two classes of browser: NN4 and IE4. Two approaches to writing code for these two DOMs grew in popularity: inline branching and platform equivalency. They are described here, not for you to apply, but for you to understand what the pioneers did, in case you encounter their code in your Web surfing.

Inline branching

The idea behind inline branching is that your scripts will use if...else decisions to execute one branch of code for one browser and another branch for the other browser. Before you can begin to write code that creates branches for each browser, you should define two global variables at the top of the page that act as Boolean flags for your if...else constructions later. Therefore, at the first opportunity for a <SCRIPT> tag in a page, include the following code fragment to set flags named is Nav4 and isIE4:

```
var isNav4, isIE4
if (parseInt(navigator.appVersion) == 4) {
    if (navigator.appName == "Netscape") {
        isNav4 = true
    } else if (navigator.appVersion.indexOf("MSIE") != -1) {
        isIE4 = true
    }
}
```

Version checking here is quite specific. First of all, it intentionally limits access to browsers whose versions come back as Version 4. This code, written when the browsers were still at Version 4, was remarkably prescient. My concern at the time was that DHTML was so volatile that it was unknown if future browser versions would be backward compatible with the code to be run inside branches governed by the two global variables. As it turned out, NN6 (whose `navigator.appVersion` reports 5) is not backward compatible with the layer structure of NN4, so that locking the NN4 branches to NN4 became a good thing. On the IE side, the `navigator.appVersion` property continues to report 4, even through IE5.5, which is backward compatible with IE4. Thus, any branch dedicated to IE4 executes under this scheme and remains syntactically accurate.

Another aspect of the flag-setting script I should mention is that the example provides no escape route for browsers that aren't level 4 or aren't either Navigator or Internet Explorer (should there be a level 4 browser from another brand). In a production environment, I would either prefilter access to the page or redirect ill-equipped users to a page that explains why they can't view the page. In the structure of the above script, redirection would have to be made in two places, as follows:

```
var isNav4, isIE4
if (parseInt(navigator.appVersion) == 4) {
    if (navigator.appName == "Netscape") {
        isNav4 = true
    } else if (navigator.appVersion.indexOf("MSIE") != -1) {
        isIE4 = true
    } else {
        location = "sorry.html"
    }
} else {
    location = "sorry.html"
}
```

Later in this chapter, I discuss the issue of designing DHTML pages that degrade gracefully in pre-DHTML browsers.

With the global variables defined in the document (and unsupported browsers redirected elsewhere), you can use them as condition values in branching statements that address an object according to the reference appropriate for each platform. For example, to change the `visibility` property of an object named instructions, you use the flags as follows:

```
if (isNav4) {
    document.instructions.visibility = "hidden"
} else {
    document.all.instructions.style.visibility = "hidden"
}
```

As the browser DOMs evolve, expand, and fragment, inline branching becomes increasingly less practical. With so many permutations of DOM according to browser brand, browser version, and operating system, you can drive yourself crazy trying to accommodate them all and maintain the code going forward. This approach also eliminates from consideration any non-NN or non-IE browser (such as Opera), which may have the capabilities needed to play your DHTML scripts. This approach also limits the possibility that future browsers with higher `navigator.appVersion` values can take advantage of your scripts.

Platform equivalency

Another technique attempts to limit the concern for the different ways each platform refers to a positionable element (because cross-browser DHTML is pretty much limited to the properties affecting positionable elements). If you examine the formats for each platform's object references, you see that all formats contain a reference to the `document` and to the object name or ID. The IE4+ DOM syntax also includes property words, such as `all` and `style`. If you assign these extra property names to variables for IE4 and leave those variables as empty strings for NN4, you can assemble an object reference for those two platforms in one statement.

To begin using this technique, set two global variables that store reference components for the scope (`all` in IE4) and the `style` object (`style` in IE4):

```
var range = ""
var styleObj = ""
if (parseInt(navigator.appVersion) == 4) {
    if (navigator.appVersion.indexOf("MSIE") != -1) {
        range = "all."
        styleObj = ".style"
    }
}
```

From this point, you can assemble an object reference with the help of the JavaScript `eval()` function, as follows:

```
var instrux = eval("document." + range + "instructions" + styleObj)
instrux.visibility = "hidden"
```

Or, you can use the `eval()` function to handle the entire property assignment in one statement, as follows:

```
eval("document." + range + "instructions" + styleObj + ".visibility = 'hidden'")
```

If your page does not have a lot of objects that your scripts will be adjusting, you can use this platform equivalency approach to create global variables holding references to your positionable objects at load time (triggered by the `onLoad` event handler so that all objects exist and can be referenced by the `eval()` function). Then, use those variables for object references throughout the scripts.

Unfortunately, the platform equivalency methodology breaks down when a NN4 layer object is nested inside another layer. The platform equivalency formulas assume that each object is directly addressable from the outermost `document` object. If your objects have a variety of nested locations, you can use either the inline branching method described earlier, or batch-assign objects to global variables at load time using platform branching techniques along the lines of the following example:

```
var instrux
function initObjectVars() {
    if (isNav4) {
        instrux = document.outerLayer.document.instructions
    } else {
        instrux = document.all.instructions.style
    }
}
```

As soon as the variable contains a valid reference to the object for the current platform, your scripts can treat the object without further concern for platform when addressing properties that have the same name in both platforms:

```
instrux.visibility = "hidden"
```

The nested layer situation is not the only potential problem for the platform equivalency approach. In fact, the W3C DOM format for referencing objects (using the `document.getElementById()` method) makes for some hair-raising string assembly and global variable assignment. Another truly negative aspect is the frequent usage of the `eval()` function. As mentioned in Chapter 42, this function is a performance speed thief.

Modern approaches to compatibility

While in-line branching and platform equivalency were suitable for their generations, the profusion of browser versions calls for better approaches to simplifying authoring for multiple DOMs. Techniques more suitable for today — object detection and custom APIs — are not really new. But these techniques are the preferred way to build cross-browser scripts with an eye to compatibility both backward and forward.

Object detection

The subject of object detection has been mentioned in several places in earlier chapters of this book. The technique has been used for a long time to let a browser not equipped to handle image objects gracefully skip over image swapping script segments:

```
if (document.images) {
    // statements to work with image objects
}
```

If there is no `document.images` property for a browser, the condition evaluates to `undefined`, which the condition treats as being `false`.

But object detection has also been misused in the past, especially in the DHTML realm, to substitute for browser version detection. For example, if a browser supported the `document.all` collection, a global variable was set to indicate that the browser was IE4 or later; the existence of `document.layers` supposedly meant that the browser was NN4. While both of those assertions are true (as of the browsers released so far), it was a mistake to link a browser version with the existence of an object or property. Instead, object detection should be used only if your script statements will be addressing that object, just as the `document.images` condition does in the previous example.

To demonstrate this tactic, consider the need to assemble a reference to an object so that it is ready to have one of its DHTML properties adjusted. Each of the three DOMs has its own syntax for assembling such a reference, and each syntax relies on the existence of a particular object or property. The function shown in Listing 47-1 (not on the CD-ROM by itself, but included in Listing 47-2) lets you pass the name or ID of a positioned element (either in string form or object form) to receive back a valid reference to the object with which style-related properties are associated — all without resorting to the `eval()` function in any form:

Listing 47-1: Using Object Detection to Assemble an Element Object Reference

```
function getObject(obj) {
    var theObj
    if (document.layers) {
        if (typeof obj == "string") {
            // just one layer deep
            return document.layers[obj]
        } else {
            // can be a nested layer
            return obj
        }
    }
    if (document.all) {
        if (typeof obj == "string") {
            return document.all(obj).style
        } else {
            return obj.style
        }
    }
    if (document.getElementById) {
        if (typeof obj == "string") {
            return document.getElementById(obj).style
        } else {
            return obj.style
        }
    }
    return null
}
```

The primary object detection for each of the three sections of this function looks for the presence of categories of objects (`document.layers` and `document.all`) or a particular method (`document.getElementById()`), and then — this is the important part — the script uses those detected objects in the statements. The script doesn't know IE4 from NN6; it *does* know how to derive valid references for three different object models, and employs the syntax of the first one for which the associated object property or method is supported.

In practice, the order of the three sections should have no bearing on your scripts, but you should be aware of one subtlety: IE5+ can work with either of the last two sections, because those browsers detect `document.all` and `document.getElementById` as valid references. If you were to switch the position of the last two sections, then IE5+ would be using W3C DOM terminology. The results, however, are the same: A valid reference to the `style` object associated with an element.

Custom APIs

Notions of object detection and simplifications of your scripts come together in the final approach to building cross-browser DHTML: Writing a custom API (Application Programming Interface). A JavaScript custom API is a library of functions you design to act as an intermediary between your scripts and other scriptable entities. Ideally, an API simplifies access to, or control of, other entities. In the context of designing a cross-browser DHTML page, an API can offer a single function that smoothes over the differences in object references and/or property names among several platforms. Your custom function provides a single access point that is consistent across all platforms. In essence, you are creating your own metavocabulary for methods and property settings.

The element object reference maker in Listing 47-1 is a good start for such an API, because all other functions for moving, hiding, showing, and changing the stacking order of a positionable element need a valid style-oriented reference to the element. Now look at a function from an API whose job is to alter the stacking order of a positionable element:

```
// set the z-order of an object
function setZIndex(obj, zOrder) {
    var theObj = getObject(obj)
    theObj.zIndex = zOrder
}
```

Your main page script would use the ID of the positioned DIV element as the first parameter to this function, with an integer indicating the value that would be assigned to the element's style sheet `z-Index` attribute:

```
setZIndex("myLayer", 100)
```

All of the branching for the various DOMs in this function is done in the `getObject()` function (Listing 47-1), which returns the valid reference for whichever of the three supported DOMs is running the script. All three DOMs, it turns out, have the same `zIndex` property representing the `z-Index` style attribute, so that no further branching is needed here.

As one more example, the next API function offers an interface to incompatible ways of adjusting the location of a positionable element. In this case, the act of moving an element has different syntax in different DOMs. One group (NN4 for layers) uses the `moveTo()` method; the rest support `left` and `top` properties of their `style` object:

```
// position an object at a specific pixel coordinate
function shiftTo(obj, x, y) {
    var theObj = getObject(obj)
    if (theObj.moveTo) {
        theObj.moveTo(x,y)
    } else if (typeof theObj.left != "undefined") {
        theObj.left = x
        theObj.top = y
    }
}
```

Notice one workaround, which, on the surface, isn't pretty: The second branch must perform an odd way of object detection. We're stuck with having to make a tradeoff when it comes to checking for the existence of a style property. If the page uses style sheets defined in `<STYLE>` tags (or imported into the page from external style sheet files), the element affected by the rule does not yield the rule's property values through the element's `style` property. The property exists, but its value in this case (or until it is set by script) is an empty string. IE5 provides a `currentStyle` property to give us the effective values, but that property is not (yet) a part of the DOM standard. But even if you assign the style sheet via the element's `STYLE` attribute (in which case the style property values come through), detecting the presence of the property with the conditional expression

```
if (theObj.left)
```

is not practical here anyway. If the effective value of the `left` and `top` properties were an empty string (or zero for a numeric style property value), the conditional expression would evaluate to the equivalent of `false`, making it appear as though the property doesn't exist. To validate the existence of the property, the conditional expression verifies that the value of a named property has a type other than "undefined." It may seem like a long way to go to prove the existence of a property, but it works, even if the value is an empty string or zero.

It is important that both branches perform object detection. Although it is unlikely (but, as we learned from the transition between NN4 and NN6, not impossible), if a future browser should completely alter its vocabulary, omitting the objects being detected here, the function ends gracefully, without generating script errors.

An API is usually best deployed as an external `.js` file. One such API file is described later in this chapter. Bear in mind, however, that a lengthy API gets downloaded to the browser, no matter how much or how little of it your main scripts use. Blindly linking in a big library just to use a few of its functions is a mistake. You serve your users better if you create a subset of the API, and link the subset to the page (or drop the few functions directly into the page's scripts if the combination is not reused on a lot of pages).

Handling non-DHTML browsers

An important question to ask yourself as you embark on a DHTML-enhanced page is how you intend to treat visitors whose browsers aren't up to the task. In many respects the problem is similar to the problem of treating nonscriptable browsers when your page relies on scripting (see Chapter 13).

The moment your page uses DHTML to position an element, you must remember that non-DHTML browsers display the content according to traditional HTML rendering rules. No elements are allowed to overlap. Any block-level tag is rendered at the left margin of the page, unless some other non-DHTML alignment (center or right) is at work. This goes for elements that you design to be DHTML-positioned to sit offscreen (perhaps with a clickable tab) until called by the user. An element defined as being hidden or not displayed in DHTML will be visible. In most cases, your carefully designed DHTML page will look terrible.

However, a page that does not use too radical a layout strategy may still be usable in non-DHTML browsers. You should always check your DHTML-enabled page in an older browser to see how it looks. Perhaps there isn't too much you need to do to degrade the DHTML so that the page is acceptable in older browsers.

The ultimate responsibility for deciding your compatibility strategy with older browsers rests with you and your perceptions about your page visitors. If they are in need of vital information from your site and that information is readable in non-DHTML browsers, then that may be enough. Otherwise, you must provide a separate content path for both levels of browsers, much as you may be doing for scriptable versus nonscriptable browsers.

A DHTML API Example

Now it's time to get to a real DHTML API that you can use and build upon for your own applications. Listing 47-2 contains the API code, which is most likely to be deployed as an external `.js` library file. In fact, this API is used as-is in a map puzzle game application in Chapter 56. You can see there how it is used to control element positioning, dragging, and layering for the three DOM families. The code in Listing 47-2 is longer than most listings in this book, so for your convenience, I interlace commentary amid the long listing.

No global variables are needed for this API. Because all browser branching is performed via object detection, there is no need for browser version detection. Instead, the library starts with the `getObject()` function shown earlier in this chapter. Virtually every other function in this library makes a trip to `getObject()` to convert the name of the object passed as a parameter to an object reference whose positionable (or other style-related property) can be adjusted.

Listing 47-2: **The Custom API (DHTMLapi.js)**

```
// convert object name string or object reference
// into a valid object reference ready for style change
function getObject(obj) {
    var theObj
    if (document.layers) {
        if (typeof obj == "string") {
            return document.layers[obj]
        } else {
            return obj
        }
    }
    if (document.all) {
        if (typeof obj == "string") {
            return document.all(obj).style
        } else {
            return obj.style
        }
    }
    if (document.getElementById) {
        if (typeof obj == "string") {
            return document.getElementById(obj).style
        } else {
            return obj.style
        }
    }
    return null
}
```

A pair of functions handles all motion of positionable elements. The first function, `shiftTo()` takes three parameters: the ID of the object being moved, and the horizontal and vertical pixel coordinates of the top-left corner of the element. The assumption is that the main page script that invokes this library function performs the calculation of the coordinates. You see that code in Chapter 56. Branches inside this function handle the NN4 `layer.moveTo()` method or the setting of `style` properties for other DOMs. In these other browsers, moving the element requires adjusting two positional properties, left and top. Even though the adjustments are made in separate statements, the action on the screen does not follow the action statement-by-statement. Between screen buffering and quick execution, the repositioning appears as a single shift.

```
// position an object at a specific pixel coordinate
function shiftTo(obj, x, y) {
    var theObj = getObject(obj)
    if (theObj.moveTo) {
        theObj.moveTo(x,y)
    } else if (typeof theObj.left != "undefined") {
        theObj.left = x
        theObj.top = y
    }
}
```

The `shiftBy()` function mimics NN4's `layer.moveBy()` method. The second and third parameters represent the number of pixels that the object should be moved on the page. A positive number means to the right or down; a negative number means to the left or up; a value of zero means no change to the axis. For NN4, the script uses the `layer.moveBy()` method. But for the rest, the passed values are added to the `left` and `top` properties. Notice that because these properties return strings that include the units for the measurements, the incremental values are added to integer extractions from the current settings. And because the units being used here are the default (pixels), no units have to be assigned with the new values (although they could without penalty).

```
// move an object by x and/or y pixels
function shiftBy(obj, deltaX, deltaY) {
    var theObj = getObject(obj)
    if (theObj.moveBy) {
        theObj.moveBy(deltaX, deltaY)
    } else if (typeof theObj.left != "undefined") {
        theObj.left = parseInt(theObj.left) + deltaX
        theObj.top = parseInt(theObj.top) + deltaY
    }
}
```

Both platforms use the same property name for setting the stacking order of positionable thingies. Therefore, the `setZIndex()` function does little more than convert the object reference and assign the incoming value to the `zIndex` property.

```
// set the z-order of an object
function setZIndex(obj, zOrder) {
    var theObj = getObject(obj)
    theObj.zIndex = zOrder
}
```

NN4 and browsers with `style` objects have their own way of referring to the background color. The `setBGColor()` function applies the correct syntax based on whichever property is detected in the object.

```
// set the background color of an object
function setBGColor(obj, color) {
    var theObj = getObject(obj)
    if (theObj.bgColor) {
        theObj.bgColor = color
    } else if (typeof theObj.backgroundColor!= "undefined") {
        theObj.backgroundColor = color
    }
}
```

Allowable values for the `visibility` property are very unprogrammatic in my opinion. I expect a Boolean value rather than strings. To accede to reality while making the process of showing and hiding elements more logical to me, I created API functions called `show()` and `hide()`.

```
// set the visibility of an object to visible
function show(obj) {
    var theObj = getObject(obj)
    theObj.visibility = "visible"
}

// set the visibility of an object to hidden
function hide(obj) {
    var theObj = getObject(obj)
    theObj.visibility = "hidden"
}
```

Although the `left` and `top` properties of NN4 layers do not include unit values, it is still safe to use `parseInt()` on the values returned from the properties, whether they be retrieved in NN4 or browsers that have `style` objects (whose properties return units). The need for these API functions came from the way the map puzzle application in Chapter 56 works. For a couple of operations, it calculates the destination for an object with respect to the position of one of the other positioned elements. These functions return the values needed for the main program's calculation. This is also an example of how you may need to embellish the API for your own application.

```
// retrieve the x coordinate of a positionable object
function getObjectLeft(obj)  {
    var theObj = getObject(obj)
    return parseInt(theObj.left)
}

// retrieve the y coordinate of a positionable object
function getObjectTop(obj)  {
    var theObj = getObject(obj)
    return parseInt(theObj.top)
}
```

The previous API is generalizable enough to be used as a library with any cross-platform DHTML application using positioning. The API can even be used with a platform-specific page. It is more efficient, however, to use a browser's native objects, properties, and methods if you know for sure that users will have only one brand of browser.

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CHAPTER 48

Internet Explorer Behaviors

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In This Chapter

Introducing IE behaviors

Understanding the structure of behavior XML files

Exploring behavior samples

✦ ✦ ✦ ✦

Internet Explorer 5 for Windows was the first browser to deploy what Microsoft calls *behaviors*. Microsoft and others have proposed the behaviors concept to the W3C, and it could some day become one of the W3C standard recommendations. Such a standard might not be implemented exactly the way Microsoft currently implements behaviors, but most of the concepts are the same, and the syntax being discussed so far is similar. While there is no guarantee that the W3C will adopt behaviors as a standard, you will see that the concept seems to be a natural extension to the work that has already been adopted for both CSS and XML. Even though behaviors run only on Windows versions of IE5+ (as of this writing anyway), that browser family and operating system are pervasive enough to warrant an extended description of how behaviors work.

The W3C effort is called Behavioral Extensions to CSS. For the latest document describing the work of the participants of the standards discussions, visit `http://www.w3.org/TR/becss`.

Style Sheets for Scripts

You can best visualize what a behavior is in terms of the way you use style sheets. Consider a style sheet rule whose selector is a tag or a class name. The idea behind the style sheet is that one rule, which can define dozens of rendering characteristics of a chunk of HTML content, can be applied to perhaps dozens, if not hundreds, of elements within the document. A corporation may design a series of rules for the way its Web documents will look throughout the Web site. If the designer decides to alter the font family or color for, say, H1 elements, then that change is made in one place (the external style sheet file), and the impact is felt immediately across the entire site. Any page that includes an H1 element renders the header with the newly modified style.

Imagine now that instead of visual styles associated with an element, you want to define a *behavioral style* for a particular group of elements. A behavioral style is the way an element responds to predominantly user interaction with the element. For example, if the design specifications for a Web site indicate that all links should have their text colored a certain way when at rest, but on mouse rollovers, the text color changes to a more contrasting color, the font weight increases to bold, and the text becomes underlined. Those modifications require scripts to change the style properties of the element in response to the mouse action of the user. The scripts that fire in response to specific user actions (events) are written in an external file known as a behavior, and a behavior is associated with an element, class, or tag through the same CSS syntax that you use for other style attributes.

A behavior, of course, assumes that its scripts can work with whatever HTML element is associated with the behavior. Just as it would be illogical to associate the `tableLayout` style attribute with an element that wasn't a TABLE, so, too, would it be illogical to associate a behavior, whose scripts employed TABLE object properties and methods, to a P element. Even so, a well-designed behavior can obtain details about the element being manipulated through the element object's properties. The better you are at writing generalizable JavaScript functions, the more successful you will be in implementing behaviors.

Embedding Behavior Components

IE treats each behavior as a component, or add-on building block for the browser. IE5 comes equipped with a handful of behaviors built into the browser (the so-called default behaviors, which happen to rely on specific XML elements embedded in a document). Behaviors that you create most likely exist as separate files on the server, just like external `.css` and `.js` files do. The file extension for a behavior file is `.htc` (standing for HTML Component).

Linking in a behavior component

To associate a behavior with any single element, class of elements, or tag as the page loads, use CSS rule syntax and the IE-specific `behavior` attribute. The basic syntax is as follows:

```
selector {behavior:url(componentReference)}
```

As with any style sheet rule, you can combine multiple rule attributes, delimiting them with semicolons. The format of the *`componentReference`* depends on whether you are using one of the IE default behaviors or a behavior you've written to an external file. For default behaviors, the reference is in the format:

```
#default#componentName
```

For example, if you want to associate the `download` behavior with any element of class `downloads`:

```
.downloads {behavior:url(#default#download)}
```

Relative or absolute URIs to external .htc files can also be specified. For example, if your site contains a directory named behaviors and a file named hilite.htc, the style sheet rule from the root directory is:

```
.hiliters {behavior:url(behaviors/hilite.htc)}
```

As with all CSS style sheet rules, behaviors can be specified in a STYLE element of the page, in the STYLE attribute of an individual element, or in a rule defined inside an imported .css file.

Enabling and disabling behaviors

In Chapter 15, you can find details of IE5/Windows methods for all HTML elements that let scripts manage the association of a behavior with an element after the page has loaded. Invoking the addBehavior() method on an element assigns an external .htc file to that element. When you no longer need that behavior associated with the element, invoke the removeBehavior() method.

Component Structure

An .htc behavior file is a text file consisting of script statements inside a <SCRIPT> tag set and some special XML tags that IE5/Windows knows how to parse. You create .htc files in the same kind of plain text editor that you use for external .js or .css files.

Script statements

Unlike external .js files, an .htc behavior file includes <SCRIPT> tags, which surround any JavaScript (or VBScript, if you like) statements that control the behavior. Because a behavior most typically is written to control one or more aspects of the HTML element to which it is connected, statements tend to operate only on the associated object element. A special reference — element — is used to refer to the element object itself (much like the way the this keyword in a custom object's method self-refers to the object associated with the method).

If your behavior will be modifying either the content or style of the element, use the element reference as a foundation to the reference to one of that element object's properties or methods. For example, if a statement in a behavior needs to set the style.visibility property so that the element hides itself, the statement in the behavior script is:

```
element.style.visibility = "hidden"
```

Any valid reference from the point of view of the element object is fair game, including references to the element's parentElement, even though the parent element is not explicitly associated with the behavior.

Variable scope

Except for the special element reference, script content of a behavior is completely self-contained. You can define global variables in the behavior that are accessible to any script statement in the behavior. But a global variable in a behavior does not become a global variable for the main document's scripts to use. You can expose variables so that scripts outside of the behavior can get to them (as described below), but this exposure is not automatic.

Most of the script content of a behavior consists of functions that usually interact in some fashion with the associated element (via the element's properties and/or methods). Local variables in functions have the same scope and operate just like they do in regular script functions. Global variables you define in a behavior, if any, are usually there for the purpose of preserving values between separate invocations of the functions.

Assigning event handlers

Functions in a behavior are triggered from outside the behavior through two means: event handlers and direct invocation of functions declared as public (described in the next section). Event handler binding is performed in a way that is not used elsewhere in the IE4+ DOM. Each event type (for example, `onMouseOver`, `onKeyPress`) requires its own special XML tag at the top of the behavior file. The format for the event handler tag is as follows:

```
<PUBLIC:ATTACH EVENT="eventName" ONEVENT="behaviorFunctionName()" />
```

As the behavior loads, the `PUBLIC:ATTACH` tag instructs the browser to expose to the "public" (that is, the world outside of the behavior) an event type (whose name always begins with the "on" prefix in the IE4+ event model); whenever an event of that type reaches the behavior's element, then the function (defined within the behavior file) is invoked. In XML terminology, the `PUBLIC:` part of the tag is known as a *namespace*, and IE includes a built-in parser for the `PUBLIC` namespace. Notice, too, the XML syntax at the end of the tag that allows a single set of angle brackets to act as a start and end tag set (there is no content for this tag, just the attributes and their values).

To demonstrate, imagine that a behavior has a function named `underlineIt()`, which sets the `element.style.textDecoration` property to underline. To get the element to display the underline decoration as the user rolls the mouse atop the element, bind this function to the element's `onMouseOver` event handler as follows:

```
<PUBLIC:ATTACH EVENT="onmouseover" ONEVENT="underlineIt()" />
```

If you compare the wording of the opening part of the tag, you may recognize a connection to the IE4+ event model's `attachEvent()` method of all HTML elements (Chapter 15). You can have as many event binding tags as your element needs. To invoke multiple functions in response to a single event type, simply add the subsequent function invocation statements to the `ONEVENT` attribute, separating the calls by semicolons (the same as with regular JavaScript statement delimiters).

Exposing properties and methods

XML tags with the `PUBLIC:` namespace are also used (with different attributes) to expose a behavior's global variables as properties of the element and a behavior's functions as methods of the element. The syntax for both types of "public" announcements is as follows:

```
<PUBLIC:PROPERTY NAME="globalVarName" />
<PUBLIC:METHOD NAME="functionName" />
```

Values for both items are string versions of references to the variable and function (no parentheses). Again, you can define as many properties and methods for a behavior as you need.

As soon as a property and/or method is made public in a behavior, scripts from outside the behavior can access those items as if they were properties or methods of the element associated with the behavior:

```
document.all.elementID.behaviorProperty
document.all.elementID.behaviorMethod()
```

If you associate a behavior with a style sheet class selector, and several document elements share that class name, each one of those elements gains the public properties and methods of that behavior, accessible through references to the individual elements. That's because a behavior's scripts are written to read or modify properties of whatever element receives a bound event or is referenced along the way to the public property or method.

Behavior Examples

The two following examples are intentionally simple to help you grasp the concepts of behaviors if they are new to you. The first example interacts with multiple elements strictly through event binding; the second example exposes a property and method that the main page's scripts access to good effect.

Example 1: Element dragging behavior

This book contains several examples of how to script a page to let a user drag an element around the browser window (Chapters 31 and 56 in particular). In all those examples, the dragging code and event handling was embedded in some fashion into the page's scripts. The first example of a behavior, however, drives home the notion of separating an element's behavior from its content (just as a CSS2 style sheet separates an element's appearance from its content).

Imagine that it's your job to design a page that employs three draggable elements. Two of the elements are images, while the third is a panel layer that also includes a form. If you haven't scripted DHTML before, this may sound like a daunting task at first, one rife with the possibility of including multiple versions of the same scripts to accommodate different kinds of draggable elements.

Now imagine that to the rescue comes a scripter who has built a behavior that takes care of all of the dragging scripting for you. All you do is assign that behavior by way of one attribute of each draggable element's style sheet rule. Absolutely no other scripting is required on the main page to achieve the element dragging.

Listing 48-1 shows the behavior file (`drag.htc`) that controls basic dragging of a positionable element on the page. You may recognize some of the code as an IE4+ version of the cross-browser dragging code used elsewhere in this book (for a blow-by-blow account of these functions, see the description of the map puzzle game in Chapter 56). The names of the three operative functions and the basic way they do their jobs are identical to the other dragging scripts. Event binding, however, follows the behavior format through the XML tags. All interaction with the outside world occurs through the "public" event handlers.

Listing 48-1: An Element Dragging Behavior

```
<PUBLIC:ATTACH EVENT="onmousedown" ONEVENT="engage()" />
<PUBLIC:ATTACH EVENT="onmousemove" ONEVENT="dragIt()" />
<PUBLIC:ATTACH EVENT="onmouseup"   ONEVENT="release()" />
<PUBLIC:ATTACH EVENT="onmouseover" ONEVENT="setCursor()" />
<PUBLIC:ATTACH EVENT="onmouseout"  ONEVENT="release();restoreCursor()" />

<SCRIPT LANGUAGE="JScript">
// global declarations
var offsetX = 0
var offsetY = 0
var selectedObj
var oldZ, oldCursor

// initialize drag action on mousedown
function engage() {
    selectedObj = (element == event.srcElement) ? element : null
    if (selectedObj) {
        offsetX = event.offsetX - element.document.body.scrollLeft
        offsetY = event.offsetY - element.document.body.scrollTop
        oldZ = element.runtimeStyle.zIndex
        element.style.zIndex = 10000
        event.returnValue = false
    }
}

// move element on mousemove
function dragIt() {
    if (selectedObj) {
        selectedObj.style.pixelLeft = event.clientX - offsetX
        selectedObj.style.pixelTop = event.clientY - offsetY
        event.cancelBubble = true
        event.returnValue = false
    }
}

// restore state on mouseup
function release() {
    if (selectedObj) {
        selectedObj.style.zIndex = oldZ
    }
    selectedObj = null
}

// make cursor look draggable on mouseover
function setCursor() {
    oldCursor = element.runtimeStyle.cursor
   element.style.cursor = "hand"
}
```

```
// restore cursor on mouseout
function restoreCursor() {
    element.style.cursor = oldCursor
}
</SCRIPT>
```

Notice a subtlety in Listing 48-1 that is implied by the element-specific scope of a behavior. Two statements in the `engage()` function need to reference scroll-related properties of the `document.body` object. Because the only connection between the behavior and the document is via the `element` reference, that reference is used along with the `document` property (a property of every HTML element object in IE4+, as shown in Chapter 15). From there, the `body` object and the required properties can be accessed.

Listing 48-2 is a simple page that contains three elements that are associated with the `drag.htc` behavior through a style sheet rule definition (for the `draggable` class). The document is incredibly uncomplicated. Even the `drag.htc` file isn't very big. But together they produce a far more interesting page for the user than a couple of static images and a form.

Listing 48-2: **Three Draggable Elements Using the Behavior**

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
.draggable {position:absolute; behavior:url(drag.htc)}
#img1 {left:150px; top:150px}
#img2 {left:170px; top:170px}
#txt1 {left:190px; top:190px; background-color:aqua; width:150px; height:50px;
text-align:center}
</STYLE>
</HEAD>

<BODY>
<H1>IE5+ Behavior Demo (Dragging)</H1>
<HR>
<IMG CLASS="draggable" ID="img1" SRC="cpu1.gif">
<IMG CLASS="draggable" ID="img2" SRC="desk3.gif">
<DIV CLASS="draggable" ID="txt1">A form inside a DIV element.
    <FORM>
        <INPUT TYPE="button" VALUE="Does Nothing">
    </FORM>
</DIV>
</BODY>
</HTML>
```

Obviously, the dragging example here is very rudimentary. It isn't clear from the sample code what the user gets from the page, other than the joy of moving things around. If you were designing an application that genuinely benefits from draggable objects (for example, the map puzzle in Chapter 56), you can easily enhance the behavior to perform actions, such as snapping a dragged element into place when it is within a few pixels of its proper destination. For such an implementation, the behavior can be given some extra global variables, akin to the values assigned to the state objects in Chapter 56, including the pixel coordinates of the ideal destination for a dragged element. An `onLoad` event handler for the page can fire a public `init()` function in each element's behavior to assign those coordinate values. Any event that can bubble (such as mouse events) does so from the behavior to the target. Therefore, you can extend the event action of the behavior by adding a handler for the same event to the element outside of the behavior.

Example 2: Text rollover behavior

In the second example, you see how a behavior exposes a global variable and function as a public property and method, respectively. The demonstration reinforces the notion that even if a single behavior file is associated with multiple elements (for example, the elements share the same class, and the behavior is assigned to the class), each behavior maintains its own variable values, independent of the other elements and their behaviors.

The nature of this behavior is to set the `color` style property of the associated element to either a default color (red) or to another color that has been passed into the behavior via one of its public methods. The color setting is preserved in one of the behavior's global variables, and that variable is exposed as a public property.

Listing 48-3 shows the `.htc` behavior file's content. Only two events are bound to this behavior: `onmouseover` and `onmouseout`—the typical rollover events. The `onMouseOver` event invokes the `makeHot()` function, while the `onMouseOut` event invokes the `makeNormal()` function. Before the `makeHot()` function makes any changes to the `color` and `fontWeight` style properties of the element, existing settings are preserved in (non-public) global variables in the behavior. This allows the `makeNormal()` function to restore the original settings, regardless of what document styles may be applied to the element in a variety of pages. That's something to keep in mind when you design behaviors: they can be deployed in pages controlled by any number of style sheets. Don't assume any basic style setting; instead, use the `currentStyle` property to read and preserve the effective property values before touching them with your behavior's modification scripts.

Neither of the event handler functions are exposed as public methods. This was a conscious decision for a couple of reasons. The most important reason is that both functions rely on being triggered by a known event occurring on the element. If either function were invoked externally, the event object would contain none of the desired information. Another reason behind this is from a common programming style for components that protects inner workings, while exposing only those methods and properties that are "safe" for others to invoke. For this code, the public method does little more than set a property. It's an important property, to be sure, and one of the protected functions relies on it. But by allowing the public method little room to do any damage other than execution of the behavior, the design makes the behavior component that more robust.

Assigning a color value to the public property and passing one as a parameter to the public method accomplishes the same result in this code. As you will see, the property gets used in the demonstration page to retrieve the current value of the global variable. In a production behavior component, the programmer would probably choose to expose this value strictly as a read/write property or expose two methods, one for getting and one for setting the value. The choice would be at the whim of the programmer's style and would likely not be both. Using a method, however, especially for setting a value, creates a framework in which the programmer can also perform validation of the incoming value before assigning it to the global variable (something the example here does not do).

Listing 48-3: Rollover Behavior (makeHot.htc)

```
<PUBLIC:ATTACH EVENT="onmouseover" ONEVENT="makeHot()" />
<PUBLIC:ATTACH EVENT="onmouseout" ONEVENT="makeNormal()" />
<PUBLIC:PROPERTY NAME="hotColor" />
<PUBLIC:METHOD NAME="setHotColor" />
<SCRIPT LANGUAGE="JScript">
var oldColor, oldWeight
var hotColor = "red"

function setHotColor(color) {
    hotColor = color
}

function makeHot() {
    if (event.srcElement == element) {
        oldColor = element.currentStyle.color
        oldWeight = element.currentStyle.fontWeight
        element.style.color = hotColor
        element.style.fontWeight = "bold"
    }
}

function makeNormal() {
    if (event.srcElement == element) {
        element.style.color = oldColor
        element.style.fontWeight = oldWeight
    }
}
</SCRIPT>
```

To put the public information and the behavior, itself, to work, a demonstration page includes three spans within a paragraph that are associated with the behavior. Listing 48-4 shows the code for the demo page.

In addition to the text with rollover spans, the page contains two SELECT controls, which let you assign a separate color to each of the three elements associated with the behavior. The first SELECT element lets you choose one of the three elements. Making that choice invokes the `readColor()` function in the same page. This is the function that reads the `hotColor` public property of the chosen span. That color value is used to select the color name for display in the second SELECT element. If you make a choice in the list of colors, the `applyVals()` function invokes the public `setHotColor()` method of the element currently selected from the list of elements. Rolling the mouse over that element now highlights in the newly selected color, while the other elements maintain their current settings.

Listing 48-4: Applying the Rollover Behavior

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
.hotStuff {font-weight:bold; behavior:url(makeHot.htc)}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function readColor(choice) {
    var currColor = document.all(choice.value).hotColor
    var colorList = choice.form.color
    for (var i = 0; i < colorList.options.length; i++) {
        if (colorList.options[i].value == currColor) {
            colorList.selectedIndex = i
            break
        }
    }
}
function applyVals(form) {
    var elem = form.elem.value
    document.all(elem).setHotColor(form.color.value)
}
</SCRIPT>
</HEAD>

<BODY>
<H1>IE5+ Behavior Demo (Styles)</H1>
<HR>
<FORM>
Choose Hilited Element:
<SELECT NAME="elem" onChange="readColor(this)">
    <OPTION VALUE="elem1">First
    <OPTION VALUE="elem2">Second
    <OPTION VALUE="elem3">Third
</SELECT>
Choose Hilite Color:
<SELECT NAME="color" onChange="applyVals(this.form)">
    <OPTION VALUE="red" SELECTED>Red
    <OPTION VALUE="blue">Blue
    <OPTION VALUE="green">Green
</SELECT>
</FORM>
<P>Lorem ipsum dolor sit amet, <SPAN ID="elem1"
CLASS="hotStuff">consectetaur</SPAN> adipisicing elit, sed do eiusmod tempor
incididunt ut <SPAN ID="elem2" CLASS="hotStuff">labore et dolore magna
aliqua</SPAN>. Ut enim adminim veniam, quis nostrud exercitation ullamco laboris
<SPAN ID="elem3" CLASS="hotStuff">nisi ut aliquip ex ea commodo
consequat</SPAN>.</P>
</DIV>
</BODY>
</HTML>
```

Behaviors are not the solution for every scripting requirement. As demonstrated here, they work very well for generic style manipulation, but you are certainly not limited to that sphere. By having a reference back to the element associated with the behavior, and then to the document that contains the element, a behavior's scripts can have free run over the page—provided the actions are either generic among any page or generic among a design template that is used to build an entire Web site or application.

Even if you don't elect to use behaviors now (perhaps because you must support browsers other than IE/Windows), they may be in your future. Behaviors are fun to think about and also instill good programming practice in the art of creating reusable, generalizable code.

For More Information

In addition to the address of W3C activity on behaviors, Microsoft devotes many pages of its developer site to behaviors. Here are some useful pointers.

Overview:

`http://msdn.microsoft.com/workshop/author/behaviors/overview.asp`

Using DHTML Behaviors:

`http://msdn.microsoft.com/workshop/author/behaviors/howto/using.asp`

Default Behaviors Reference:

`http://msdn.microsoft.com/workshop/author/behaviors/reference/reference.asp`

IE5.5 Element Behaviors (an extension to the original behaviors):

`http://msdn.microsoft.com/workshop/author/behaviors/overview/elementb_ovw.asp`

Each of these locations ends with yet more links to related pages at the Microsoft Developer Network (MSDN) Web site.

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49 CHAPTER

Application: Tables and Calendars

✦ ✦ ✦ ✦

In This Chapter

Accommodating older browsers

Scripted tables

Date calculations

✦ ✦ ✦ ✦

Working with HTML tables is a lot of fun, especially if, like me, you are not a born graphics designer. By adding a few tags to your page, you can make your data look more organized, professional, and appealing. Having this power under scripting control is even more exciting, because it means that in response to a user action or other variable information (such as the current date or time), a script can do things to the table as the table is being built. In IE4+ and W3C DOMs, scripts can modify the content and structure of a table even after the page has loaded, allowing the page to almost "dance."

You have three options when designing scripted tables for your pages, although only two are backward compatible with non-DHTML browsers:

✦ Static tables

✦ Dynamic tables

✦ Dynamic HTML tables

The design path you choose is determined by whether you need to dynamically update some or all fields of a table (data inside `<TD>...</TD>` tags) and which browser levels you need to support. To highlight the differences among the three styles, this chapter traces the implementation of a monthly calendar display in all three formats.

About the Calendars

Because the emphasis here is on the way tables are scripted and displayed, I quickly pass over structural issues of the calendar versions described in the following sections. The first two examples are backward compatible to the earliest browsers that didn't even know genuine `Array` objects.

The final example, however, is a much more modern affair, utilizing table-related DOM objects and methods to simplify the code. It requires IE4+ for Windows (unfortunately, a bug in IE/Mac causes problems with the amount of TABLE object modification the script does) and NN6.

All three calendars follow similar (if not over-simplified) rules for displaying calendar data. English names of the months are coded into the script, so that they can be plugged into the calendar heading as needed. To make some of the other calendar calculations work (such as figuring out which day of the week is the first day of a given month in a given year), I define a method for my month objects. The method returns the JavaScript date object value for the day of the week of a month's first date. Virtually everything I do to implement the month objects is adapted from the custom objects discussion of Chapter 34.

Static Tables

The issue of updating the contents of a table's fields is tied to the nature of an HTML document being loaded and fixed in the browser's memory. Recall that for early browsers, you can modify precious few elements of a document and its objects after the document has loaded. That case certainly applies for typical data points inside a table's `<TD>` tag pair. After a document loads — even if JavaScript has written part of the page — none of its content (except for text and textarea field contents and a few limited form element properties) can be modified without a complete reload.

Listing 49-1 contains the static version of a monthly calendar. The scripted table assembly begins in the Body portion of the document. Figure 49-1 shows the results.

Listing 49-1: A Static Table Generated by JavaScript

```
<HTML>
<HEAD>
<TITLE>JavaScripted Static Table</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// function becomes a method for each month object
function getFirstDay(theYear, theMonth){
    var firstDate = new Date(theYear,theMonth,1)
    return firstDate.getDay() + 1
}
// number of days in the month
function getMonthLen(theYear, theMonth) {
    var oneDay = 1000 * 60 * 60 * 24
    var thisMonth = new Date(theYear, theMonth, 1)
    var nextMonth = new Date(theYear, theMonth + 1, 1)
    var len = Math.ceil((nextMonth.getTime() - 
        thisMonth.getTime())/oneDay)
    return len
}
// correct for Y2K anomalies
function getY2KYear(today) {
    var yr = today.getYear()
    return ((yr < 1900) ? yr+1900 : yr)
}
```

```
// create basic array
theMonths = new MakeArray(12)
// load array with English month names
function MakeArray(n) {
    this[0] = "January"
    this[1] = "February"
    this[2] = "March"
    this[3] = "April"
    this[4] = "May"
    this[5] = "June"
    this[6] = "July"
    this[7] = "August"
    this[8] = "September"
    this[9] = "October"
    this[10] = "November"
    this[11] = "December"
    this.length = n
    return this
}
// end -->
</SCRIPT>
</HEAD>

<BODY>
<H1>Month at a Glance (Static)</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
// initialize some variables for later
var today = new Date()
var theYear = getY2KYear(today)
var theMonth = today.getMonth() // for index into our array

// which is the first day of this month?
var firstDay = getFirstDay(theYear, theMonth)
// total number of <TD>...</TD> tags needed in for loop below
var howMany = getMonthLen(theYear, theMonth) + firstDay

// start assembling HTML for table
var content = "<CENTER><TABLE BORDER>"
// month and year display at top of calendar
content += "<TR><TH COLSPAN=7>" + theMonths[theMonth] + " " + theYear +
"</TH></TR>"
// days of the week at head of each column
content += "<TR><TH>Sun</TH><TH>Mon</TH><TH>Tue</TH><TH>Wed</TH>"
content += "<TH>Thu</TH><TH>Fri</TH><TH>Sat</TH></TR>"
content += "<TR>"

// populate calendar
for (var i = 1; i < howMany; i++) {
    if (i < firstDay) {
        // 'empty' boxes prior to first day
```

Continued

Listing 49-1 *(continued)*

```
        content += "<TD></TD>"
    } else {
        // enter date number
        content += "<TD ALIGN='center'>" + (i - firstDay + 1) + "</TD>"
    }
    // start new row after each week
    if (i % 7 == 0 &&  i != howMany) {
        content += "</TR><TR>"
    }
}
content += "</TABLE></CENTER>"

// blast entire table's HTML to the document
document.write(content)
// end -->
</SCRIPT>
</BODY>
</HTML>
```

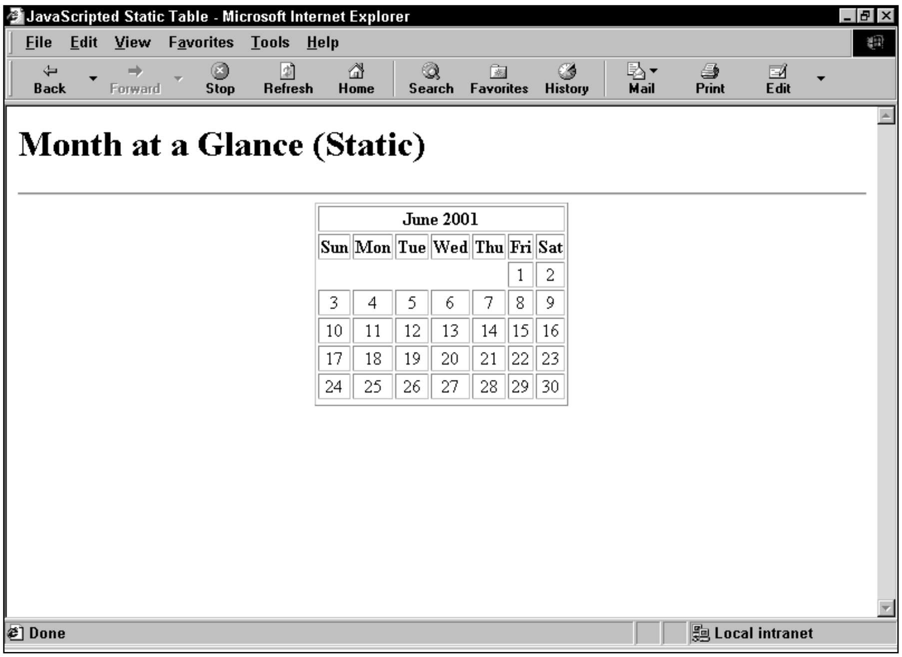


Figure 49-1: The static table calendar generated by Listing 49-1

In this page, a little bit of the HTML — the `<H1>` heading and `<HR>` divider — is unscripted. The rest of the page consists entirely of the table definition, all of which is constructed in JavaScript. Though you may want to interlace straight HTML and scripted HTML within the table definition, bugs exist in NN2 and NN3 that make this tactic hazardous. The safest method is to define the entire table from the `<TABLE>` to `</TABLE>` tags in JavaScript and post it to the page in one or more `document.write()` methods.

Most of the work for assembling the calendar's data points occurs inside of the `for` loop. Because not every month starts on a Sunday, the script determines the day of the week on which the current month starts. For all fields prior to that day, the `for` loop writes empty `<TD></TD>` tags as placeholders. After the numbered days of the month begin, the `for` loop writes the date number inside the `<TD>...</TD>` tags. Whatever the script puts inside the tag pair is written to the page as flat HTML. Under script control like that in the example, however, the script can designate what goes into each data point — rather than writing fixed HTML for each month's calendar.

The important point to note in this example is that although the content of the page may change automatically over time (without having to redo any HTML for the next month), after the page is written, its contents cannot be changed. If you want to add controls or links that are to display another month or year, you have to rewrite the entire page. This can be accomplished by passing the desired month and year as a search string for the current page's URL and then assigning the combination to the `location.href` property. You also have to add script statements to the page that look for a URL search string, extract the passed values, and use those values to generate the calendar while the page loads (see Chapter 17 for examples of how to accomplish this feat). But to bring a calendar such as this even more to life (while avoiding page reloading between views), you can implement it as a dynamic table.

Dynamic Tables

The only way to make data points of a table dynamically updatable in backward-compatible browsers is to turn those data points into text (or TEXTAREA) objects. The approach to this implementation is different from the static table because it involves the combination of *immediate* and *deferred* scripting. Immediate scripting facilitates the building of the table framework, complete with fields for every modifiable location in the table. Deferred scripting enables users to make choices from other interface elements, causing a new set of variable data to appear in the table's fields.

Listing 49-2 turns the preceding static calendar into a dynamic one by including controls that enable the user to select a month and year to display in the table. As testament to the support for absolute backward compatibility, a button triggers the redrawing of the calendar contents, rather than `onChange` event handlers in the SELECT elements. A bug in NN2 for Windows caused that event not to work for the SELECT object.

Form controls aside, the look of this version is quite different from the static calendar. Compare the appearance of the dynamic version shown in Figure 49-2 against the static version in Figure 49-1.

Listing 49-2: A Dynamic Calendar Table

```
<HTML>
<HEAD>
<TITLE>JavaScripted Dynamic Table</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
// function becomes a method for each month object
function getFirstDay(theYear, theMonth){
    var firstDate = new Date(theYear,theMonth,1)
    return firstDate.getDay()
}
// number of days in the month
function getMonthLen(theYear, theMonth) {
    var oneDay = 1000 * 60 * 60 * 24
    var thisMonth = new Date(theYear, theMonth, 1)
    var nextMonth = new Date(theYear, theMonth + 1, 1)
    var len = Math.ceil((nextMonth.getTime() -
        thisMonth.getTime())/oneDay)
    return len
}
// correct for Y2K anomalies
function getY2KYear(today) {
    var yr = today.getYear()
    return ((yr < 1900) ? yr+1900 : yr)
}
// create basic array
theMonths = new MakeArray(12)
// load array with English month names
function MakeArray(n) {
    this[0] = "January"
    this[1] = "February"
    this[2] = "March"
    this[3] = "April"
    this[4] = "May"
    this[5] = "June"
    this[6] = "July"
    this[7] = "August"
    this[8] = "September"
    this[9] = "October"
    this[10] = "November"
    this[11] = "December"
    this.length = n
    return this
}
// deferred function to fill fields of table
function populateFields(form) {
    // initialize variables for later from user selections
    var theMonth = form.chooseMonth.selectedIndex
    var theYear = form.chooseYear.options[form.chooseYear.selectedIndex].text
```

```
    // initialize date-dependent variables

    // which is the first day of this month?
    var firstDay = getFirstDay(theYear, theMonth)
    // total number of <TD>...</TD> tags needed in for loop below
    var howMany = getMonthLen(theYear, theMonth)

    // set month and year in top field
    form.oneMonth.value = theMonths[theMonth] + " " + theYear
    // fill fields of table
    for (var i = 0; i < 42; i++) {
        if (i < firstDay || i >= (howMany + firstDay)) {
            // before and after actual dates, empty fields
            // address fields by name and [index] number
            form.oneDay[i].value = ""
        } else {
            // enter date values
            form.oneDay[i].value = i - firstDay + 1
        }
    }
}

// end -->
</SCRIPT>
</HEAD>

<BODY>
<H1>Month at a Glance (Dynamic)</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
// initialize variable with HTML for each day's field
// all will have same name, so we can access via index value
// empty event handler prevents
// reverse-loading bug in some platforms
var oneField = "<INPUT TYPE='text' NAME='oneDay' SIZE=2 onFocus=''>"
// start assembling HTML for raw table
var content = "<FORM><CENTER><TABLE BORDER>"
// field for month and year display at top of calendar
content += "<TR><TH COLSPAN=7><INPUT TYPE='text' NAME='oneMonth'></TH></TR>"
// days of the week at head of each column
content += "<TR><TH>Sun</TH><TH>Mon</TH><TH>Tue</TH><TH>Wed</TH>"
content += "<TH>Thu</TH><TH>Fri</TH><TH>Sat</TH></TR>"
content += "<TR>"

// layout 6 rows of fields for worst-case month
for (var i = 1; i < 43; i++) {
    content += "<TD ALIGN='middle'>" + oneField + "</TD>"
    if (i % 7 == 0) {
        content += "</TR><TR>"
    }
}
```

Continued

Listing 49-2 *(continued)*

```
content += "</TABLE>"
// blast empty table to the document
document.write(content)

// end -->
</SCRIPT>
<SELECT NAME="chooseMonth">
<OPTION SELECTED>January<OPTION>February
<OPTION>March<OPTION>April<OPTION>May
<OPTION>June<OPTION>July<OPTION>August
<OPTION>September<OPTION>October<OPTION>November<OPTION>December
</SELECT>
<SELECT NAME="chooseYear">
<OPTION SELECTED>2000<OPTION>2001
<OPTION>2002<OPTION>2003
<OPTION>2004<OPTION>2005
<OPTION>2006<OPTION>2007
</SELECT>
<INPUT TYPE="button" NAME="updater" VALUE="Update Calendar"
onClick="populateFields(this.form)">
</FORM>
</BODY>
</HTML>
```

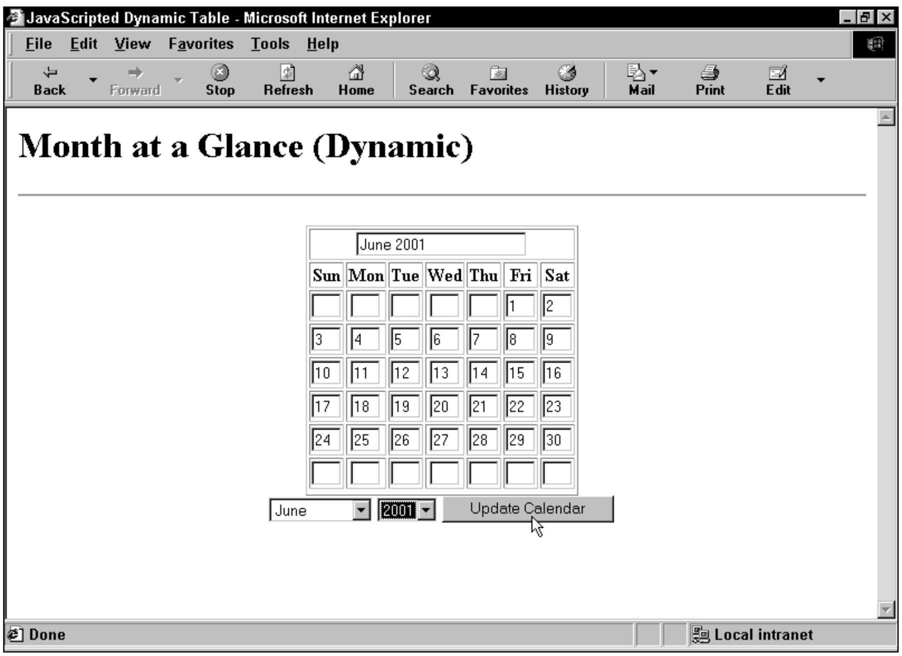


Figure 49-2: Dynamic calendar generated by Listing 49-2

When you first load Listing 49-2, it creates an empty table. Even so, it may take a while to load, depending on the platform of your browser and the speed of your computer's processor. This page creates numerous text objects. An `onLoad` event handler in the Body definition also could easily set the necessary items to load the current month.

From a cosmetic point of view, the dynamic calendar may not be as pleasing as the static one in Figure 49-1. Several factors contribute to this appearance.

From a structural point of view, creating a table that can accommodate any possible layout of days and dates that a calendar may require is essential. That means a basic calendar consisting of six rows of fields. For many months, the last row remains completely empty. But because the table definition must be fixed when the page loads, this layout cannot change on the fly.

The more obvious cosmetic comparison comes from the font and alignment of data in text objects. Except for capabilities of browsers capable of using style sheets, you're stuck with what the browser presents in both categories. In the static version, you can define different font sizes and colors for various fields, if you want (such as coloring the entry for today's date). Not so in text objects in a backward-compatible program.

This cosmetic disadvantage, however, is a boon to functionality and interactivity on the page. Instead of the user being stuck with an unchanging calendar month, this version includes pop-up menus from which the user can select a month and year of choice. Clicking the Update Calendar button refills the calendar fields with data from the selected month.

One more disadvantage to this dynamic table surfaces, however: All text objects can be edited by the user. For many applications, this capability may not be a big deal. But if you're creating a table-based application that encourages users to enter values in some fields, be prepared (in other words, have event handlers in place) to either handle calculations based on changes to any field or to alert users that the fields cannot be changed (and restore the correct value).

Hybrids

It will probably be the rare scripted table that is entirely dynamic. In fact, the one in Figure 49-2 is a hybrid of static and dynamic table definitions. The days of the week at the top of each column are hard-wired into the table as static elements. If your table design can accommodate both styles, implement your tables that way. The fewer the number of text objects defined for a page, the better the performance for rendering the page, and the less confusion for the page's users.

Dynamic HTML Tables

If you have the luxury of developing for IE4+ and/or NN6, you have all the resources of the TABLE and related element objects, as described in Chapter 27. The resulting application will appear to be much more polished, because not only does your content flow inside a table (which you can style to your heart's delight), but the content is dynamic within the table.

Listing 49-3 blends the calendar calculations from the earlier two calendar versions with the powers of IE4+/Windows and W3C DOMs. A change to a requested calendar month or year instantly redraws the body of the table, without disturbing the rest of the page (see Figure 49-3).

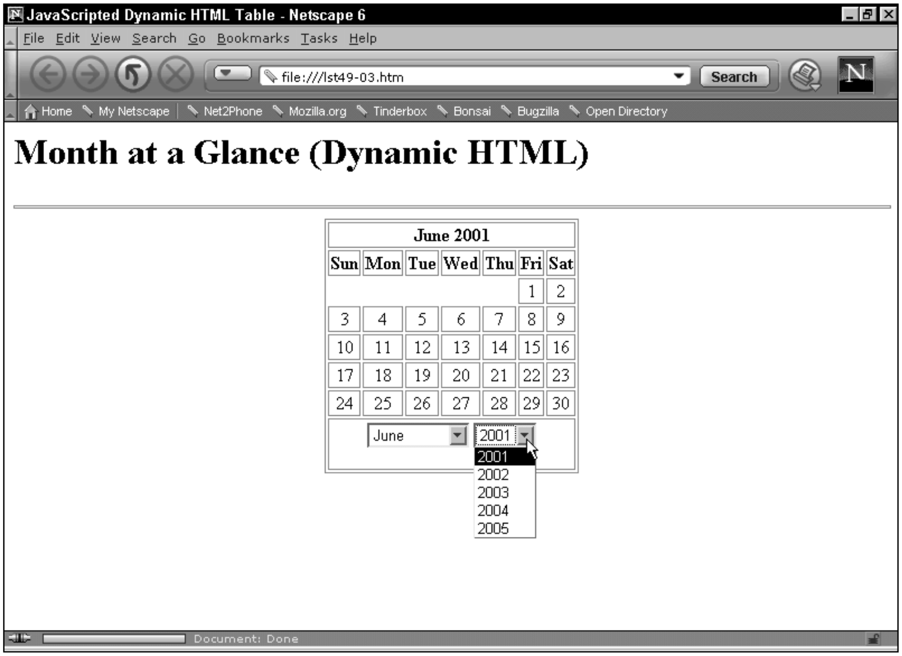


Figure 49-3: DHTML table

Basic date calculations are identical to the other two versions. Because this page has to be used with more modern browsers, it can use a genuine `Array` object for the month names. Also, the way the table must be constructed each time is very different from two previous versions. In this version, the script creates new table rows, creates new cells for those rows, and then populates those cells with the date numbers. Repeat loop logic is quite different, relying on a combination of `while` and `for` loops to get the job done.

Other features made possible by more modern browsers include automatic population of the list of available years. This page will never go out of style (unless browsers in 2050 no longer use JavaScript). There is also more automation in the triggers of the function that populates the table.

Listing 49-3: **Dynamic HTML Calendar**

```
<HTML>
<HEAD>
<TITLE>JavaScripted Dynamic HTML Table</TITLE>
<STYLE TYPE="text/css">
TD, TH {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
/*******************
  UTILITY FUNCTIONS
********************/
// day of week of month's first day
function getFirstDay(theYear, theMonth){
    var firstDate = new Date(theYear,theMonth,1)
    return firstDate.getDay()
}
// number of days in the month
function getMonthLen(theYear, theMonth) {
    var oneDay = 1000 * 60 * 60 * 24
    var thisMonth = new Date(theYear, theMonth, 1)
    var nextMonth = new Date(theYear, theMonth + 1, 1)
    var len = Math.ceil((nextMonth.getTime() -
        thisMonth.getTime())/oneDay)
    return len
}
// create array of English month names
var theMonths =
["January","February","March","April","May","June","July","August",
"September","October","November","December"]
// return IE4+ or W3C DOM reference for an ID
function getObject(obj) {
    var theObj
    if (document.all) {
        if (typeof obj == "string") {
            return document.all(obj)
        } else {
            return obj.style
        }
    }
    if (document.getElementById) {
        if (typeof obj == "string") {
            return document.getElementById(obj)
        } else {
            return obj.style
        }
    }
    return null
}

/************************
  DRAW CALENDAR CONTENTS
*************************/
// clear and re-populate table based on form's selections
function populateTable(form) {
    var theMonth = form.chooseMonth.selectedIndex
    var theYear =
parseInt(form.chooseYear.options[form.chooseYear.selectedIndex].text)
    // initialize date-dependent variables
    var firstDay = getFirstDay(theYear, theMonth)
    var howMany = getMonthLen(theYear, theMonth)
```

Continued

Listing 49-3 *(continued)*

```
    // fill in month/year in table header
    getObject("tableHeader").innerHTML = theMonths[theMonth] +
    " " + theYear

    // initialize vars for table creation
    var dayCounter = 1
    var TBody = getObject("tableBody")
    // clear any existing rows
    while (TBody.rows.length > 0) {
        TBody.deleteRow(0)
    }
    var newR, newC
    var done=false
    while (!done) {
        // create new row at end
        newR = TBody.insertRow(TBody.rows.length)
        for (var i = 0; i < 7; i++) {
            // create new cell at end of row
            newC = newR.insertCell(newR.cells.length)
            if (TBody.rows.length == 1 && i < firstDay) {
                // no content for boxes before first day
                newC.innerHTML = ""
                continue
            }
            if (dayCounter == howMany) {
                // no more rows after this one
                done = true
            }
            // plug in date (or empty for boxes after last day)
            newC.innerHTML = (dayCounter <= howMany) ?
                dayCounter++ : ""
        }

    }
}

/*******************
  INITIALIZATIONS
********************/
// create dynamic list of year choices
function fillYears() {
    var today = new Date()
    var thisYear = today.getFullYear()
    var yearChooser = document.dateChooser.chooseYear
    for (i = thisYear; i < thisYear + 5; i++) {
        yearChooser.options[yearChooser.options.length] = new Option(i, i)
    }
    setCurrMonth(today)
}
```

```
// set month choice to current month
function setCurrMonth(today) {
    document.dateChooser.chooseMonth.selectedIndex = today.getMonth()
}
</SCRIPT>
</HEAD>

<BODY onLoad="fillYears(); populateTable(document.dateChooser)">
<H1>Month at a Glance (Dynamic HTML)</H1>
<HR>
<TABLE ID="calendarTable" BORDER=1 ALIGN="center">
<TR>
    <TH ID="tableHeader" COLSPAN=7></TH>
</TR>
<TR><TH>Sun</TH><TH>Mon</TH><TH>Tue</TH><TH>Wed</TH>
<TH>Thu</TH><TH>Fri</TH><TH>Sat</TH></TR>
<TBODY ID="tableBody"></TBODY>
<TR>
    <TD COLSPAN=7>
    <P>
    <FORM NAME="dateChooser">
        <SELECT NAME="chooseMonth"
        onChange="populateTable(this.form)">
            <OPTION SELECTED>January<OPTION>February
            <OPTION>March<OPTION>April<OPTION>May
            <OPTION>June<OPTION>July<OPTION>August
            <OPTION>September<OPTION>October
            <OPTION>November<OPTION>December
    </SELECT>
    <SELECT NAME="chooseYear" onChange="populateTable(this.form)">
    </SELECT>
    </FORM>
    </P></TD>
</TR>
</TABLE>
</BODY>
</HTML>
```

Further Thoughts

The best deployment of an interactive calendar requires the kind of Dynamic HTML currently available in IE4+/Windows and W3C DOMs. Moreover, the cells in those DOMs can receive mouse events so that a user can click a cell and it will highlight perhaps in a different color or display some related, but otherwise hidden, information.

A logical application for such a dynamic calendar would be in a pop-up window or frame that lets a user select a date for entry into a form date field. It eliminates typing in a specific date format, thereby ensuring a valid date entry every time. Without DHTML, you can create a static version of the calendar that renders the numbers in the calendar cells as HTML links. Those links can use a `javascript:` URL to invoke a function call that sets a date field in the main form.

Note

The dynamic calendar in Listing 49-2 assumes that the browser treats like-named text boxes in a form as an array of fields. While this is true in all versions of NN, IE3 does not follow this behavior. To accommodate this anomaly, you must modify the script to assign unique names to each field (with an index number as part of the name) and use the `eval()` function to assist looping through the fields to populate them. On the CD-ROM is Listing 49-2b, which is a cross-compatible version of the dynamic calendar.

✦ ✦ ✦

CHAPTER 50

Application: A Lookup Table

✦ ✦ ✦ ✦

In This Chapter

Severless data collection lookup

Data-entry validation

✦ ✦ ✦ ✦

One of the first ideas that intrigued me about JavaScript was the notion of delivering CGI-like functionality along with an HTML document. On the Web, numerous, small data collections currently require CGI scripting and a back-end database engine to drive them. Of course, not everyone who has information to share has access to the server environment (or the expertise) to implement such a solution. JavaScript provides that power.

A Serverless Database

Before you get too carried away with the idea of letting JavaScript take the place of your SQL database, you need to recognize several limitations that prevent JavaScript from being a universal solution. First, any database that you embed into an HTML document is read-only. Although you can script an interface and lookup routines for the user, no provisions are available for writing revised information back to the server, if that is your intention.

A second consideration is the size of the data collection. Unlike databases residing on servers, the entire JavaScript database (or subset you define for inclusion into a single HTML document) must be downloaded to the user's browser before the user can work with the data. As a point of reference, think about image files. At less than 56 Kbps, how large an image file would you tolerate downloading? Whatever that limit may be (anywhere from 10 to 35K, depending on your patience) is what your database size limit should be. For many special-purpose collections, this is plenty of space, assuming one byte per character. Unlike what happens when the user downloads an embedded image file, the user doesn't see special statusbar messages about your database: To the browser, these messages are all part of the HTML coming in with the document.

The kind of data I'm talking about here is obviously text data. That's not to say you can't let your JavaScript-enhanced document act as a front end to data files of other types on your server. The data in your embedded lookup table can be URLs to images that get swapped into the page as needed.

The Database

As I was thinking about writing a demonstration of a serverless database, I encountered a small article in the *Wall Street Journal* that related information I had always suspected. The Social Security numbers assigned to virtually every U.S. citizen are partially coded to indicate the state in which you registered for your Social Security number. This information often reveals the state in which you were born (another study indicates that two-thirds of U.S. citizens live their entire lives in the same state). The first three digits of the nine-digit number comprise this code.

When the numbering system was first established, each state was assigned a block of three-digit numbers. Therefore, if the first three digits fall within a certain range, the Social Security Administration has you listed as being registered in the corresponding state or territory. I thought this would be an interesting demonstration for a couple of reasons: first, the database is not that large, so it can be easily embedded into an HTML document without making the document too big to download, even on slow Internet connections; second, it offers some challenges to data-entry validation, as you see in a moment.

Note

Before young people from populous states write to tell me that their numbers are not part of the database, let me emphasize that I am well aware that several states have been assigned number blocks not reflected in the database. This example is only a demonstration of scripting techniques, not an official Social Security Administration page.

The Implementation Plan

For this demonstration, all I started with was a printed table of data. I figured that the user interface for this application would probably be very plain: a text field in which the user can enter a three-digit number, a clickable button to initiate the search, and a text field to show the results of the lookup. Figure 50-1 shows the page. Pretty simple by any standards.

Given that user interface (I almost always start a design from the *interface* — how my page's users will experience the information presented on the page), I next planned the internals. I needed the equivalent of two tables: one for the numeric ranges, and one for the state names. Because most of the numeric ranges are contiguous, I could get by with a table of the high number of each range. This meant that the script would have to trap elsewhere for the occasional numbers that fall outside of the table's ranges — the job of data validation.

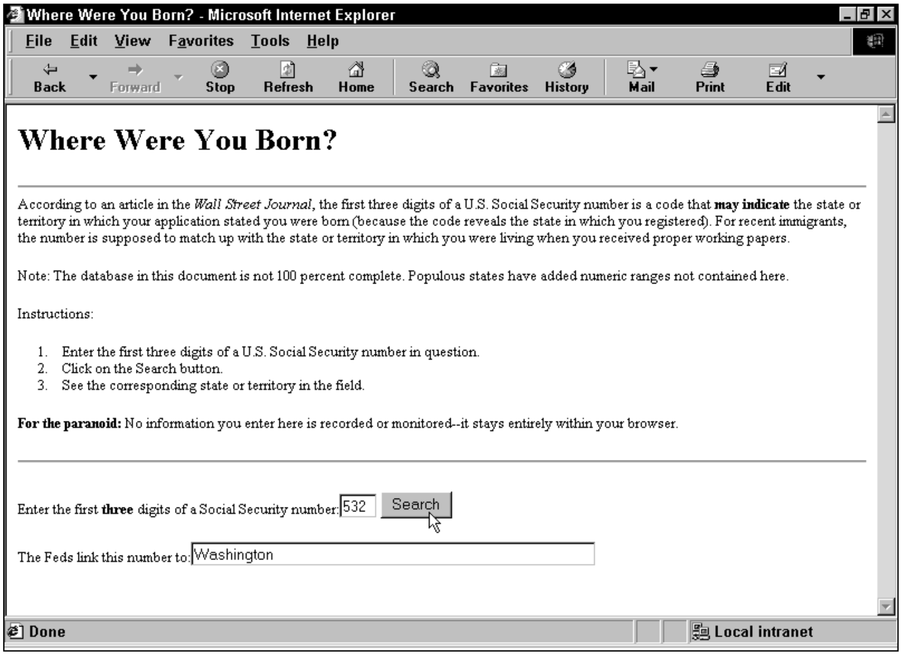


Figure 50-1: The Social Security number lookup page

Because the two tables were so closely related to each other, I had the option of creating two separate arrays, so that any given index value would correspond to both the numeric and state name entries in both tables (*parallel arrays*, I call them). The other option was to create a two-dimensional array (see Chapter 37), in which each array entry has data points for both the number and state name. For purposes of demonstration to first-time database builders, I decided to stay with two parallel arrays. This method makes visualizing how the lookup process works with two separate arrays a little easier.

The Code

The HTML document starts normally through the definition of the document title:

```
<HTML>
<HEAD>
<TITLE>Where Were You Born?</TITLE>
```

Because I chose to use the `Array` object of NN3 and IE3/J2, I added a separate script segment to gracefully handle the click of the button for those who landed at this page with an earlier scriptable browser. By putting a `<SCRIPT LANGUAGE="JavaScript">` tag ahead of the `<SCRIPT LANGUAGE="JavaScript1.1">` tag, I ensure that the one function triggered by the button is treated appropriately for all scriptable browsers:

```
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from non-scriptable browsers
function search(form) {
    alert("This page a more recent browser version.")
}
// end hiding -->
</SCRIPT>
```

Immediately after the starting <SCRIPT> tag comes the HTML beginning comment, so that most non-JavaScript-enabled browsers ignore all statements between the start and end comments (just before the </SCRIPT> tag). Failure to do this results in all code lines appearing in non-JavaScript browsers as regular HTML text.

Now we come to the JavaScript 1.1-level scripts, which handle everything from building the tables of data to looking up data later in response to a button click. I begin by creating the first array for the top numbers of each entry's numeric range.

In this application, you will see that I place utility function definitions close to the top of the script sections and put any action-oriented scripts (functions acting in response to event handlers) closer to the bottom of the script sections. My preference is to have all dependencies resolved before the script needs them. This philosophy carries over from the logic that dictates putting as many scripts in the Head as possible, so that even if the user (or network) should interrupt downloading of a page before every line of HTML reaches the browser, any user interface element relying on scripts will have those scripts loaded and ready to go. The order of functions in this example is not critical, because as long as they all reside in the Head section, they are defined and loaded by the time the field and button appear at the bottom of the page. But after I develop a style, I find it easier to stick with it — one less matter to worry about while scripting a complex application.

After creating an array (named `ssn`) with 57 empty slots, the script populates all 57 data points of the array, starting with the first entry going into the slot numbered 0. These data numbers correspond to the top end of each range in the 57-entry table. For example, any number greater than 3 but less than or equal to 7 falls into the range of the second data entry of the array (`ssn[1]`).

```
<SCRIPT LANGUAGE="JavaScript1.1">
<!-- hide from non-scriptable browsers

// create array that lists the top end of each numeric range
var ssn = new Array(57)
ssn[0] = 3
ssn[1] = 7
ssn[2] = 9
ssn[3] = 34
ssn[4] = 39
ssn[5] = 49
ssn[6] = 134
ssn[7] = 158
ssn[8] = 211
ssn[9] = 220
ssn[10] = 222
ssn[11] = 231
ssn[12] = 236
ssn[13] = 246
ssn[14] = 251
ssn[15] = 260
```

```
ssn[16] = 267
ssn[17] = 302
ssn[18] = 317
ssn[19] = 361
ssn[20] = 386
ssn[21] = 399
ssn[22] = 407
ssn[23] = 415
ssn[24] = 424
ssn[25] = 428
ssn[26] = 432
ssn[27] = 439
ssn[28] = 448
ssn[29] = 467
ssn[30] = 477
ssn[31] = 485
ssn[32] = 500
ssn[33] = 502
ssn[34] = 504
ssn[35] = 508
ssn[36] = 515
ssn[37] = 517
ssn[38] = 519
ssn[39] = 520
ssn[40] = 524
ssn[41] = 525
ssn[42] = 527
ssn[43] = 529
ssn[44] = 530
ssn[45] = 539
ssn[46] = 544
ssn[47] = 573
ssn[48] = 574
ssn[49] = 576
ssn[50] = 579
ssn[51] = 580
ssn[52] = 584
ssn[53] = 585
ssn[54] = 586
ssn[55] = 599
ssn[56] = 728
```

I do the same for the array containing the states and territory names. Both of these array populators seem long but pale in comparison to what you would have to do with a database of many kilobytes. Unfortunately, JavaScript doesn't give you the power to load existing data files into arrays (but see the recommendations at the end of the chapter), so any time you want to embed a database into an HTML document, you must go through this array-style assignment frenzy:

```
// create parallel array listing all the states/territories
// that correspond to the top range values in the first array
var geo = new Array(57)
geo[0] = "New Hampshire"
geo[1] = "Maine"
geo[2] = "Vermont"
geo[3] = "Massachusetts"
```

```
geo[4] = "Rhode Island"
geo[5] = "Connecticut"
geo[6] = "New York"
geo[7] = "New Jersey"
geo[8] = "Pennsylvania"
geo[9] = "Maryland"
geo[10] = "Delaware"
geo[11] = "Virginia"
geo[12] = "West Virginia"
geo[13] = "North Carolina"
geo[14] = "South Carolina"
geo[15] = "Georgia"
geo[16] = "Florida"
geo[17] = "Ohio"
geo[18] = "Indiana"
geo[19] = "Illinois"
geo[20] = "Michigan"
geo[21] = "Wisconsin"
geo[22] = "Kentucky"
geo[23] = "Tennessee"
geo[24] = "Alabama"
geo[25] = "Mississippi"
geo[26] = "Arkansas"
geo[27] = "Louisiana"
geo[28] = "Oklahoma"
geo[29] = "Texas"
geo[30] = "Minnesota"
geo[31] = "Iowa"
geo[32] = "Missouri"
geo[33] = "North Dakota"
geo[34] = "South Dakota"
geo[35] = "Nebraska"
geo[36] = "Kansas"
geo[37] = "Montana"
geo[38] = "Idaho"
geo[39] = "Wyoming"
geo[40] = "Colorado"
geo[41] = "New Mexico"
geo[42] = "Arizona"
geo[43] = "Utah"
geo[44] = "Nevada"
geo[45] = "Washington"
geo[46] = "Oregon"
geo[47] = "California"
geo[48] = "Alaska"
geo[49] = "Hawaii"
geo[50] = "District of Columbia"
geo[51] = "Virgin Islands"
geo[52] = "Puerto Rico"
geo[53] = "New Mexico"
geo[54] = "Guam, American Samoa, N. Mariana Isl., Philippines"
geo[55] = "Puerto Rico"
geo[56] = "Long-time or retired railroad workers"
```

Now comes the beginning of the data validation functions. Under control of a master validation function shown in a minute, the `stripZeros()` function removes any leading 0s that the user may have entered. Notice that the instructions tell the user to enter the first three digits of a Social Security number. For 001 through 099, that means the numbers begin with one or two 0s. JavaScript, however, treats any numeric value starting with 0 as an octal value. Because I have to do some numeric comparisons for the search through the `ssn[]` array, the script must make sure that the entries (which are strings to begin with, coming as they do from text objects) can be converted to decimal numbers. The `parseInt()` function, with the all-important second parameter indicating Base 10 numbering, does the job. But because the remaining validations assume a string value, the integer is reconverted to a string value before it is returned.

```
// **BEGIN DATA VALIDATION FUNCTIONS**
// JavaScript sees numbers with leading zeros as octal values,
// so strip zeros
function stripZeros(inputStr) {
    return parseInt(inputStr, 10).toString()
}
```

The next three functions are described in full in Chapter 43, which discusses data validation. In the last function, a copy of the input value is converted to an integer to enable the function to make necessary comparisons against the boundaries of acceptable ranges.

```
// general purpose function to see if an input value has been entered
// at all
function isEmpty(inputStr) {
    if (inputStr == null || inputStr == "") {
        return true
    }
    return false
}

// general purpose function to see if a suspected numeric input
// is a positive integer
function isNumber(inputStr) {
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.charAt(i)
        if (oneChar < "0" || oneChar > "9") {
            return false
        }
    }
    return true
}

// function to determine if value is in acceptable range for this
// application
function inRange(inputStr) {
    num = parseInt(inputStr)
    if (num < 1 || (num > 586 && num < 596) || (num > 599 &&
        num < 700) || num > 728) {
        return false
    }
    return true
}
```

The master validation controller function (named `isValid()` in this application) is also covered in depth in Chapter 43. A statement that wants to know if it should proceed with the lookup process calls this function. If any one validation test fails, the function returns `false`, and the search does not proceed.

```
// Master value validator routine
function isValid(inputStr) {
    if (isEmpty(inputStr)) {
        alert("Please enter a number into the field before
clicking the button.")
        return false
    } else {
        if (!isNumber(inputStr)) {
            alert("Please make sure entries are numbers only.")
            return false
        } else {
            if (!inRange(inputStr)) {
                alert("Sorry, the number you entered is not part of our
database.  Try another three-digit number.")
                return false
            }
        }
    }
    return true
}
// **END DATA VALIDATION FUNCTIONS**
```

The `search()` function is invoked by two different event handlers (and indirectly by a third). The two direct calls come from the input field's `onChange` event handler and the Search button's `onClick` event handler. The handler passes a reference to the form, which includes the button and both text objects.

To search the database, the script repeatedly compares each succeeding entry of the `ssn[]` array against the value entered by the user. For this process to work, a little bit of preliminary work is needed. First comes an initialization of a variable, `foundMatch`, which comes into play later. Initially set to `false`, the variable is set to `true` only if there is a successful match — information you need later to set the value of the result text object correctly for all possible conditions.

```
// Roll through ssn database to find index;
// apply index to geography database
function search(form) {
    var foundMatch = false
    var inputStr = stripZeros(form.entry.value)
    if (isValid(inputStr)) {
        inputValue = inputStr
        for (var i = 0; i < ssn.length; i++) {
            if (inputValue <= ssn[i]) {
                foundMatch = true
                break
            }
        }
    }
    form.result.value = (foundMatch) ? geo[i] : ""
    form.entry.focus()
    form.entry.select()
}
```

Next comes all the data preparation. After the entry is passed through the zero stripper, a copy is dispatched to the master validation controller, which, in turn, sends copies to each of its special-purpose minions. If the master validator detects a problem from the results of any of those minions, it returns `false` to the condition that wants to know if the input value is valid. Should the value not be valid, processing skips past the `for` loop and proceeds immediately to an important sequence of three statements.

The first is a conditional statement that relies on the value of the `foundMatch` variable that was initialized at the start of this function. If `foundMatch` is still `false`, that means that something is wrong with the entry and it cannot be processed. To prevent any incorrect information from appearing in the result field, that field is set to an empty string if `foundMatch` is `false`. The next two statements set the focus and selection to the entry field, inviting the user to try another number.

On the other hand, if the entry is a valid number, the script finally gets to perform its lookup task. Looping through every entry of the `ssn[]` array starting with entry 0 and extending until the loop counter reaches the last item (based on the array's length property), the script compares the input value against each entry's value. If the number is less than or equal to a particular entry, the value of the loop counter (`i`) is frozen, the `foundMatch` variable is set to `true`, and execution breaks out of the `for` loop.

This time through the conditional expression, with `foundMatch` being `true`, the statement plugs the corresponding value of the `geo[]` array (using the frozen value of `i`) into the result field. Focus and selection are set to the entry field to make it easy to enter another value.

Browsers that recognize keyboard events benefit by allowing the search to be initiated if the user presses the Enter key after entering a number. An `onKeyPress` event handler for the input text box invokes the `searchOnReturn()` function. This function employs cross-browser event parsing to find out if the Return key had been pressed while the text pointer was in the text box. If so, then the `search()` function, described earlier, is asked to do its job. Any characters other than the Return key are allowed to pass unchanged to the input box.

```
// start search if input field receives a Return character
function searchOnReturn(form, evt) {
    evt = (evt) ? evt : (window.event) ? window.event : ""
    if (evt) {
        var theKey = (evt.which) ? evt.which : evt.keyCode
        if (theKey == 13) {
            search(form)
            return false
        }
    }
    return true
}
// end code hiding -->
</SCRIPT>
</HEAD>
```

The balance of the code is the Body part of the document. The real action takes place within the Form definition.

```
<BODY>
<H1>Where Were You Born?</H1>
<HR>
```

```
According to an article in the <CITE>Wall Street Journal</CITE>, the first three
digits of a U.S. Social Security number is a code for the state or territory in
which your application stated you were born.  For recent immigrants, the number
is supposed to match up with the state or territory in which you were living
when you received proper working papers.<P>
Note: The database in this document is not 100 percent complete.  Populous
states have added numeric ranges not contained here.<P>
Instructions:
<OL><LI>Enter the first three digits of a U.S. Social Security number in
question.</LI>
<LI>Click on the Search button.</LI>
<LI>See the corresponding state or territory in the field.</L1>
</OL>

<P><B>For the paranoid:</B> No information you enter here is recorded or
monitored—it stays entirely within your browser.<P>
<HR>
```

The form's `onSubmit` event handler is set to prevent accidental submission (or pseudo-submission, because no `ACTION` attribute is specified for the form) that IE/Mac does from any form's text box (other browsers submit on Return from only a single-field form). Each of the text objects is sized to fit the expected data. A handful of event handlers invoke the `search()` function (directly and indirectly), passing a reference to the form as a parameter.

```
<FORM onSubmit="return false">
Enter the first <B>three</B> digits of a Social Security number:<INPUT
TYPE="text" NAME="entry" SIZE=4 onKeyPress="return searchOnReturn(this.form,
event)" onChange="search(this.form)">
<INPUT TYPE="button" VALUE="Search" onClick="search(this.form)">
<P>
The Feds link this number to:<INPUT TYPE="text" NAME="result" SIZE=50>
</FORM>
</BODY>
</HTML>
```

Further Thoughts

If I were doing this type of application for production purposes, I would turn each pairing of range high number and geographical location into separate objects and store the objects in an array. Making that technique work requires one extra function and a different way of populating the data. The following is an example using the same variable names as the preceding listing:

```
// specify an array entry with two items
function dataRecord(ssn, geo) {
    this.ssn = ssn
    this.geo = geo
    return this
}
```

```
// initialize basic array
var numberState = new Array(57)

// populate main array with smaller arrays
numberState[0] = new dataRecord(3,"New Hampshire")
numberState[1] = new dataRecord(7,"Maine")
numberState[2] = new dataRecord(9,"Vermont")
```

The other changes (marked in boldface) occur in the `search()` function, which must address this data in a slightly different way than it did before:

```
function search(form) {
    var foundMatch = false
    var inputStr = stripZeros(form.entry.value)
    if (isValid(inputStr)) {
        inputValue = inputStr
        for (var i = 0; i < numberState.length; i++) {
            if (inputValue <= numberState[i].ssn) {
                foundMatch = true
                break
            }
        }
    }
    form.result.value = (foundMatch) ? numberState[i].geo :""
    form.entry.focus()
   form.entry.select()
}
```

All references to data are to the `numberState[]` array and properties of its objects (either `ssn` or `geo`). With the data for each record arranged in a comma-delimited fashion, it may be easier to transfer data exported from an existing database to your script with less copying and pasting or dragging and dropping.

Another possibility would be to use JavaScript's capability to load `.js` files that have the arrays already populated or have variables preloaded with comma-delimited values. By using the *`string`*`.split()` method (Chapter 34), you can easily assign data in this format to an array.

From a user interface perspective, the `searchOnReturn()` function can do more with the event object. For instance, it could filter data entry so that only numbers ever reach the input text field. You would still want to perform the data-entry validation in case someone were to paste some non-numeric text into the text box.

I truly believe that serverless data lookups offer a great opportunity to many creative JavaScripters.

✦ ✦ ✦

51
CHAPTER

Application: A "Poor Man's" Order Form

✦ ✦ ✦ ✦

In This Chapter

Live math on table rows and columns

Number formatting

Code reusability

✦ ✦ ✦ ✦

I hesitate to call the application described in this chapter an "order form" because it is not in any way intended for use as a client-side shopping cart or some of the more advanced e-commerce applications you see on the Web. No, the goal here is to demonstrate how JavaScript can be used to assist users with column-and-row arithmetic, very much like the kinds of arithmetic needed to calculate the total for an order of goods.

While this order form is not linked to any particular online catalog, some or all of it can be used as a piece for a small e-commerce site. The form in the example here requires that users input product descriptions and prices, but there is no reason that a client-side JavaScript shopping cart can't accumulate the shopper's choices from catalog pages, and then present them in an order form with product descriptions and prices hard-wired into the table. There still are entry boxes for quantity and selecting local sales tax rates. But all the arithmetic products and sums are calculated quickly on the client with JavaScript.

Along the way, you should also discover how to design code — more specifically, JavaScript data structures — in such a way that they are easily editable by non-scripters who are responsible for updating the embedded data. Therefore, even if you prefer to leave professional e-commerce order processing to server CGIs, you may still pick up a scripting tip or two from this "poor man's" version of an order form.

Defining the Task

I doubt that any two order forms on the Web are executed precisely the same way. Much of the difference has to do with the way a CGI program on the server wants to receive the data on its way to an order-entry system or database. The rest has to do with how clever the HTML programmer is. To come up with a generalized demonstration, I had to select a methodology and stay with it.

Because the intended goal of this demonstration is to focus on the rows and columns of an order form, I omit the usual name-and-address input elements. Instead, the code deals exclusively with the tabular part of the form, including the footer "stuff" of a form for subtotals, sales tax, shipping, and the grand total.

Another goal is to design the order form with an eye to as much reusability as possible. In other words, I may design the form for one page, but I also want to adapt it to another order form quickly without having to muck around too deeply in complicated HTML and JavaScript code. One giant annoyance that this approach eliminates is the normal HTML repetition of row after row of tags for input fields and table cells. JavaScript can certainly help you out there.

The order form code also demonstrates how to perform math and display results in two decimal places, use the `String.split()` method to make it easy to build arrays of data from comma-delimited lists, and enable JavaScript arrays to handle tons of repetitive work.

The Form Design

Figure 51-1 shows a rather simplified version of an order form as provided in the listings. Many elements of the form are readily adjustable by changing only a few characters near the top of the JavaScript listing. At the end of the chapter, I provide several suggestions for improving the user experience of a form, such as this one.

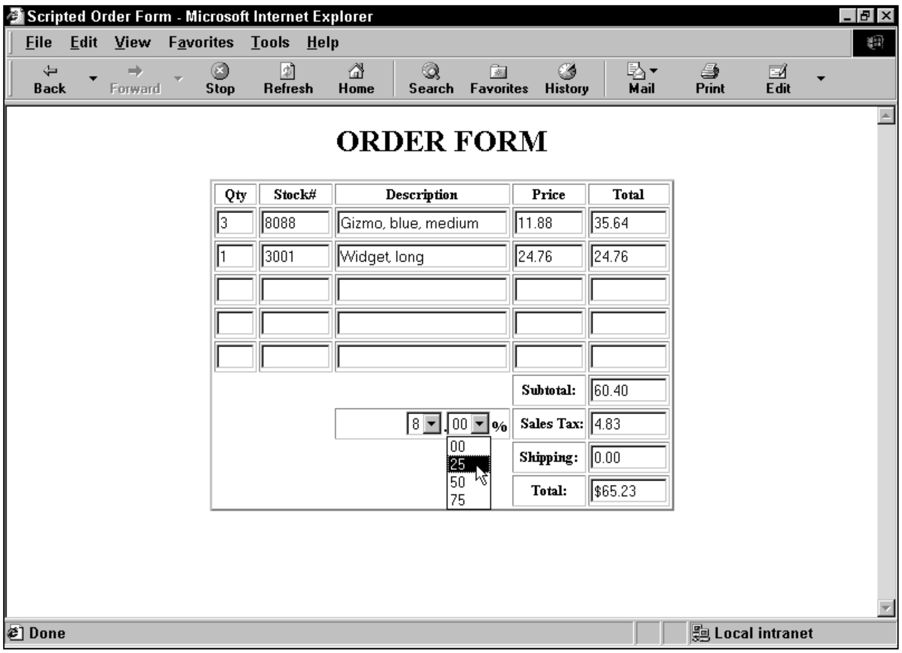


Figure 51-1: The order form display

Form HTML and Scripting

Because this form is generated as the document loads, JavaScript writes most of the document to reflect the variable choices made in the reusable parts of the script. In fact, in this example, only the document heading is hard-wired in HTML.

The script uses a few JavaScript facilities that aren't available in the earliest browsers, so you have to guard against browsers of other levels reaching this page and receiving script errors when `document.write()` statements fail to find functions defined inside JavaScript 1.1 language script tags. As part of this defense, I defined a JavaScript 1.0 function, called `initialize()`, ahead of any other script. This function is called later in the Body. Because both types of browsers can invoke this function, the Head portion of this document contains an `initialize()` function in both JavaScript 1.0 and JavaScript 1.1 script tags. For JavaScript 1.0 browsers, the function displays a message alerting the user that this form requires a more recent browser. Your message could be more helpful and perhaps even provide a link to another version of the order form. In the JavaScript 1.1 portion, the `initialize()` function is empty, sitting ready to catch and ignore the call made by the document:

```
<HTML>
<HEAD>
<TITLE>Scripted Order Form</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
// displays notice for non-JavaScript 1.1 browsers
function initialize() {
    document.write("This page a more recent browser version.")
}
// -->
</SCRIPT>
```

Global adjustments

The next section is the start of the JavaScript 1.1-level statements and functions that do most of the work for this document. The script begins by initializing three very important global variables. This location is where the author defining the details for the order form also enters information about the column headings, column widths, and number of data entry rows.

```
<SCRIPT LANGUAGE="JavaScript1.1">
<!--
// ** BEGIN GLOBAL ADJUSTMENTS ** //
// Order form columns and rows specifications
// **Column titles CANNOT CONTAIN PERIODS
var columnHeads = "Qty,Stock#,Description,Price,Total".split(",")
var columnWidths = "3,7,20,7,8".split(",")
var numberOfRows = 5
```

The first two assignment statements perform double duty. Not only do they provide the location for customized settings to be entered by the HTML author, but they use the *string*`.split()` method to literally create arrays out of their series of comma-delimited strings. At first, this may seem to be a roundabout way to generate an array, because you can also create the array directly with:

```
var columnHeads = new Array("Qty","Stock",...)
```

But the way shown here minimizes the possibility of goofing up the quotes and commas when modifying the data, especially if modification might be attempted by a non-scripter.

So much of the repetitive work to come in this application is built around arrays that it will prove to be extraordinarily convenient to have the column title names and column widths in parallel arrays. The number-of-rows value also plays a role in not only drawing the form, but calculating it as well.

Notice the caveat about periods in column heading strings. You will soon see that these column names are assigned as text object names, which, in turn, are used to build object references to text boxes. Object names cannot have periods in them, so for these column headings to perform their jobs, you have to leave periods out of their names.

As part of the global adjustment area, the `extendRow()` method requires knowledge about which columns are to be multiplied to reach a total for any row:

```
// data entry row math
function extendRow(form,rowNum) {
    // **change 'Qty' and 'Price' to match your column names
    var rowSum = form.Qty[rowNum].value * form.Price[rowNum].value
    // **change 'Total' to match your corresponding column name
    form.Total[rowNum].value = formatNum(rowSum,2)
}
```

This example uses the `Qty`, `Price`, and `Total` fields for math calculations. Those field names are inserted into the references within this function. To calculate the total for each row, the function receives the form object reference and the row number as parameters. As described later, the order form is generated as a kind of array. Each field in a column intentionally has the same name. This scheme enables scripts to access a given field in that column by row number when using the row number as an index to the array of objects bearing the same name. For example, for the first row (row 0), you calculate the total by multiplying the quantity field of row 0 (`form.Qty[0].value`) times the price field of row 0 (`form.Price[0].value`). You then format that value to two places to the right of the decimal and plug that number into the value of the total field for row 0 (`form.Total[0].value`).

The final place where you have to worry about customized information is in the function that adds up the total columns. The function must know the name that you assigned to the total column:

```
function addTotals(form) {
    var subTotal = 0
    for (var i = 0; i < numberOfRows; i++) {
        // **change 'Total' in both spots to match your column name
        subTotal += (form.Total[i].value != "") ?
            parseFloat(form.Total[i].value) : 0
    }
    form.subtotal.value = formatNum(subTotal,2)
    form.tax.value = formatNum(getTax(form,subTotal),2)
    form.total.value = "$" + formatNum((parseFloat(form.subtotal.value) +
        parseFloat(form.tax.value) + parseFloat(form.shipping.value)),2)
}
// ** END GLOBAL ADJUSTMENTS ** //
```

The addTotals() function receives the form reference as a parameter, which it uses to read and write data around the form. The first task is to add up the values of the total fields from each of the data-entry rows. Here you need to be specific about the name you assign to that column. To keep code lines to a minimum, you use a conditional expression inside the for loop to make additions to the subTotal amount only when a value appears in a row's total field. Because all values from text fields are strings, you use parseFloat() to convert the values to floating-point numbers before adding them to the subTotal variable.

Three more assignment statements fill in the subtotal, tax, and total fields. The subtotal is nothing more than a formatted version of the amount reached at the end of the for loop. The task of calculating the sales tax is passed off to another function (described in a following section), but its value is also formatted before being plugged into the sales tax field. For the grand total, you add floating-point-converted values of the subtotal, tax, and shipping fields before slapping a dollar sign in front of the result. Even though the three fields contain values formatted to two decimal places, any subsequent math on such floating-point values incurs the minuscule errors that send formatting out to sixteen decimal places. Thus, you must reformat the results after the addition.

Do the math

As you can see from Figure 51-1, the user interface for entering the sales tax is a pair of SELECT elements. This type of interface minimizes the possibility of users entering the value in all kinds of weird formats that, in some cases, would be impossible to parse. The function that calculates the sales tax of the subtotal looks to these select objects for their current settings.

```
function getTax(form,amt){
    var chosenPercent = form.percent[form.percent.selectedIndex].value
    var chosenFraction = form.fraction[form.fraction.selectedIndex].value
    var rate = parseFloat(chosenPercent + "." + chosenFraction) / 100
    return amt * rate
}
```

After receiving the form object reference and subtotal amount as parameters, the function reads the two values chosen in the SELECT elements. The string value properties of the SELECT objects are temporarily stored in local variables. To arrive at the actual rate, you concatenate the two portions of the string (joined by an artificial decimal point) and parseFloat() the string to get a number that you can then divide by 100. The product of the subtotal times the rate is returned to the calling statement (in the preceding addTotals() function).

All of the calculation that ripples through the order form is controlled by a single calculate() function:

```
function calculate(form,rowNum) {
    extendRow(form,rowNum)
    addTotals(form)
}
```

This function is called by any object that affects the total of any row. Such a request includes both the form object reference and the row number. This information lets the single affected row, and then the totals column, be recalculated. Changes to some objects, such as the sales tax SELECT objects, affect only the totals column, so they will call addTotals() function directly rather than this function (the rows don't need recalculation).

Number formatting, as explained in Chapter 35, is a detail that scripters must handle themselves (unless you are designing for IE5.5+ and NN6+, which include the *number*.toFixed() method for number formatting). We can borrow the formatting code from Chapter 35, and use it here as-is:

```
function formatNum(expr,decplaces) {
    var str = (Math.round(parseFloat(expr) *
        Math.pow(10,decplaces))).toString()
    while (str.length <= decplaces) {
        str = "0" + str
   }
    var decpoint = str.length - decplaces
    return str.substring(0,decpoint) + "." +
    str.substring(decpoint,str.length)
}
```

Being able to pick up this function from a different application should reinforce the advantage to writing functions to be as generalizable as possible. Rather than building page-specific references into the formatting function, it accepts parameters that could come from anywhere. Page specifics are left to another function that deals with reading and writing text box values.

Cooking up some HTML

As we near the end of the scripting part of the document's Head section, we come to two functions that are invoked later to assemble some table-oriented HTML based on the global settings made at the top. One function assembles the row of the table that contains the column headings:

```
function makeTitleRow() {
    var titleRow = "<TR>"
    for (var i = 0; i < columnHeads.length; i++) {
        titleRow += "<TH>" + columnHeads[i] + "</TH>"
    }
    titleRow += "</TR>"
    return titleRow
}
```

The heart of the makeTitleRow() function is the for loop, which makes simple <TH> tags out of the text entries in the columnHeads array defined earlier. All this function does is assemble the HTML. A document.write() method in the Body puts this HTML into the document.

```
function makeOneRow(rowNum) {
    var oneRow = "<TR>"
    for (var i = 0; i < columnHeads.length; i++) {
        oneRow += "<TD ALIGN=middle><INPUT TYPE=text SIZE=" +
            columnWidths[i] + " NAME=\'" + columnHeads[i] +
            "\' onChange='calculate(this.form," + rowNum + ")'></TD>"
    }
    oneRow += "</TR>"
    return oneRow
}
```

Creating a row of entry fields is a bit more complex, but not much. Instead of assigning just a word to each cell, you assemble an entire `<INPUT>` object definition. You use the `columnWidths` array to define the size for each field (which therefore defines the width of the table cell in the column). `columnHead` values are assigned to the field's NAME attribute. Each column's fields have the same name, no matter how many rows exist. Finally, the `onChange` event handler invokes the `calculate()` method, passing the form and, most importantly, the row number, which comes into this function as a parameter (see the following section).

Some JavaScript language cleanup

The final function in the Head script is an empty function for `initialize()`. This function is the one that JavaScript 1.1-level browsers activate after the document loads into them:

```
// do nothing when JavaScript 1.1 browser calls here
function initialize() {}
//-->
</SCRIPT>
</HEAD>
<BODY>
<CENTER>
<H1>ORDER FORM</H1>
<FORM>
<TABLE BORDER=2>
<SCRIPT LANGUAGE="JavaScript">
<!--
initialize()
// -->
</SCRIPT>
```

From there, you start the `<BODY>` definition, including a simple header. You immediately go into the form and table definitions. A JavaScript script that will be run by all versions of JavaScript invokes the `initialize()` function. JavaScript 1.0–level browsers execute the `initialize()` function in the topmost version in the Head so that they display the warning message in the document's body; JavaScript 1.1–level browsers execute the empty function you see.

Tedium lost

Believe it or not, all of the rows of data-entry fields in the table are defined by the handful of JavaScript statements that follow:

```
<SCRIPT LANGUAGE="JavaScript1.1">
document.write(makeTitleRow())
// order form entry rows
for (var i = 0; i < numberOfRows; i++) {
    document.write(makeOneRow(i))
}
```

The first function to be called is the `makeTitleRow()` function, which returns the HTML for the table's column headings. Then a very simple `for` loop writes as many rows of the field cells as defined in the global value near the top of the document. Notice how the index of the loop, which corresponds to the row number, is passed to the `makeOneRow()` function, so that it can assign that row number to its relevant statements. Therefore, these few statements generate as many entry rows as you need.

Tedium regained

What follows in the script writes the rest of the form to the screen. To make these fields as intelligent as possible, the scripts must take the number of columns into consideration. A number of empty-space cells must also be defined (again, calculated according to the number of columns). Finally, the code-consuming SELECT element definitions must also be in this segment of the code.

```
// order form footer stuff (subtotal, sales tax, shipping, total)
var colSpacer = "<TR><TD COLSPAN=" +
    (columnWidths.length - 2) + "></TD>"
document.write(colSpacer)
document.write("<TH>Subtotal:</TH>")
document.write("<TD><INPUT TYPE=text SIZE=" +
    columnWidths[columnWidths.length - 1] + " NAME=subtotal></TR>")
document.write("<TR><TD COLSPAN=" +
    (columnWidths.length - 3) + "></TD>")
var tax1 = "<SELECT NAME=percent
onChange='addTotals(this.form)'><OPTION>0<OPTION>1<OPTION>2<OPTION>3"
tax1 += "<OPTION VALUE=1>1<OPTION VALUE=2>2<OPTION VALUE=3>3"
tax1 += "<OPTION VALUE=4>4<OPTION VALUE=5>5<OPTION VALUE=6>6"
tax1 += "<OPTION VALUE=7>7<OPTION VALUE=8>8<OPTION VALUE=9>9"
tax1 += "</SELECT>"
var tax2 = "<SELECT NAME=fraction onChange='addTotals(this.form)'>"
tax2 += "<OPTION VALUE=0>00<OPTION VALUE=25>25"
tax2 += "<OPTION VALUE=5>50<OPTION VALUE=75>75</SELECT>"
document.write("<TH ALIGN=RIGHT>" + tax1 + "." + tax2 + "\%</TH>")
document.write("<TH ALIGN=RIGHT>Sales Tax:</TH>")
document.write("<TD><INPUT TYPE=text SIZE=" +
    columnWidths[columnWidths.length - 1] + " NAME=tax VALUE=0.00></TR>")
document.write(colSpacer)
document.write("<TH>Shipping:</TH>")
document.write("<TD><INPUT TYPE=text SIZE=" +
    columnWidths[columnWidths.length - 1] + " NAME=shipping VALUE=0.00
onChange='addTotals(this.form)'></TR>")
document.write(colSpacer)
document.write("<TH>Total:</TH>")
document.write("<TD><INPUT TYPE=text SIZE=" +
    columnWidths[columnWidths.length - 1] + " NAME=total></TR>")
</SCRIPT>

</TABLE></FORM>
</BODY>
</HTML>
```

To gain a better understanding of how the script assembles the HTML for this part of the table, start by looking at the `colSpacer` variable. This variable contains a table cell definition that must span all but the rightmost two columns. Thus, the

COLSPAN attribute is calculated based on the length of the columnWidths array (minus two for the columns we need for data). Therefore, to write the line for the subtotal field, you start by writing one of these column spacers, followed by the <TH> type of cell with the label in it. For the actual field, you must size it to match the fields for the rest of the column. That's why you summon the value of the last columnWidths value for the SIZE attribute. You use similar machinations for the Shipping and Total lines of the form footer material.

In between these locations, you define the Sales Tax SELECT objects (and a column spacer that is one cell narrower than the other one you used). To reduce the risk of data-entry error and to allow for a wide variety of values without needing a 40-item pop-up list, I divided the choices into two components and then display the decimal point and percentage symbol in hard copy. Both SELECT objects trigger the addTotals() function to recalculate the rightmost column of the form.

Sometimes, it seems odd that you can script four lines of code to get 20 rows of a table, yet it takes twenty lines of code to get only four more complex rows of a table. Such are the incongruities of the JavaScripter's life.

Further Thoughts

Depending on the catalog of products or services being sold through this order form, the first improvement I would make is to automate the entry of stock number and description. For example, if the list of all product numbers isn't that large, you may want to consider dropping a SELECT element into each cell of the Description column. Then, after a user makes a selection, the onChange event handler performs a lookup through a product array and automatically plugs in the description and unit price. In any version of this form, you also need to perform data validation for crucial calculation fields, such as quantity.

In a CGI-based system that receives data from this form, individual fields do not have unique names, as mentioned earlier. All Qty fields, for instance, have that name. But when the form is submitted, the name-value pairs appear in a fixed order every time. Your CGI program can pull the data apart partly by field name, partly by position. The same goes for a program you may build to extract form data that is e-mailed to you rather than sent as a CGI request.

Some of the other online order forms I've seen include reset buttons for every row or a column of checkmarks that lets users select one or more rows for deletion or resetting. Remember that people make mistakes and change their minds while ordering online. Give them plenty of opportunity to recover easily. If getting out of jam is too much trouble, they will head for the History list or Back button, and that valued order will be, well, history.

✦ ✦ ✦

52 CHAPTER

Application: Outline-Style Table of Contents

✦ ✦ ✦ ✦

In This Chapter

Multiple frames

Clickable images

Custom objects

Image caching

Persistent data

Dynamic HTML positioning

✦ ✦ ✦ ✦

In your Web surfing, you may have encountered sites that implement an expandable, outline type of table of contents. I've long thought that these elements were great ideas, especially for sites with lots of information. An outline, such as the Windows Explorer or text-style Macintosh Finder windows, enables the author to present a large table of contents in a way that doesn't necessarily take up a ton of page space or bandwidth. From listings of top-level entries, a user can drill down to reveal only those items of interest.

No matter how much I like the idea, however, I dislike visiting these sites. A CGI program on the server responds to each click, chews on my selection, and then sends back a completely new screen, showing my choice expanded or collapsed. After working with outlines in the operating system and outliner programs on personal computers, the delays in this processing seem interminable. It occurred to me that implementing the outline interface as a client-side JavaScript can significantly reduce the delay problem and make outlines a more viable interface to a site's table of contents. This chapter documents the process that went into an early version of the outliner, which works with most older browsers. Some newer versions are also presented.

Design Challenges

The more I looked into implementing an outline in the early scripting days, the more challenges I found ahead of me.

The first problem was making the little icons (widgets) clickable so that they respond to user mouse actions. Even though images are objects in NN3 and IE4+, NN images don't have mouse-oriented event handlers until you reach NN6 (although you can make some mouse events work in some versions of NN4/Windows). Therefore, it was necessary to surround each image with a link object whose HREF attribute called a `javascript:` URL and function to do the job. This technique also helped solve the next problem.

After a user clicks an outline widget, the script must update the window or frame containing the outline to expand or collapse a portion of the outline. The original design predated dynamically updated pages of IE4 and NN6, so the entire page had to be rewritten. But to make that work, the script needed a way to represent and temporarily preserve the current state of the outline — a line-by-line rundown on whether a line was currently expanded or collapsed. If the script could save that state somewhere, the widget's link HREF attribute could summon a JavaScript function whose job is to perform a soft reload of the current page without reopening it — with the `history.go()` method. Therefore, as a user clicked a widget, the state of the outline created by that click would be generated in the script, saved, and then used to specify the expanded or collapsed state of each line as the page reloaded.

Just when I was congratulating myself on how clever I was, I realized that any attempt to save the state of the new outline in a variable was doomed: Even a soft reload restores variables to their original state. I'd have to find another way to maintain the data.

The first method I used was to store the outline state (a string of `0`s and `1`s, in which a `1` indicated that the item was expanded) in a text box. Text and TEXTAREA objects maintain their contents even through a document reload (but not a reopen). Although this method was convenient, it was ugly because it meant that the field would have to be in the frame. One tactic was to make the frame a non-scrolling frame and stuff the field out of sight by pushing it to the far right with padding spaces inside a `<PRE>...</PRE>` tag.

Next, it was time to try Netscape's mechanism for storing persistent data on the client computer: the `document.cookie` property. Cookies are not unique to JavaScript. Any CGI can also store data, such as a user's login name and password for a site, in a cookie. The cookie did the trick. Information about the outline lasts in the cookie of any user's computer only as long as the browser stays running.

Another detail that I wanted to overcome was the initial delay experienced the first time a user clicked one of the collapsed widgets in the outline. At that point, only one of three icon image files had been loaded and cached in the browser. In the very first version of this application for NN2, I arranged to display all three widgets as decoration on the page to get them loaded up front. But with NN3+ and IE4+, I can precache all the widget art files and deploy them instantly when needed.

The Implementation Plan

I admit to approaching the outline technique the first time without a specific data-display goal in mind — not always the best way to go about it. In search of some logical and public domain data that I could use as an example, I came upon the tables of information about food composition (grams of protein, fat, calories, and so on) published by the U.S. government. For this demonstration, I created one HTML document containing data for two hierarchical categories of foods: peas and pickles. At the beginning of each food category, I assigned an anchor to which the text entries of the outline point.

My design for this implementation calls for two frames set up as columns (see Figure 52-1). The narrower left column houses the outline interface. After the frame-set loads, the wider right frame initially shows an introductory HTML document. Clicking any of the links in the outline changes the view of the right-hand frame from the introductory document to the food data document. A link at the bottom of the food data document enables the user to view the introductory document again in the same frame, if desired.

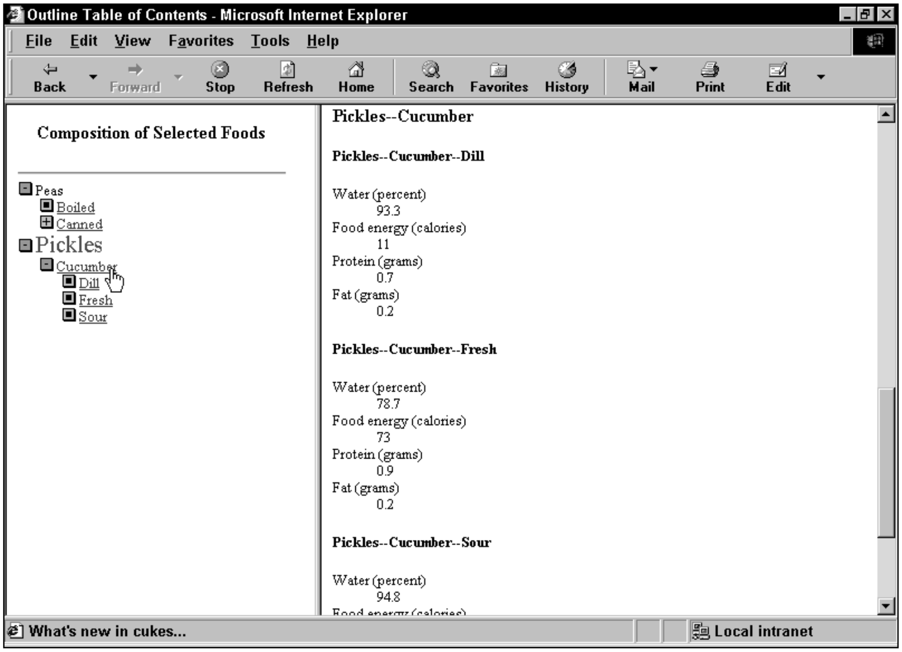


Figure 52-1: The outline in the left frame is dynamic and local.

In addition to image caching, NN3 and IE4 gave me reason to make some other improvements to the outliner over a version originally created for NN2. They include

✦ Adjustable indentation spacing

✦ Easier specification of widget art files

✦ Easier way to specify a target frame for the results

✦ Additional array field for statusbar display text

All adapter-adjustable elements appear near the top of the script to make it easy for scripters without a lot of experience to modify the application for their own sites.

For this fourth edition of the book, a couple of minor improvements make the outliner easier to modify and deploy. First, the tedious sequential numbering of items is gone. Second, performance in NN4 is greatly enhanced with the help of streamlined cookie handling.

The Code

All files for this implementation of the outline are on the CD-ROM accompanying this book, so I display here only the code for the framesetting document (index.htm) and the outline (toc5.htm). Earlier numbered filenames were used for previous editions of this book.

Setting the frames

To establish the frames, the script creates a two-column format, assigning 35 percent of the page as a column to contain the outline:

```
<HTML>
<HEAD>
<TITLE>Outline Table of Contents</TITLE>
</HEAD>

<FRAMESET COLS="35%,65%">

<NOFRAMES>
<H1>It's really cool...</H1>
<H2>...but only if you a frames-capable browser</H2>
<HR>
<A HREF="index.html">Back </A>
</NOFRAMES>

    <FRAME NAME="Frame1" SRC="toc4.htm">
    <FRAME NAME="Frame2" SRC="intro.htm">
</FRAMESET>
</HTML>
```

Because pages designed for multiple frames and JavaScript don't fare well in browsers incapable of displaying frames, a good approach is to surround HTML with a <NOFRAMES> tag for display to users of old browsers. You can substitute any link you like for the one shown here, which goes back to the main JavaScript page at my Web site.

The names that I assign to the two frames aren't very original or clever, but they help me remember which frame is which. Because the nature of the contents of the second frame changes (either the introductory document or the data document), I couldn't think of a good name to reflect its purpose.

Outline code

Now we come to some lengthy code for the outline (in file toc5.htm). Much of the code deals with managing the binary representation of the current state of the outline. For each line of the completely exploded outline, the code designates a 0 for a line that has no nested items showing and a 1 for a line that has a nested item showing. This sequence of 0s and 1s (as one string) is the road map that the script follows when redrawing the outline. Cues from the 0 and 1 settings let the script know whether it should display a nested item (if one exists) or leave that item collapsed.

To help me visualize the inner workings of these scripts, I developed a convention that calls any item with nested items beneath it a *mother*. Any nested item is that mother's *daughter*. A daughter can also be a mother if it has an item nested beneath it. You see how this plays out in the code shortly.

The food outline document starts out simply enough, with the standard opening of a JavaScript script. The first specification set apart for easy modification is the size of the indentation level in pixels.

```
<HTML>
<HEAD>
<TITLE>Food Selection Outline</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- begin hiding
// ** BEGIN OUTLINE AUTHOR-ADJUSTABLE SPECIFICATIONS **//

// size of horizontal indent per level
var indentPixels = 20
```

Outline level indentations are controlled by the width of a transparent image file. Indentation size is uniform throughout the outline, and the value is controlled via the `indentPixels` global variable. The image file is actually only a single pixel large, but by setting the width as needed (see the following example), it occupies a known amount of space, without affecting the font characteristics of the outline text.

Two more groups of adjustable items come next. The first group takes care of the widget images. This group is where you specify the filenames for the three widgets and provide the script with their height and width measurements:

```
// art files and sizes for three widget styles
// (all three widgets must have same height/width)
var collapsedWidget = "plus.gif"
var expandedWidget = "minus.gif"
var endpointWidget = "end.gif"
var widgetWidth = 12
var widgetHeight = 12

// Target for documents loaded when user clicks on a link.
// Specify your target frame name here.
var displayTarget = "Frame2"
```

When you design your widget art (if you don't like mine), be sure to design all three to be the same size. This practice prevents scaling of the images later.

If you deploy the outliner for your site, be sure to change the name of the frame assigned to the `displayTarget` global variable. This value eventually becomes part of the text links in the outline. If you want a click of a link to completely replace the current frameset with a different page, then specify `_top` as the display target.

Assembling outline content

The last of the easily modifiable areas defines the content of the outline. After defining the primary array (`db`), a second dimension is added to create an array of custom objects. The dbRecord array (defined in the following listing) helps populate the db array with specifics provided in the comma-delimited statements here:

```
// Create array object containing outline content and attributes.
// To adapt outline for your use, modify this table.
// Start the array with [1], and continue without gaps to your last item.
// The order of the five parameters:
//    1. Boolean (true or false) whether _next_ item is indented.
//    2. String to display in outline entry (including <FONT> tags).
//    3. URL of link for outline entry; Use empty string ("") for no link
//    4. Integer of indentation level (0 is leftmost margin level)
//    5. String for status line onMouseOver (apostrophes require \\')
var db = new Array()
db[db.length] = new dbRecord(true,"Peas","",0,"")
db[db.length] = new dbRecord(false,"Boiled","foods.htm#boiled",
    1,"Mmm, boiled peas...")
db[db.length] = new dbRecord(true,"Canned","foods.htm#canned",
    1,"Check out canned peas...")
db[db.length] = new dbRecord(false,"Alaska","foods.htm#alaska",
    2,"Alaska\\'s finest...")
db[db.length] = new dbRecord(false,"Low-Sodium","foods.htm#losodium",
    2,"A healthy treat...")
db[db.length] = new dbRecord(true,"<FONT COLOR=red
SIZE=+2>Pickles</FONT>","",0,"")
db[db.length] = new dbRecord(true,"Cucumber","foods.htm#cucumber",
    1,"What\\'s new in cukes...")
db[db.length] = new dbRecord(false,"Dill","foods.htm#dill",
    2,"Pucker up...")
db[db.length] = new dbRecord(false,"Fresh","foods.htm#fresh",
    2,"You\\'d prefer stale?")
db[db.length] = new dbRecord(false,"Sour","foods.htm#sour",
    2,"For sweeties...")
// add more records to complete your outline
// ** END AUTHOR-ADJUSTABLE SPECIFICATIONS **//
```

Each record consists of five items. The first item is a Boolean value, which denotes whether the item is a mother item (that is, the next item in the list is nested one level deeper). The HTML that displays in the outline comes next. This text can be multiple-word strings, or any HTML that you like (some users have assigned <IMG> tags to show pictures instead of text). For the third item, you can insert any valid URL, whether it be to a separate site, an anchor in another document (as shown here), or even a javascript: URL to execute another function. If you don't want an entry in the outline to be a link — just plain, flat text — leave this third item as an empty string, as I do here for the topmost items in both categories. The fourth item is a number representing how many nested levels the item has. And finally, the last item is a string containing the text that appears in the statusbar when the user rolls the mouse over the item in the outline. Because of a quirk in the way the statusbar responds to quoted characters, any string literal character (normally preceded with a backslash) requires two backslashes (one to alert the browser of the other).

Be sure to keep the items for the db array in the same top-to-bottom order as you'd expect to see in a fully expanded outline. Notice that the index values of the array are automatically inserted for you: The length property of an array is always one more than the highest index. By inserting references to the db.length property in the brackets, you instruct JavaScript to "walk the ladder" upward from zero. If you move things around the outline, however, don't forget to adjust the indentation levels if they are affected by the content changes.

The bottom of the array creation section marks the end of the code that you need to modify after you deploy the outliner. The rest of the JavaScript code works silently for you, but if you intend to perform further customizations to the outliner, understanding how it all works will help.

On to the constructor function for the `dbRecord` entries: This function is the classic JavaScript way to build a custom object (see Chapter 41):

```
// object constructor for each outline entry
// (see object-building calls, below)
function dbRecord(mother,display,URL,indent,statusMsg){
    this.mother = mother   // is this item a parent?
    this.display = display // text to display
    this.URL = URL         // link tied to text; no link for empty string
    this.indent = indent   // how deeply nested?
    this.statusMsg = statusMsg  // descriptive text for status bar
    return this
}
```

To preload all the images into the browser's image cache, you create new `Image` objects for each and assign the filenames to their `src` properties. Notice that these statements are not in functions, but rather execute as the page loads:

```
// pre-load all images into cache
var fillerImg = new Image(1,1)
fillerImg.src = "filler.gif"
var collapsedImg = new Image(widgetWidth,widgetHeight)
collapsedImg.src = collapsedWidget
var expandedImg = new Image(widgetWidth,widgetHeight)
expandedImg.src = expandedWidget
var endpointImg = new Image(widgetWidth,widgetHeight)
endpointImg.src = endpointWidget
```

Cookie storage

To preserve the binary digit string between redraws of the outline, this script must save the string to a place that won't be overwritten or emptied during the document reload. The `document.cookie` fills that requirement nicely. Excerpting and adapting parts of Bill Dortch's cookie functions (see Chapter 18), this script simplifies the writing of a cookie that disappears when the user quits the browser:

```
// ** functions that get and set persistent cookie data **
// set cookie data
var mycookie = document.cookie
function setCurrState(setting) {
        mycookie = document.cookie = "currState=" + escape(setting)
}
// retrieve cookie data
function getCurrState() {
        var label = "currState="
        var labelLen = label.length
        var cLen = mycookie.length
        var i = 0
```

```
        while (i < cLen) {
                var j = i + labelLen
                if (mycookie.substring(i,j) == label) {
                        var cEnd = mycookie.indexOf(";",j)
                        if (cEnd ==     -1) {
                                cEnd = mycookie.length
                        }
                        return unescape(mycookie.substring(j,cEnd))
                }
                i++
        }
        return ""
}
```

A global variable is used to act as a speedy intermediary between the actual browser cookie and the functions here that need to access cookie data. The `setCurrState()` function contains a construction that you don't see much in this book, but is quite valid. Notice the three-piece assignment statement. Evaluation of this statement works from right to left. The rightmost expression concatenates a cookie label and the value passed in as a parameter to the function. Note, too, that the value is passed through the `escape()` function to properly URL-encode the data for the sake of data integrity (so that spaces and odd punctuation don't mess up the mechanism). The concatenated value is assigned to the `document.cookie` property. With the value safely dropped into the cookie (it may be just one of several name/value pairs for this domain), the value of the `document.cookie` property (which includes all name/value pairs for the domain) is assigned to the `mycookie` global variable.

Retrieving information from the cookie still requires a bit of parsing to be on the safe side. If other cookie writing were to come from the current server path, more than one cookie would be available to the current document. Parsing the entire cookie for just the portion that corresponds to the `currState` labeled cookie ensures that the script gets only the data previously saved to that label. In an earlier version of this code, the frequent access to the `document.cookie` property inside the `while` loop of `getCurrState()` wasn't a problem until the sluggish cookie reading performance of NN4 got in the way. Adapting the code to use the global variable for the repetitive parsing of the cookie value rescued the day.

The focal point

The `toggle()` function, which is pivotal in this outline scheme, receives as a parameter the index number of the `db` array element whose content the user just clicked. The purpose of this function is to grab a copy of the current outline state from the cookie, alter the binary representation of the clicked item, and feed the revised binary number back to the cookie (where it governs the display of the outline after the document reloads):

```
// **function that updates persistent storage of state**
// toggles an outline mother entry, storing new value in the cookie
function toggle(n) {
    var newString = ""
    var currState = getCurrState()
```

```
    var expanded = currState.charAt(n) // of clicked item
    newString += currState.substring(0,n)
    newString += expanded ^ 1 // Bitwise XOR clicked item
    newString += currState.substring(n+1,currState.length)
    setCurrState(newString) // write new state back to cookie
}
```

To make this happen, you must extract two pieces of information before any processing: the current state from the cookie and the current setting of the clicked item. The latter is saved in a local variable named `expanded` because its `0` or `1` value represents the expanded state of that particular entry in the outline.

With those information morsels in hand, the script starts building the new binary string that gets written back to the cookie. The new string consists of three pieces: the front part of the existing string up to (but not including) the digit representing the clicked item, the changed entry, and the rest of the original string.

Changing the setting of the clicked item from a `0` to a `1`, or vice versa, is necessary. Although I can implement this task a few different ways (for example, using a conditional expression or an `if...else` construction), I thought I'd exercise an operator that otherwise gets little use: the bitwise XOR operator (^). Because the values involved here are `0` and `1`, performing an XOR operation with the value of `1` inverts the original value:

```
0 ^ 1 = 1
1 ^ 1 = 0
```

Okay, perhaps using an XOR operator is showing off. But the experience forced me to understand a JavaScript power that may come in handy for the future.

Selecting a widget image for an entry

At this point, the script starts defining functions to help the script statements in the Body write the HTML for the new version of the outline. The `getGIF()` function determines which of the three widget image files needs to be specified for a particular entry in the outline. The function receives the index value to the `db` array of entries created earlier in the script. As the Body script assembles the HTML for the outline, it calls this function once for each item in the outline. In return, the function provides a reference to one of three `Image` objects created earlier:

```
// **functions used in assembling updated outline**
// returns the proper GIF file name for each entry's control
function getGIF(n, currState) {
    var mom = db[n].mother  // is entry a parent?
    var expanded = currState.charAt(n) // of clicked item
    if (!mom) {
        return endpointWidget
    } else {
        if (expanded == 1) {
            return expandedWidget
        }
    }
    return collapsedWidget
}
```

The decision process for this function first tries to eliminate any item that ends a mother–daughter chain. Any item that is as deeply nested as it can be (which means the item is not a mother) automatically gets the `endpointWidget` image.

Now you're left with trying to figure out whether the item in the display should get an expanded or collapsed icon. The holder of this information is the cookie. Thus, the script extracts the binary setting for the entry under scrutiny. If the cookie shows that entry to be a `1`, it means that the item has nested items showing and that it should get the `expandedWidget` image; otherwise, it should get the `collapsedWidget` image. Notice that you're returning *references* to the `Image` objects, not the names of the image files.

A similar excursion through each item determines what status message is assigned to the `onMouseOver` event handler for each of the widget images. The decision tree is identical to that of the `getGIF()` function:

```
// returns the proper status line text based on the icon style
function getGIFStatus(n, currState) {
    var mom = db[n].mother  // is entry a parent
    var expanded = currState.charAt(n) // of rolled item
    if (!mom) {
        return "No further items"
    } else {
        if (expanded == 1) {
            return "Click to collapse nested items"
        }
    }
    return "Click to expand nested items"
}
```

Initialize the cookie

The final task of the script running in the head is to initialize the cookie if it's empty. Using the length of the `db` array as a counter, you build a string of `0`s, with one `0` for each item in the outline:

```
// initialize 'current state' storage field
if (getCurrState() == "" || getCurrState().length != (db.length)) {
    initState = ""
    for (i = 0; i < db.length; i++) {
        initState += "0"
    }
    setCurrState(initState)
}

// end -->
</SCRIPT>
</HEAD>
```

Each of those `0`s in the parameter to the `setCurrState()` function corresponds to a collapsed setting for an entry in the outline. In other words, the first time the outline appears, all items are in the collapsed mode. If you modify the outline for your own use by creating your own `db` array of data, the initial state of the cookie will be set for you automatically based on the length of the `db` array.

Writing the outline

At last we reach the document Body, where the outline is assembled and written to the page. Script statements here are immediate, meaning that they execute while the page loads. I have you begin by initializing some variables that you will need in a moment. The most important variable is `newOutline`, which will be used to accumulate the contents of the outline for eventual writing to the page:

```
<BODY>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
// build new outline based on the values of the cookie
// and data points in the outline data array.
// This fires each time the user clicks on a control,
// because the HREF for each one reloads the current document.
var newOutline = ""
var prevIndentDisplayed = 0
var showMyDaughter = 0
var currState = getCurrState() // get whole state string
document.write("<CENTER><H3>Composition of Selected Foods</H3>")
```

The following section is the real beef of this script: the part that assembles the HTML for the outline that displays as the document loads. In other words, this part must read the current state data from the cookie and assemble widget images and text links according to the map of expanded and collapsed items in the cookie data. These activities take place within a `for` loop that cycles through every item in the database. Each value of the `i` index refers to one listing in the `db` array. Trace the logic of one entry:

```
// cycle through each entry in the outline array
for (var i = 0; i < db.length; i++) {
    var theGIF = getGIF(i, currState)  // get the image
    var theGIFStatus = getGIFStatus(i, currState) // get the status message
    var currIndent = db[i].indent      // get the indent level
    var expanded = currState.charAt(i) // current state

    // display entry only if it meets one of three criteria
    if (currIndent == 0 || currIndent <= prevIndentDisplayed ||
        (showMyDaughter == 1 &&
        (currIndent - prevIndentDisplayed == 1))) {
        newOutline += "<IMG SRC=\"filler.gif\" HEIGHT = 1 WIDTH =" +
            (indentPixels * currIndent) + ">"
        newOutline += "<A HREF=\"javascript:history.go(0)\" " +
            "onMouseOver=\"window.status=\'" + theGIFStatus +
            "\';return true;\" onClick=\"toggle(" + i + ");return " +
            (theGIF != endpointWidget) + "\">"
        newOutline += "<IMG SRC=\"" + theGIF + "\" HEIGHT=" +
            widgetHeight + " WIDTH=" + widgetWidth + " BORDER=0></A>"
        if (db[i].URL == "" || db[i].URL == null) {
            newOutline += " " + db[i].display + "<BR>"    // no link
        } else {
            newOutline += " <A HREF=\"" + db[i].URL + "\" TARGET=\"" +
                displayTarget + "\" onMouseOver=\"window.status=\'" +
                db[i].statusMsg + "\';return true;\">" + db[i].display +
                "</A><BR>"
        }
```

```
        prevIndentDisplayed = currIndent
        showMyDaughter = expanded
        if (db.length > 25) {
            document.write(newOutline)
            newOutline = ""
        }
    }
}
```

First, you call upon two previously defined functions to grab the widget image object and corresponding `onMouseOver` message for the statusbar. Two more variables contain the indent property for the item (that is, how many steps indented the item will appear in the outline structure) and the current expanded state, based on the cookie's entry for that item.

Not every entry in the outline database is displayed. For instance, a nested item whose mother is collapsed won't need to be displayed. To find out if an entry should be displayed, the script performs a number of tests on some of its values. An item can be displayed if any of the following conditions are met:

✦ The item is a topmost item, with an indentation factor of 0.

✦ The item is at the same or smaller indentation level as the previous item displayed.

✦ The previous item was tagged as being expanded, and the current item is indented from the previous item by one level.

Over the next few statements, the script pieces together the HTML for the outline entry, starting with the width necessary for the transparent filler image (based on the number of pixels specified for indentations near the top of the script). Next comes the link definition that wraps around the widget image. The following concepts apply to each link:

✦ The HREF attribute is the `javascript:` URL to invoke the `history.go()` method.

✦ The `onMouseOver` event handler is set to adjust the status message to the previously retrieved message (notice the `return true` statement to make the setting take effect).

✦ The `onClick` event handler is set to call the `toggle()` function, passing the number of the item within the outline database. An `onClick` event handler is carried out before the browser responds to the click of the link by navigating to the URL. Therefore, the `toggle()` function changes the setting of the cookie a fraction of a second before the browser refreshes the document (which relies on that new cookie setting). But click events on widgets that have no children do not need to hit the `toggle()` function. Therefore, the content of the `return` statement is influenced by whether or not the widget image is an endpoint image.

In the next statement, the `newOutline` string accumulation continues with the `<IMG>` tag specifications for the widget art. Specifying the `HEIGHT` and `WIDTH` attributes for the image is important, partly to help the browser lay out the page more quickly, partly to avoid pesky performance inconsistencies.

Next comes a decision about whether to display the item text as a link or as plain text. The script inspects the `db[i].URL` property to see if it is empty. If so, that means no URL is specified for a link, and the item should be built as plain text.

If a URL is specified for the item, the script instead constructs a link around the text. In this HTML assembly process, numerous calls to properties of the `db` array fetch properties of the entry for the URL, the statusbar message, and the text to display. Notice, too, that the link sets the target of the link to the frame name assigned to `displayTarget` near the top of the script.

As you near the end of the loop, two variable values, `prevIndentDisplayed` and `showMyDaughter`, are updated with settings from the current traversal through the loop. These values influence the display of nested items for the next entry's journey through the loop.

But before looping around again, the script inspects whether the outline is longer than 25 entries. If so, the script writes the outline entries that have accumulated so far, resetting the `newOutline` variable to empty for the next time through the loop. The reasoning behind this last routine is to help long outlines start to display their goods faster. I have seen Web site authors use this outline for literally hundreds of entries. At that quantity, the usually fast JavaScript begins to bog down a bit. By writing lines from a big outline to the page early, the user gets visual feedback that something is happening.

Once outside the loop, the script writes whatever last items may have accumulated in the `newOutline` variable. For outlines with less than 25 items, the whole outline is written in one push; for longer outlines, the value is empty at this point, because the intermediate writings have completed the job.

All that's left is to close up standard tags to finish the document definition:

```
document.write(newOutline)

// end -->
</SCRIPT>
</BODY>
</HTML>
```

Notice that the `document.write()` statement here is not followed by `document.close()`. Because this content is being written as the page loads, the output stream is closed at the end of the page's HTML.

Customization possibilities

Although this DHTML-free outliner is not the fanciest to be found on the Web, it is, nevertheless, quite popular probably due to its ease of customizability and backward compatibility to all but the earliest browsers (you can find the very original version at my Web site). Other page authors have pushed and pulled on this code to tailor it to a variety of special needs.

Alternative displays

At the root of almost all significant customization jobs lie modifications to the `dbRecord` object constructor near the beginning of the page and the HTML assembly portion in the Body. They work hand in hand. For example, one user wants different links in the outline to load pages into different targets. Most links are to load content into another frame of the same frameset, while others are to replace the frameset entirely. In the version provided previously, one target is assumed, and it is set as a global variable. But if you need to provide different targets for each item, you can add a new property (perhaps named `target`) to the `dbRecord` constructor, and assign the string name of the target (for example, "Frame2", "_top") to the property for each item. Then, in the HTML accumulation portion, assign the value of `db[i].target` to that `TARGET` attribute (watching out for the necessary pairings of quote symbols, as shown in other attribute assignments).

Another request asked that the text associated with the plus/minus images be clickable, not to navigate to another page, but to expand and collapse the nested content. All the pieces for this variation are already in place. By performing minor reconstructive surgery on the HTML accumulator script, you can add a branch that looks for the `db[i].mother` property. If it's `true`, then don't write the closing `</A>` tag after the widget. Instead, branch to write the `db[i].display` text without its own URL link, and write the widget's `</A>` tag after the text. Now the widget and text share the same link as the widget originally had.

Cookie-free zones

Not everyone likes to develop with cookies. That's not a problem for this outliner, even though the previous example uses them liberally. The data that preserves the state of the outline is nothing but a string of `1`s and `0`s. If you are using a frameset, that string can be preserved as a global variable in the framesetting document.

To minimize the changes needed to the existing code, you can continue to use the same functions — `setCurrState()` and `getCurrState()` — as the interfaces to the reading and writing of the state. Begin by defining a global variable in the Head portion of the framesetting document, initializing it as an empty string:

```
<SCRIPT LANGUAGE="JavaScript">
outlineState = ""
</SCRIPT>
```

Now you can modify the two functions in the outliner page as follows:

```
// ** functions that get and set state data **
// set cookie data
var mycookie = document.cookie
function setCurrState(setting) {
        mycookie = parent.outlineState = setting
}
// retrieve cookie data
function getCurrState() {
        return parent.outlineState
}
```

Notice that there is no need for the label that has to be assigned to a cookie. The variable name keeps this data separate from the rest of the script space.

The only downside to not using a cookie is that the outline state is not preserved if the frameset goes away. If the user revisits the frameset in the same session, the outline state will be reinitialized at its beginning state.

Expanding/collapsing all at once

If you have an extensive outline, you may want to provide a shortcut to the user to expand everything at once or close up the entire outline. Because the string of `1`s and `0`s maintains the state of the outline, you can use the `db` array to help you create a new state string, and then apply it to the page. Here are two functions that do the job:

```
function expandAll() {
    expState = ""
    for (i = 1; i < db.length; i++) {
        expState += (db[i].mother) ? "1" : "0"
    }
    setCurrState(expState)
    history.go(0)
}

function collapseAll() {
    collState = ""
    for (i = 1; i < db.length; i++) {
        collState += "0"
    }
    setCurrState(collState)
    history.go(0)
}
```

All you need are a couple of buttons to invoke these functions, and you're in business.

Reducing server access

Through the lifetime of this outliner application, it has seen wildly different behaviors of the various browsers with regard to how much the browser reaches out to the server for each redisplay of the outline. While the `history.go(0)` type of reloading is supposed to be the least onerous, some browsers seem to read the entire file from scratch. This approach is still faster than having a CGI script completely reconfigure a page, but for an extensive outline and a slow Internet connection, the results can be objectionable.

One possible solution is to avoid reloading the page at all. Instead, place all of the code for the outliner management and creation in the framesetting document. Code that currently writes the outline as the page loads can be encapsulated in a function that writes to the frame designated as the outline frame (don't forget the `document.close()` for this writing!). Function calls from the outliner (to `toggle()`, for instance) have to be modified so that the reference is to the function in the parent frame (`parent.toggle(`*n*`)`).

Distributing the code around frames may not be as convenient as keeping it all together, but user experience should weigh more heavily than programmer expedience. This practice also opens the possibility for putting all of the outliner code, except for the calls to the constructor functions, in an external `.js` library. You can then put multiple outline contents into multiple `.js` libraries and load the pairs that you need into a frameset.

Using `document.write()` to another frame may still not avoid server access entirely. It is not uncommon for the application of any image file—including those that have been precached—to check the cached version against the modification date of the file on the server. This activity is much faster than downloading the image again, but if you see network activity even after shifting the outliner's scripts to the frameset, at least you understand what's happening. A version of the application directed from the parent window is contained on the CD-ROM.

Multiple outlines

The example in this chapter assumes that a site will be using only one outline-style table of contents. You can, of course, have multiple outlines for different sections of a Web site or application. But if the outlines all share the same cookie data, then the state of the most recent outline will be applied to the next one that loads. Items will be magically opened. And if the number of items between the two outlines is different, the cookie data can get a bit messy.

To solve this problem, assign a different cookie label for each outline. That prevents one outline's state from stepping on another.

Cascading Style Sheet Version

The advent of Cascading Style Sheets (CSS) brought a number of intriguing possibilities for an application, such as the outliner. Not only can style sheets be used to control the look of the items in the outline, but additional properties make it possible to hide and show elements, including inserting or removing elements from the rendered content. Alas, not all of these features work in NN4, so that the version under discussion in this section resorts to redrawing the outline for NN4. But for IE4+ and W3C DOMs, the response is very fast, and no page reloading is necessary. One of the goals, too, in this application was to reuse as much of the code from earlier versions as possible. Note that this version does not work (or work correctly) with browsers prior to NN4 or IE4.

CSS implementation plan

Many of the compromises in this version resulted from quirky behavior of NN4 with some types of elements and style sheets. I chose to render the outline content as a series of nested DIV elements. If this were being implemented strictly in more well behaved browsers, style sheet control over UL and LI elements would be even more convenient because those elements already have an indentation scheme built into them. With so much HTML code needed to generate the DIV elements and their contents, I decide to trade the cleverness of multidimensional array storage of outline content for the better performance of straight HTML. Each row of content in the outline is set in its own `<DIV>` block tag set. Any row that had children nested inside contains those items as a nested block.

Style sheets afforded the design a handy behavior. Hiding and showing blocks via the CSS-Positioning `visibility` property (see Chapter 30) is not an apt solution here, because hiding an item does not remove it from the page rendering. Therefore, unless the page included a ton of positioning code to overlap hidden items with visible items (which would have worked in NN4, but at the price of substantial increases in code and inflexibility), the outline would not cinch up if a branch is collapsed. To the rescue comes the `display` property of a style. One value of this property (`none`) not only hides the block, but it temporarily removes it from the rendering order of the page. Any items rendered below it that are visible (that is, whose `display` property is set to `block`) scoot up to render after the previous visible item.

Setting the `display` property has slightly different results in NN4 and more modern DOMs. In NN4, you can set the property after the block has been rendered on the page, but its appearance does not change; in both the IE4+ and W3C DOMs, the change is immediate, with the rest of the page reflowing to adjust to the change in the block's visibility and presence. Therefore, for NN4, the page still needs to reload itself and remember the state of the outline between reloads (via the same cookie mechanism used for the earlier version) so that the page can set the property value as the page loads. And except for only a couple of places in the code, both the IE4+ and W3C DOMs share positioning code.

The CSS version uses the same cookie value (a sequence of `1` and `0` values) to represent the visible or hidden state of each item as in the old version. To convey the change of state, however, the function called by the click of an icon widget must pass the index values of the child items affected by the expansion or collapse of a node. This means that more of the HTML — in this case, the parameters of the functions — has to be hard-wired to the structure of the outline, as you see shortly. Less of this would be necessary if NN4's implementation of CSS offered the same level of scriptable introspection into HTML elements as IE4's implementation: We'd be able to employ the style property inheritance behavior to simplify the way blocks are shown and hidden. Because the two classes of browsers supported in this example are so different in this regard, the scripting reflects the lowest common denominator for controlling the toggle of expanded and collapsed states.

The CSS code

By putting so much of the content directly into HTML, the scripting component of the CSS outliner version is significantly smaller than the older version. Where possible, I stayed with the same function and variable naming schemes of the previous version.

At the top of the document, I define three styles for the amount of indentation required by the three indentation levels of my sample outline. If the outline were to go to more levels, I would add styles accordingly.

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
    DIV.indent0 {margin-left:0}
    DIV.indent1 {margin-left:10}
    DIV.indent2 {margin-left:20}
</STYLE>
```

Scripting begins by setting some global variables. Browser-specific branching comes into play later, but in an effort to stamp out explicit version detection, the code here relies on object detection to set the requisite flags. Only browsers capable of the CSS style scripting needed here have a `document.styleSheets` property, so flags are set for the two supported browser classes. These flags are set here primarily as a convenience for writing branching code later. Rather than constantly retesting for the presence of the property, the global flags are shorter and marginally faster. Two more variables hold their respective browser class state values, with the NN4 version maintaining a copy of the cookie as a variable for performance reasons.

```
<SCRIPT LANGUAGE="JavaScript">
// global variables
var isNN4, isCSS, CSScurrState, NN4Cookie = document.cookie
```

```
if (document.styleSheets) {
    isCSS = true
    isNN4 = false
} else {
    isCSS = false
    isNN4 = true
}
```

To each of the cookie storage functions from the original version, I add a branch to handle the storage and retrieval of state data for CSS browsers, simply setting and getting the global variable. This may seem to be more indirect than is necessary, but it is essential to allow the reuse of many functions in other parts of the code so that those areas don't have to worry about browser platform. Notice that the label for this outline's cookie is slightly different from that of the earlier version. This difference allows you to open both outliners with NN4 in the same session and not worry about one cookie value overlapping with the other.

```
// ** functions that get and set persistent data **
// set persistent data
function setCurrState(setting) {
    if (isNN4) {
        NN4Cookie = document.cookie = "currState2=" + escape(setting)
    } else {
        // for CSS, data is saved as a global variable instead of cookie
        CSScurrState = setting
    }
}

// retrieve persistent data
function getCurrState() {
    if (isCSS) {
        // for CSS, data is in global var instead of cookie
        return CSScurrState
    }
    var label = "currState2="
    var labelLen = label.length
    var cLen = NN4Cookie.length
    var i = 0
    while (i < cLen) {
        var j = i + labelLen
        if (NN4Cookie.substring(i,j) == label) {
            var cEnd = NN4Cookie.indexOf(";",j)
            if (cEnd ==    -1) {
                cEnd = NN4Cookie.length
            }
            return unescape(NN4Cookie.substring(j,cEnd))
        }
        i++
    }
    return ""
}
```

The `toggle()` function is called by the `onClick` event handler of the links surrounding the widget icon art in the outline. A variable number of parameters are passed to this function, so that the parameters are extracted and analyzed via the `arguments` property of the function. Both browsers with only a few small browser-specific branches use a great deal of the code. Inside the large `for` loop, a CSS branch dynamically changes the setting of the `style.display` property. For NN4, the page is reloaded after all changes to the cookie version of the state are saved. After the NN4 version goes off to reload the page, the CSS version swaps the image of the toggled widget. As a final touch, the window is given focus so that IE/Windows browsers lose the dotted rectangle around the clicked image.

```
// **function that updates persistent storage of state**
// toggles an outline mother entry, storing new value
function toggle() {
    var newString = ""
    var expanded, n
    // get all <DIV> tag objects in IE4/W3C DOMs
    if (document.all) {
        var allDivs = document.all.tags("DIV")
    } else if (document.getElementsByTagName) {
        var allDivs = document.getElementsByTagName("DIV")
    }
    var currState = getCurrState() // of whole outline
    // assemble new state string based on passed parameters
    for (var i = 0; i < arguments.length; i++) {
        n = arguments[i]
        expanded = currState.charAt(n) // of clicked item
        newString += currState.substring(0,n)
        newString += expanded ^ 1 // Bitwise XOR clicked item
        newString += currState.substring(n+1,currState.length)
        currState = newString
        newString = ""
        if (isCSS) {
            // dynamically change display style without reloading
            if (expanded == "0") {
                allDivs[n].style.display = "block"
            } else {
                allDivs[n].style.display = "none"
            }
        }
    }
    setCurrState(currState) // write new state back to cookie
    if (isNN4) {
        location.reload()
    }
    // swap images in CSS versions
    var img = document.images["widget" + (arguments[0]-1)]
    img.src = (img.src.indexOf("plus.gif") != -1) ?
        "minus.gif" : "plus.gif"
    window.focus()
}
```

A prerequisite for loading the page to begin with is setting the initial value of the state. This is the only part of the script that must be hard-wired based on the structure of the outline — string assigned to `initState` will be different with each outline. The goal here is to set each block assigned to the `indent0` style class to `1` while all others are set to 0. These settings allow the first display of the outline to show all the root nodes, with all other items collapsed.

```
// initialize 'current state' storage field
if (!getCurrState()) {
    // must be hard-wired to outline structure with "1" for
    // each indent0 class item, "0" for all others
    initState = "1000010000"
    setCurrState(initState)
}
```

With the initial outline state saved in the above code, the following statements execute at load time to write a <STYLE> tag set for NN4. This tag sets the display property of all collapsed blocks to none. As you see in the HTML coming up, blocks are assigned ID attributes with the letter “a” followed by a sequence number starting with zero.

```
// for Navigator 4, set display style for flagged IDs to 'none'
// each time the page (re)loads
if (isNN4) {
    document.write("<STYLE TYPE='text/css'>")
    var visState = getCurrState()
    for (var i = 0; i < visState.length; i++) {
        if (visState.charAt(i) == "0") {
            document.write("#a" + i + " {display:none}\n")
        }
    }
    document.write("</STYLE>")
}
```

Initial settings of the display property for IE4+ can be done programmatically only after the document loads (the tags must exist before their properties can be adjusted). The following init() function is called from the onLoad event handler. Each browser class has a different set of initialization tasks. Both branches rely on the current state setting, so that value is retrieved just once. In the CSS branch, the style.display properties for hidden blocks are set to none. For NN4, on the other hand, the style.display properties are set as the page reloads, but this loop swaps the widget image for expanded blocks to the minus.gif version.

```
// for CSS, initialize flagged tags to style display = "none"
// for NN4, set affected images to minus.gif
function init() {
    var visState = getCurrState()
    if (isCSS) {
        for (var i = 0; i < visState.length; i++) {
            if (visState.charAt(i) == "0") {
                // branch for browser object capability
                if (document.all) {
                    document.all("a" + i).style.display = "none"
                } else if (document.getElementsByTagName) {
                    document.getElementById("a" + i).style.display = "none"
                }
            }
        }
    } else if (isNN4) {
        for (i = 0; i < visState.length; i++) {
```

```
            if (visState.charAt(i) == "1") {
                if (i+1 < visState.length && visState.charAt(i+1) == "1") {
                    if (document.images["widget" + i]) {
                        document.images["widget" + i].src = "minus.gif"
                    }
                }
            }
        }
    }
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()">
<CENTER><H3>Composition of Selected Foods</H3><HR></CENTER>
```

Now begins the HTML that defines the content of the outline. For readability, I have formatted the `<DIV>` tag sets to follow the indentation of the outline data (this listing looks much better if you open the file from the CD-ROM in your text editor with word wrap turned off). Each tag includes a `CLASS` attribute pointing to a class defined in the first `<STYLE>` tag of the page. Each tag also includes an `ID` attribute whose name begins with the letter "a" and a sequential serial number, starting with zero. Navigator uses the `ID` attributes to help it assign `display` property settings during each reload.

Like the older version of the outliner, each entry includes an image (surrounded by a clickable link) and a text entry (which may or may not be a link to a document). The link around the image includes a `javascript:` URL for the `HREF` attribute. When a link is for a widget that is a mother item, the parameters to the `toggle()` function are the serial numbers of the immediate children IDs whose display properties are to be adjusted in the `toggle()` function. These passed items only need to be in the immediate children, because any of their children inherit the `display` property of their parents. For example, the first widget toggles items 1 and 2 (ids `a1` and `a2`). Item 2 happens to be a parent to items 3 and 4. But when the `display` property of item 2 is set to `none`, then none of its children (items 3 and 4) are displayed, no matter how their display properties are set.

IMG elements associated with each toggled DIV are named along similar lines, with the name starting with "widget" and the same serial number as the containing DIV. If you look at the end of the `toggle()` function again, you'll see that the name for the IMG element is derived from the first parameter received by the `toggle()` function. That first parameter will always be one number higher than the serial number for the widget image to swap. To help you visualize the numbering scheme used within the example, the numbered identifiers and methods that relay associated numbers are shown in boldface.

```
<DIV CLASS=indent0 ID="a0">
    <A HREF="javascript:toggle(1,2)" onMouseOver=
    "status='Click to expand/collapse nested items';return true"
    onMouseOut="status='';return true">
    <IMG NAME="widget0" SRC="plus.gif" HEIGHT=12 WIDTH=12
    BORDER=0></A> Peas<BR>
    <DIV CLASS=indent1 ID="a1">
        <A HREF="javascript:void(0)" onMouseOver=
        "status='No further items';return true"
```

```
        onMouseOut="status='';return true">
        <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
        BORDER=0></A> <A HREF="foods.htm#boiled"
        TARGET=Frame2>Boiled</A><BR>
    </DIV>
    <DIV CLASS=indent1 ID="a2">
        <A HREF="javascript:toggle(3,4)" onMouseOver=
        "status='Click to expand/collapse nested items';return true"
        onMouseOut="status='';return true">
        <IMG NAME="widget2" SRC="plus.gif" HEIGHT=12 WIDTH=12
        BORDER=0></A> <A HREF="foods.htm#canned"
        TARGET=Frame2>Canned</A><BR>
        <DIV CLASS=indent2 ID="a3">
            <A HREF="javascript:void(0)"
            onMouseOver="status='No further items';return true"
            onMouseOut="status='';return true">
            <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
            BORDER=0></A> <A HREF="foods.htm#alaska"
            TARGET=Frame2>Alaska</A><BR>
        </DIV>
        <DIV CLASS=indent2 ID="a4">
            <A HREF="javascript:void(0)"
            onMouseOver="status='No further items';return true"
            onMouseOut="status='';return true">
            <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
            BORDER=0></A> <A HREF="foods.htm#losodium"
            TARGET=Frame2>Low-Sodium</A><BR>
        </DIV>
    </DIV>
</DIV>

<DIV CLASS=indent0 ID="a5">
    <A HREF="javascript:toggle(6)" onMouseOver=
    "status='Click to expand/collapse nested items';return true"
    onMouseOut="status='';return true">
    <IMG NAME="widget5" SRC="plus.gif" HEIGHT=12 WIDTH=12
    BORDER=0></A> Pickles<BR>
    <DIV CLASS=indent1 ID="a6">
        <A HREF="javascript:toggle(7,8,9)" onMouseOver=
        "status='Click to expand/collapse nested items';return true"
        onMouseOut="status='';return true">
        <IMG NAME="widget6" SRC="plus.gif" HEIGHT=12 WIDTH=12
        BORDER=0></A> <A HREF="foods.htm#cucumber"
        TARGET=Frame2>Cucumber</A><BR>
        <DIV CLASS=indent2 ID="a7">
            <A HREF="javascript:void(0)" onMouseOver=
            "status='Click to expand nested items';return true"
            onMouseOut="status='';return true">
            <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
            BORDER=0></A> <A HREF="foods.htm#dill"
            TARGET=Frame2>Dill</A><BR>
        </DIV>
        <DIV CLASS=indent2 ID="a8">
            <A HREF="javascript:void(0)"
            onMouseOver="status='No further items';return true"
```

```
            onMouseOut="status='';return true">
            <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
            BORDER=0></A> <A HREF="foods.htm#fresh"
            TARGET=Frame2>Fresh</A><BR>
        </DIV>
        <DIV CLASS=indent2 ID="a9">
            <A HREF="javascript:void(0)"
            onMouseOver="status='No further items';return true"
            onMouseOut="status='';return true">
            <IMG SRC="end.gif" HEIGHT=12 WIDTH=12
            BORDER=0></A> <A HREF="foods.htm#sour"
            TARGET=Frame2>Sour</A><BR>
        </DIV>
    </DIV>
</DIV>
</BODY>
</HTML>
```

The CSS version (for the identical outline content) is a slightly smaller file size than the older, compatible one, but not so big a difference as to influence your choice. Browser compatibility should be your number one criterion. Ease of modification for changing content and improved user experience for browsers following the CSS branch are tied in second.

A Futuristic (XML) Outline

As XML and its associated technologies head toward a solid standardized footing, the latest browsers available as this edition is being written provide mixed support for some of the key features of an ideal environment. As those issues are sorting themselves out, getting to know portions of XML through the IE5+/Windows XML data island features is possible. While it's not normally okay to embed XML in an HTML document (that is, the two designations specify unique document types), IE5+/Windows provides an `<XML>` tag, in which you can insert XML tags. Scripts can access the elements inside the XML data island, referencing those elements as child nodes of the XML element. See Chapter 33 for the reference material on the IE XML element.

Birth of an XML specification

Collapsible outlines provide convenient ways to organize hierarchical information all around us. You'd be hard-pressed to find a more active proponent of the outline than Dave Winer, CEO of UserLand Software, Inc. (`http://www.userland.com`). Dave is a veteran software developer, as well as author and outspoken Web publisher. His `www.scripting.com` Web site is a popular destination if you want to find out the latest Internet and computing technology "buzz."

As an outgrowth of development for his company's Web tools, Dave looked to the XML structure to assist in representing outline content in a shareable, easily parseable format. The result is a specification called Outline Processor Markup Language, or OPML for short. You can read all about the formal specification at `http://www.opml.org/spec`. Like virtually all XML, OPML is intended to be written by software, not humans (although humans input the data via a user-friendly front-end provided by the software). Even so, the format of an OPML outline is extremely readable by humans, and, with little more trouble than writing basic HTML tags manually, you can represent an outline in this format yourself.

A plain OPML file, saved as an `.xml` file, can be viewed through the native XML parsers of IE5+ and NN6. These parsers automatically render XML tags in the same hierarchical fashion as OPML encourages outlines to be structured. But such rendering is under strict control of the browser, unless you also get involved with XML style sheets (the XSL and XSLT standards), at which point, browser implementation incompatibilities can make the going tough.

I liked the OPML data format when I first saw it, and I think it's a convenient way to convey an outline's data to the client, at which point JavaScript and the browser's DOM can take over to provide interesting visuals for the content and interaction with the content. Thus was born the last example of this chapter, in which the outliner's data is delivered not in the form of scripted arrays or hard-wired HTML DIV elements. Instead, the data arrives in its native XML (OPML) format inside an IE5+/Windows XML data island. Rendering of the native XML is suppressed, and scripts take over to do the rest.

OPML outliner prep

The appearance of widgets and text for the new outliner has changed to more closely emulate the kinds of outline presentations that you see in some Windows programs (see Figure 52-2). For demonstration purposes, the same frameset structure and outline content from earlier examples are used for the OPML version so that you can more easily see the differences in implementations and grasp new concepts presented here. For example, the comparison of how the outline data is delivered in the form of JavaScript objects (the first example) and OPML is enlightening.

As you recall, a custom object constructor function generated one JavaScript object for each outline entry. The properties of the object are completely under your control, so that you can add properties (such as the target of an entry's link), whose values influence the way the entry is rendered and the way it behaves. OPML has a similar extensibility feature. Each outline entry is nothing more than a tag. An entry that does not have any nested child nodes can use the XML shortcut of combining a start and end tag inside one set of angle brackets:

```
<tagName attribute="value" ... />
```

And any entry that has nested nodes contains the nested nodes between its start and end tags, as shown here with the actual tag names used in OPML (indentation is optional, but increases readability):

```
<outline text="text">
    <outline text="text"/>
    <outline text="text"/>
</outline
```

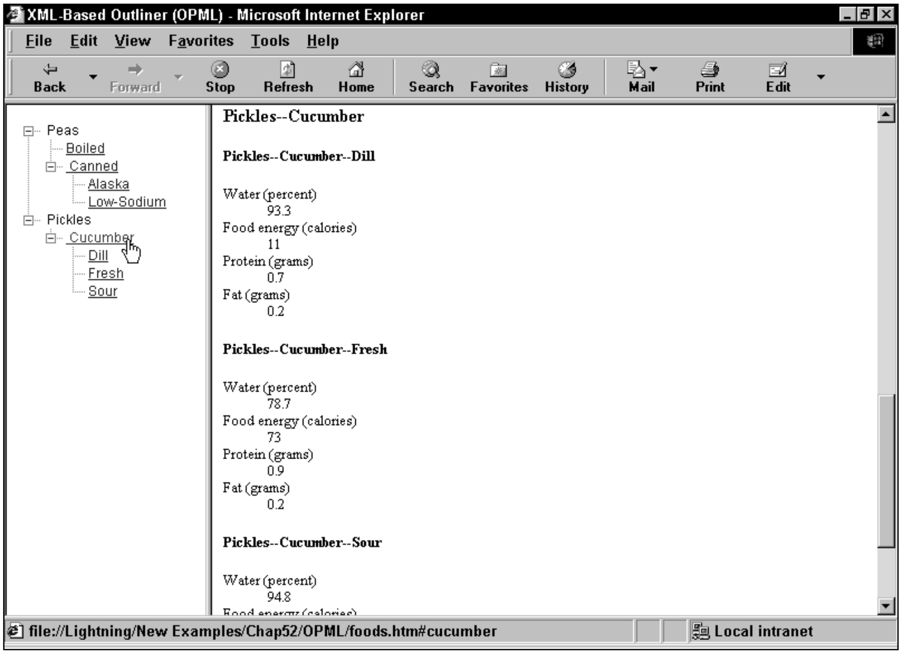


Figure 52-2: OPML-based outliner style

If you want to associate more information about an entry, simply add an attribute. For example, if an entry is to behave as a link, you can convey that information with an attribute whose name you determine. When it comes time for your scripts to render the content in HTML, the scripts access the attribute values and generate the associated HTML for the attributes (you see an example of this in the code).

The true beauty of the OPML structure (and XML in general) is that the parent–child relationships are automatically implied by the element containment. Unlike the JavaScript custom object in the first example, the author does not have to specify how many levels deep an entry is, or whether it has any child nodes: The XML containment hierarchy describes all of that information. Suddenly, all of the W3C DOM gobbledygook about nodes, child nodes, and attributes become your friend, as your scripts convert the element hierarchy into a renderable hierarchy of your design.

The XML and HTML code

Because our focus is so tight on the outliner content, you can start the exploration of the outliner code from the HTML BODY element downward, where the outline data is embedded in an IE5+/Windows XML element.

```
<BODY onLoad="init('outlineXML')">
<XML ID="outlineXML">
<opml version="1.0">
    <head>
        <title>A Modern Outline</title>
        <dateCreated>Thu, 16 Nov 2000 02:40:00 GMT</dateCreated>
        <dateModified>Fri, 22 Dec 2000 19:35:00 GMT</dateModified>
        <ownerName>Danny Goodman</ownerName>
        <ownerEmail>dannyg@dannyg.com</ownerEmail>
        <expansionState></expansionState>
        <vertScrollState>1</vertScrollState>
        <windowTop></windowTop>
        <windowLeft></windowLeft>
        <windowBottom></windowBottom>
        <windowRight></windowRight>
    </head>
    <body>
        <outline text="Peas">
            <outline text="Boiled" uri="foods.htm#boiled"/>
            <outline text="Canned" uri="foods.htm#canned">
                <outline text="Alaska" uri="foods.htm#alaska"/>
                <outline text="Low-Sodium" uri="foods.htm#losodium"/>
            </outline>
        </outline>
        <outline text="Pickles">
            <outline text="Cucumber" uri="foods.htm#cucumber">
                <outline text="Dill" uri="foods.htm#dill"/>
                <outline text="Fresh" uri="foods.htm#fresh"/>
                <outline text="Sour" uri="foods.htm#sour"/>
            </outline>
        </outline>
    </body>
</opml>
</XML>

<DIV ID="content"></DIV>
</BODY>
</HTML>
```

Everything inside the XML element is textbook OPML version 1.0 form. Notice that the OPML syntax reuses element names that are found in all HTML files (for example, `head`, `title`, `body`). The XML island behavior isolates these tags from the browser's HTML rendering engine, so the browser won't confuse the two "documents." The only other HTML delivered in the document is an empty DIV element, which is used as the container for the outline HTML that the scripts generate as a result of the `onLoad` event handler's invocation of the `init()` function.

Also, go back to the top of the document to see the style sheets, which have an important place in delivering an XML island:

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
    XML {display:none}
    .row {vertical-align:middle; font-size:12px; font-family:Arial,sans-serif}
    .OLBlock {display:none}
    IMG {vertical-align:text-top}
</STYLE>
```

To prevent the XML block from rendering on the page, the `display` style property is set to `none` for the XML tag selector. This keeps the page clear for insertion of script-generated HTML. The other style sheet rules apply to content created by the scripts.

Setting the scripted stage

All scripts for this page are in the HEAD (although they could also be linked in from an external `.js` file). First on the docket is establishing several global variables that get used a lot within the rest of the code and make it easy to customize important visible properties, especially widget art. Due to the art choices made for this version, there are separate versions for items that appear as first, middle, and end items for different nesting states.

```
<SCRIPT LANGUAGE="JavaScript">
// global variables
// art files and sizes for widget styles and spacers
// (all images must have same height/width)
var collapsedWidget = "oplus.gif"
var collapsedWidgetStart = "oplusStart.gif"
var collapsedWidgetEnd = "oplusEnd.gif"
var expandedWidget = "ominus.gif"
var expandedWidgetStart = "ominusStart.gif"
var expandedWidgetEnd = "ominusEnd.gif"
var nodeWidget = "onode.gif"
var nodeWidgetEnd = "onodeEnd.gif"
var emptySpace = "oempty.gif"
var chainSpace = "ochain.gif"
var widgetWidth = "20"
var widgetHeight = "16"
var currState = ""
var displayTarget = "Frame2"
```

The `init()` function, invoked by the `onLoad` event handler, starts the content creation in motion. The basic sequence is to first make sure that the browser is capable of recognizing an XML data island. If the validation is okay, then a reference to the BODY portion of the outline data is retrieved so that many other functions are able to dive into the outliner hierarchy. Notice that elements of the XML data island are disguised from view of the `document` object's normal scope. Access must be made by way of the XML object, which then exposes its elements. The reference to the OPML BODY element is passed to the `makeHTML()` function, which returns the entire outline HTML to be assigned to the innerHTML property of the empty DIV element delivered with the document.

```
// initialize first time
function init(outlineID) {
    if (supportVerified(outlineID)) {
        // demo how to get outline head elements
        var hdr =
document.getElementById(outlineID).getElementsByTagName("head")[0]
        // get outline body elements for iterative conversion to HTML
        var ol =
document.getElementById(outlineID).getElementsByTagName("body")[0]
        // wrap whole outline HTML in a span
        var olHTML = "<SPAN ID='renderedOL'>" +
            makeHTML(outlineID, ol) + "</SPAN>"
        // throw HTML into 'content' DIV for display
        document.getElementById("content").innerHTML = olHTML
        initExpand(outlineID)
    }
}
```

Validation of browser support is handled by the supportVerified() function. This function is in search of the XMLDocument property of the XML element object. The property's presence indicates that the browser has what it takes to treat embedded XML as a data island. Incremental tests are needed so that earlier browsers don't choke on the reference to the property.

```
// verify that browser supports XML islands
function supportVerified(testID) {
    if (document.getElementById &&
    document.getElementById(testID) &&
    document.getElementById(testID).XMLDocument) {
        return true
    } else {
        var reply = confirm("This example requires a browser with XML data
island support, such as IE5+/Windows. Go back to previous page?")
        if (reply) {
            history.back()
        } else {
            return false
        }
    }
    return false
}
```

Accumulating the HTML

From the init() function, a call to the makeHTML() function starts the most complex actions of the scripts on this page. This function walks the node hierarchy of the outline's BODY elements, deciphering which ones are containers and which ones are end points.

Two global variables are used to keep track of how far the node walk progresses because this function calls itself from time to time to handle nested branches of the node tree. Because a reflexive call to a function starts out with new values for local variables, the globals operate as pointers to let statements in the function know which node is being accessed. The numbers get applied to an ID attribute assigned to the DIV elements holding the content.

One of the fine points of the design of this outline is the way space to the left of each entry is assembled. Unlike the earlier outlines in this chapter, this one displays vertical dotted lines connecting nodes at the same level. There isn't a vertical line for every clickable node appearing above the item, because a clickable node may have no additional siblings, meaning that the space is blank. To see what I mean, open the OPML example, and expand the Peas and Canned nodes (or see Figure 52-2). The Canned node is the end of the second "column," so the space beneath the icon is blank. That's what some of the code in `makeHTML()` named "prefix" is dealing with: Accumulating just the right combination of dotted line (`chain.gif`) and blank (`empty.gif`) images in sequence before the outline entry.

Another frequent construction throughout this function is a three-level conditional expression. This construction is used to determine whether the image just to the left of the item's text should be a start, middle, or end version of the image. The differences among them are subtle (having to do with how the vertical dotted line extends above or below the widgets). All of these decisions are made from information revealed by the inherent structure of the OPML element nesting. The listing in the book looks longer than it truly is because so many long or deeply nested lines must be wrapped to the next line. Viewing the actual file in your text editor should calm your fears a bit.

```
// counters for reflexive calls to makeHTML()
var currID = 0
var blockID = 0
// generate HTML for outline
function makeHTML(outlineID, ol, prefix) {
    var output = ""
    var nestCount, link, nestPrefix
    prefix = (prefix) ? prefix : ""
    for (var i = 0; i < ol.childNodes.length ; i++) {
        nestCount = ol.childNodes[i].childNodes.length
        output += "<DIV CLASS='row' ID='line" + currID++ + "'>\n"
        if (nestCount > 0) {
            // for entries that are also parents
            output += prefix
            output += "<IMG ID='widget" + (currID-1) +
                "' SRC='" + ((i== ol.childNodes.length-1) ?
                collapsedWidgetEnd : (blockID==0) ?
                collapsedWidgetStart : collapsedWidget)
            output += "' HEIGHT=" + widgetHeight + " WIDTH=" +
                widgetWidth
            output += " TITLE='Click to expand/collapse nested items.'
                onClick='toggle(this," + blockID + ")'>"
            // if a uri is specified, wrap the text inside a link
            link =  (ol.childNodes[i].getAttribute("uri")) ?
                ol.childNodes[i].getAttribute("uri") : ""
            if (link) {
                output += " <A HREF='" + link +
                    "' CLASS='itemTitle' TITLE='" + link +
                    "' TARGET='" + displayTarget + "'>"
            } else {
                output += " <A CLASS='itemTitle' TITLE='" +
                    link + "'>"
            }
            // finally! the actual text of the entry
```

```
            output += " " + ol.childNodes[i].getAttribute("text") +
                "</A>"
            currState += calcBlockState(outlineID, currID-1)
            output += "<SPAN CLASS='OLBlock' BLOCKNUM='" + blockID +
                "' ID='OLBlock" + blockID++ + "'>"
            // accumulate prefix art for next indented level
            nestPrefix = prefix
            nestPrefix += (i == ol.childNodes.length - 1) ?
                "<IMG SRC='" + emptySpace + "' HEIGHT=16 WIDTH=20>" :
                "<IMG SRC='" + chainSpace + "' HEIGHT=16 WIDTH=20>"
            // reflexive call to makeHTML() for nested elements
            output += makeHTML(outlineID, ol.childNodes[i], nestPrefix)
            output += "</SPAN></DIV>\n"
        } else {
            // for endpoint nodes
            output += prefix
            output += "<IMG ID='widget" + (currID-1) + "' SRC='" +
                ((i == ol.childNodes.length - 1) ?
                nodeWidgetEnd : nodeWidget)
            output += "' HEIGHT=" + widgetHeight + " WIDTH=" +
                widgetWidth + ">"
            // check for links for these entries
            link =  (ol.childNodes[i].getAttribute("uri")) ?
                ol.childNodes[i].getAttribute("uri") : ""
            if (link) {
                output += " <A HREF='" + link +
                    "' CLASS='itemTitle' TITLE='" +
                link + "' TARGET='" + displayTarget + "'>"
            } else {
                output += " <A CLASS='itemTitle' TITLE='" +
                    link + "'>"
            }
            // grab the text for these entries
            output += ol.childNodes[i].getAttribute("text") + "</A>"
            output += "</DIV>\n"
        }
    }
   return output
}
```

As with the HTML assembly code of the first outliner, if you were to add attributes to OUTLINE elements in an OPML outline (for example, a URL for an icon to display in front of the text), it is in `makeHTML()` that the values would be read and applied to the HTML being created.

The only other function invoked by the `makeHTML()` function is `calcBlockState()`. This function looks into one of the OPML outline's HEAD elements, called EXPANSIONSTATE. This element's values can be set to a comma-delimited list of numbers corresponding to nodes that are to be shown expanded when the outline is first displayed. The `calcBlockState()` function is invoked for each parent element. The element's location is compared against values in the EXPANSIONSTATE element, if there are any, and returns the appropriate `1` or `0` value for the state string being assembled for the rendered outline.

```
// apply default expansion state from outline's header
// info to the expanded state for one element to help
// initialize currState variable
function calcBlockState(outlineID, n) {
    var ol = document.getElementById(outlineID).getElementsByTagName("body")[0]
    var outlineLen = ol.getElementsByTagName("outline").length
    // get OPML expansionState data
    var expandElem =
document.getElementById(outlineID).getElementsByTagName("expansionState")[0]
    var expandedData = (expandElem.childNodes.length) ?
        expandElem.firstChild.nodeValue.split(",") : null
    if (expandedData) {
       for (var j = 0; j < expandedData.length; j++) {
            if (n == expandedData[j] - 1) {
                return "1"
            }
       }
    }
    return "0"
}
```

The final act of the initialization process is a call to the `initExpand()` function. This function loops through the `currState` global variable (whose value was written in `makeHTML()` with the help of `calcBlockState()`) and sets the `display` property to `block` for any element designed to be expanded at the outset. HTML element construction in `makeHTML()` is performed in such a way that each parent DIV has a SPAN nested directly inside of it; and inside that SPAN are all the child nodes. The `display` property of the SPAN determines whether all of those children are seen or not.

```
// expand items set in expansionState XML tag, if any
function initExpand(outlineID) {
    for (var i = 0; i < currState.length; i++) {
        if (currState.charAt(i) == 1) {
            document.getElementById("OLBlock" + i).style.display = "block"
        }
    }
}
```

By the time the `initExpand()` function has run — a lot of setup code that executes pretty quickly — the rendered outline is in a steady state. Users can now expand or collapse portions by clicking the widget icons.

Toggling node expansion

All of the widget images in the outline have `onClick` event handlers assigned to them. The handlers invoke the `toggle()` function, passing parameters consisting of a reference to the IMG element object receiving the event and the serial number of the SPAN block nested just inside the DIV that holds the image. With these two pieces of information, the `toggle()` function sets in motion the act of inverting the expanded/collapsed state of the element and the plus or minus version of the icon image. The `blockNum` parameter corresponds to the position within the `currState` string of `1`s and `0`s holding the flag for the expanded state of the block. With the current value retrieved from `currState`, the value is inverted through swapState(). Then, based on the new setting, the display property of the block is set accordingly, and widget art is changed through two special-purpose functions.

```
// toggle an outline mother entry, storing new state value;
// invoked by onClick event handlers of widget image elements
function toggle(img, blockNum) {
    var newString = ""
    var expanded, n
    // modify state string based on parameters passed IMG
    expanded = currState.charAt(blockNum)
    currState = swapState(currState, expanded, blockNum)
    // dynamically change display style
    if (expanded == "0") {
        document.getElementById("OLBlock" + blockNum).style.display =
            "block"
        img.src = getExpandedWidgetState(img.src)
    } else {
        document.getElementById("OLBlock" + blockNum).style.display =
            "none"
        img.src = getCollapsedWidgetState(img.src)
    }
}
```

Swapping the state of the currState variable utilizes the same XOR operator employed by the first outliner in this chapter. The entire currState string is passed as a parameter. The indicated digit is segregated and inverted, and the string is reassembled before being returned to the calling statement in toggle().

```
// invert state
function swapState(currState, currVal, n) {
    var newState = currState.substring(0,n)
    newState += currVal ^ 1 // Bitwise XOR item n
    newState += currState.substring(n+1,currState.length)
    return newState
}
```

As mentioned earlier, each of the clickable widget icons (plus and minus) can be one of three states, depending on whether the widget is at the start, middle, or end of a vertical-dotted chain. The two image swapping functions find out (by inspecting the URLs of the images currently occupying the IMG element) which version is currently in place so that, for instance, a starting plus (collapsed) widget is replaced with a starting minus (expanded) widget. This is a case of going the extra mile for the sake of an improved user interface.

```
// retrieve matching version of 'minus' images
function getExpandedWidgetState(imgURL) {
    if (imgURL.indexOf("Start") != -1) {
        return expandedWidgetStart
    }
    if (imgURL.indexOf("End") != -1) {
        return expandedWidgetEnd
    }
    return expandedWidget
}
```

```
// retrieve matching version of 'plus' images
function getCollapsedWidgetState(imgURL) {
    if (imgURL.indexOf("Start") != -1) {
        return collapsedWidgetStart
    }
    if (imgURL.indexOf("End") != -1) {
        return collapsedWidgetEnd
    }
    return collapsedWidget
}
```

Wrap up

There's no question that the amount and complexity of the code involved for the OPML version of the outliner are significant. The "pain" associated with developing an application such as this is all up front. After that, the outline content is easily modifiable in the OPML format (or perhaps by some future editor that produces OPML output).

Even if you don't plan to implement an OPML outline, the explanation of how this example works should drive home the importance of designing data structures that assist not only the visual design but also the scripting that you use to manipulate the visual design.

Further Thoughts

The advent of CSS and element positioning has prompted numerous JavaScripters to develop another kind of hierarchical system of pop-up or drop-down menus. You can find examples of this interface at many of the JavaScript source Web sites listed in Appendix D. Making these kinds of menus work well in NN4, IE4+, and W3C DOMs is a lot of hard work, and if you can adopt code already ironed out by others, then all the better.

Most of the code you find, however, will require a fair amount of tweaking to blend the functionality into the visual design that you have or are planning for your Web site. Finding two implementations on the Web that look or behave the same way is rare. As long as you're aware of what you'll be getting yourself into, you are encouraged to check out these interface elements. By hiding menu choices except when needed, valuable screen real estate is preserved for more important, static content.

✦ ✦ ✦

53

CHAPTER

Application: Calculations and Graphics

✦ ✦ ✦ ✦

In This Chapter

Precached images

Math calculations

CGI-like image assembly

✦ ✦ ✦ ✦

When the scripting world had its first pre-release peeks at JavaScript (while Netscape was still calling the language LiveScript), the notion of creating interactive HTML-based calculators captured the imaginations of many page authors. Somewhere on the World Wide Web, you can find probably every kind of special-purpose calculation normally done by scientific calculators and personal computer programs — leaving only weather-modeling calculations to the supercomputers of the world.

In the search for my calculator gift to the JavaScript universe, I looked around for something more graphical. Numbers, by themselves, are pretty boring; so any way the math could be enlivened was fine by me. Having been an electronics hobbyist since I was a kid, I recalled the color-coding of electronic resistor components. The values of these gizmos aren't printed in plain numbers anywhere. You have to know the code and the meaning of the location of the colored bands to arrive at the value of each one. I thought that this calculator would be fun to play with, even if you don't know what a resistor is.

The Calculation

To give you an appreciation for the calculation that goes into determining a resistor's value, here is the way the system works. Three closely spaced color bands determine the resistance value in ohms. The first (leftmost) band is the tens digit; the second (middle) band is the ones digit. Each color has a number from 0 through 9 assigned to it (black = 0, brown = 1, and so on). Therefore, if the first band is brown and the second band is black, the number you start off with is 10. The third band is a multiplier. Each color determines the power of ten by which you multiply the first digits. For example, the red color corresponds to a multiplier of 102, so that 10×102 equals 1,000 ohms.

A fourth band, if present, indicates the tolerance of the component — how far, plus or minus, the resistance measurement can fluctuate due to variations in the manufacturing process. Gold means a tolerance of plus-or-minus 5 percent; silver means plus-or-minus 10 percent; and no band means a 20 percent tolerance. A pinch of extra space typically appears between the main group of three-color bands and the one tolerance band.

User Interface Ideas

The quick-and-dirty, non-graphical approach for a user interface was to use a single frame with four SELECT elements defined as pop-up menus (one for each of the four color bands on a resistor), a button to trigger calculation, and a field to show the numeric results.

How dull.

It occurred to me that if I design the art carefully, I can have JavaScript assemble an updated image of the resistor consisting of different slices of art: static images for the resistor's left and right ends, and variable slivers of color bands for the middle. Rather than use the brute force method of creating an image for every possible combination of colors (3,600 images total!), a far more efficient approach is to have one image file for each color (12 colors plus 1 empty) and enable JavaScript to call them from the server, as needed, in the proper order. If not for client-side JavaScript, a CGI script on the server would have to handle this kind of intelligence and user interaction. But with this system, any dumb server can dish up the image files as called by the JavaScript script.

The first generation of this resistor calculator used two frames, primarily because I needed a second frame to update the calculator's art dynamically while keeping the pop-up color menus stationary. Images couldn't be swapped back in those frontier days, so the lower frame had to be redrawn for each color choice. Fortunately, NN3 and IE4 enabled me to update individual image objects in a loaded document without any document reloading. Moreover, with all the images precached in memory, page users experience no (or virtually no) delay in making a change from one value to another.

The design for the new version is a simple, single-document interface (see Figure 53-1). Four pop-up menus let you match colors of a resistor, whereas the `onChange` event handler in each menu automatically triggers an image and calculation update. To hold the art together on the page, a table border surrounds the images on the page, whereas the numeric value of the component appears in a text field.

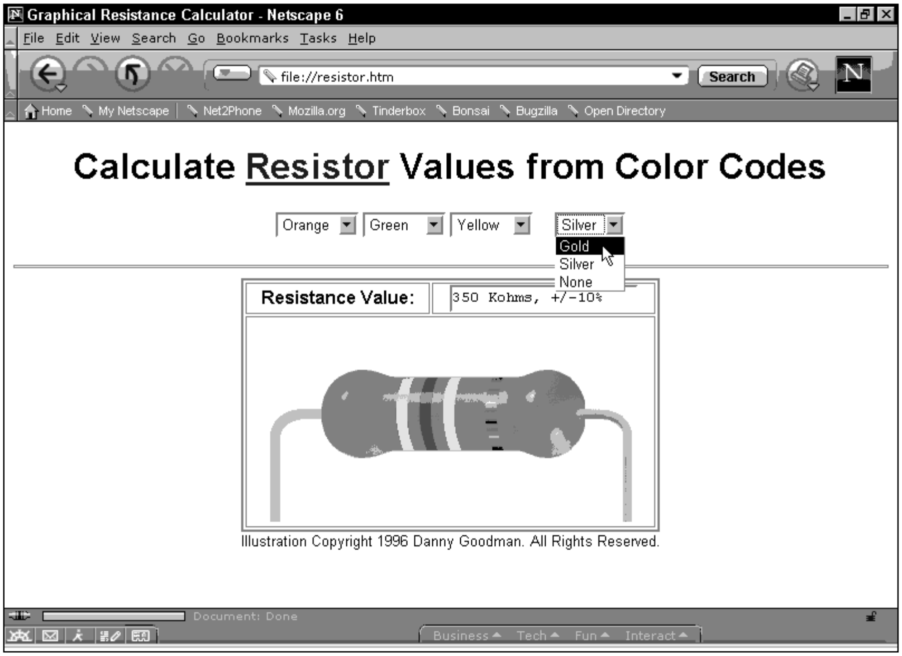


Figure 53-1: The Resistor Calculator with images inside a table border

The Code

All the action takes place in the file named `resistor.htm`. A second document is an introductory HTML text document that explains what a resistor is and why you need a calculator to determine a component's value. The article, called *The Path of Least Resistance*, can be viewed in a secondary window from a link in the main window. Here you will be looking only at `resistor.htm`, which has been updated to include style sheets.

The document begins in the traditional way. It specifies a JavaScript 1.1-level language because you will be using several features of that language version:

```
<HTML>
<HEAD>
<TITLE>Graphical Resistance Calculator</TITLE>
<STYLE TYPE="text/css">
BODY {font-family:Arial, Helvetica, serif}
</STYLE>
<SCRIPT LANGUAGE="JavaScript1.1">
<!-- hide script from nonscriptable browsers
```

Basic arrays

In calculating the resistance, the script needs to know the multiplier value for each color. If not for the last two multiplier values actually being negative multipliers (for example, 10^{-1} and 10^{-2}), I could have used the index values without having to create this array. But the two out-of-sequence values at the end make it easier to work with an array rather than to try special-casing these instances in later calculations:

```
// create array listing all the multiplier values
var multiplier = new Array()
multiplier[0] = 0
multiplier[1] = 1
multiplier[2] = 2
multiplier[3] = 3
multiplier[4] = 4
multiplier[5] = 5
multiplier[6] = 6
multiplier[7] = 7
multiplier[8] = 8
multiplier[9] = 9
multiplier[10] = -1
multiplier[11] = -2
// create object listing all tolerance values
var tolerance = new Array()
tolerance[0] = "+/-5%"
tolerance[1] = "+/-10%"
tolerance[2] = "+/-20%"
```

Although the script doesn't do any calculations with the tolerance percentages, it needs to have the strings corresponding to each color for display in the pop-up menu. The `tolerance` array is there for that purpose.

Calculations and formatting

Before the script displays the resistance value, it needs to format the numbers in values that are meaningful to those who know about these values. Just as measures of computer storage bytes, high quantities of ohms are preceded with "kilo" and "meg" prefixes, commonly abbreviated with the "K" and "M" letters. The `format()` function determines the order of magnitude of the final calculation (from another function shown in the following section) and formats the results with the proper unit of measure:

```
// format large values into kilo and meg
function format(ohmage) {
    if (ohmage >= 1e6) {
        ohmage /= 1e6
        return "" + ohmage + " Mohms"
    } else {
        if (ohmage >= 1e3) {
            ohmage /= 1e3
            return "" + ohmage + " Kohms"
```

```
        } else {
            return "" + ohmage + " ohms"
        }
    }
}
```

The selections from the pop-up menus meet the calculation formulas of resistors in the `calcOhms()` function. Because this function is triggered indirectly by each of the SELECT objects, sending any of their parameters to the function is a waste of effort. Moreover, the `calcOhms()` function is invoked by the `onLoad` event handler, which is not tied to the form or its controls. Therefore, the function obtains the reference to the form and then extracts the necessary values of the four SELECT objects by using explicit (named) references. Each value is stored in a local variable for convenience in completing the ensuing calculation.

Recalling the rules used to calculate values of the resistor bands, the first statement of the calculation multiplies the "tens" pop-up value times 10 to determine the tens digit and then adds the ones digit. From there, the combined value is multiplied by the exponent value of the selected multiplier value. Notice that the expression first assembles the value as a string to concatenate the exponent factor and then evaluates it to a number. Although I try to avoid the `eval()` function because of its slow performance, the one call per calculation is not a performance issue at all. The evaluated number is passed to the `format()` function for proper formatting (and setting of order of magnitude). In the meantime, the tolerance value is extracted from its array, and the combined string is plugged into the result text field (which is in a separate form, as described later):

```
// calculate resistance and tolerance values
function calcOhms() {
    var form = document.forms["rescalc"]
    var d1 = form.tensSelect.selectedIndex
    var d2 = form.onesSelect.selectedIndex
    var m = form.multiplierSelect.selectedIndex
    var t = form.toleranceSelect.selectedIndex
    var ohmage = (d1 * 10) + d2
    ohmage = eval("" + ohmage + "e" + multiplier[m])
    ohmage = format(ohmage)
    var tol = tolerance[t]
    document.forms["ouput"].result.value = ohmage + ", " + tol
}
```

Preloading images

As part of the script that runs when the document loads, the next group of statements precaches all possible images that can be displayed for the resistor art. For added scripting convenience, the color names are loaded into an array. With the help of that just-created array of color names, you then create another array (`imageDB`), which both generates `Image` objects for each image file and assigns a URL to each image. Notice an important subtlety about the index values being used to create each entry of the `imageDB` array: Each index is a `colorArray` entry, which is the name of the color. As you found out in Chapter 37, if you create an array element with a named index, you must use that style of index to retrieve the data thereafter; you cannot switch arbitrarily between numeric indexes and names. As you see in a moment, this named index provides a critical link between the choices a user makes in the pop-up lists and the image objects being updated with the proper image file.

```
// pre-load all color images into image cache
var colorArray = new Array("Black","Blue","Brown","Gold","Gray",
    "Green","None","Orange","Red","Silver","Violet","White","Yellow")
var imageDB = new Array()
for (i = 0; i < colorArray.length; i++) {
    imageDB[colorArray[i]] = new Image(21,182)
    imageDB[colorArray[i]].src = colorArray[i] + ".gif"
}
```

The act of assigning a URL to the `src` property of an `Image` object instructs the browser to pre-load the image file into memory. This pre-loading happens as the document is loading, so another few seconds of delay won't be noticed by the user.

Changing images on the fly

The next four functions are invoked by their respective SELECT object's `onChange` event handler. For example, after a user makes a new choice in the first SELECT object (the "tens" value color selector), that SELECT object reference is passed to the `setTens()` function. Its job is to extract the text of the choice and use that text as the index into the `imageDB` array. Alternatively, the color name can also be assigned to the `VALUE` attribute of each OPTION, and the `value` property read here. You need this connection to assign the `src` property of that array entry to the `src` property of the image that you see on the page (defined in the following section). This assignment is what enables the images of the resistor to be updated instantaneously—just the one image "slice" affected by the user's choice in a SELECT object.

```
function setTens(choice) {
    var tensColor = choice.options[choice.selectedIndex].text
    document.tens.src = imageDB[tensColor].src
    calcOhms()
}
function setOnes(choice) {
    var onesColor = choice.options[choice.selectedIndex].text
    document.ones.src = imageDB[onesColor].src
    calcOhms()
}
function setMult(choice) {
    var multColor = choice.options[choice.selectedIndex].text
    document.mult.src = imageDB[multColor].src
    calcOhms()
}
function setTol(choice) {
    var tolColor = choice.options[choice.selectedIndex].text
    document.tol.src = imageDB[tolColor].src
    calcOhms()
}
```

The rest of the script for the Head portion of the document merely provides the statements that open the secondary window to display the introductory document:

```
function showIntro() {
    window.open("resintro.htm","",
        "WIDTH=400,HEIGHT=320,LEFT=100,TOP=100")
}
// end script hiding -->
</SCRIPT>
</HEAD>
```

Creating the SELECT objects

A comparatively lengthy part of the document is consumed with the HTML for the four SELECT objects. Notice, however, that the document contains an `onLoad` event handler in the `<BODY>` tag. This handler calculates the results of the currently selected choices whenever the document loads or reloads. If it weren't for this event handler, you would not see the resistor art when the document first appears. Also, because many browsers maintain their form controls' setting while the page is in history, a return to the page later must display the images previously selected in the form.

```
<BODY onLoad="calcOhms()"><CENTER>
<H1>Calculate <A HREF="javascript:showIntro()" onMouseOver="status='An
introduction to the resistor electronic component...';return true">Resistor</A>
Values from Color Codes</H1>
<FORM NAME="rescalc">
<SELECT NAME="tensSelect" onChange="setTens(this)">
    <OPTION SELECTED> Black
    <OPTION> Brown
    <OPTION> Red
    <OPTION> Orange
    <OPTION> Yellow
    <OPTION> Green
    <OPTION> Blue
    <OPTION> Violet
    <OPTION> Gray
    <OPTION> White
</SELECT>
<SELECT NAME="onesSelect" onChange="setOnes(this)">
    <OPTION SELECTED> Black
    <OPTION> Brown
    <OPTION> Red
    <OPTION> Orange
    <OPTION> Yellow
    <OPTION> Green
    <OPTION> Blue
    <OPTION> Violet
    <OPTION> Gray
    <OPTION> White
```

```
</SELECT>
<SELECT NAME="multiplierSelect" onChange="setMult(this)">
<OPTION SELECTED> Black
    <OPTION> Brown
    <OPTION> Red
    <OPTION> Orange
    <OPTION> Yellow
    <OPTION> Green
    <OPTION> Blue
    <OPTION> Violet
    <OPTION> Gray
    <OPTION> White
    <OPTION> Gold
    <OPTION> Silver
</SELECT>    
<SELECT NAME="toleranceSelect" onChange="setTol(this)">
    <OPTION SELECTED> Gold
    <OPTION> Silver
    <OPTION> None
</SELECT>
</FORM>
<HR>
```

Drawing the initial images

The balance of the document, mostly in JavaScript, is devoted to creating the table and image objects whose `src` properties will be modified with each choice of a SELECT object. The act of assembling the HTML for the image table occurs right after the SELECT objects have rendered. References to those SELECT elements are required in order to extract the currently selected values. If the FORM element that holds the SELECT elements is not closed, you can't build a valid (and backward compatible) reference to the SELECT elements. Therefore, the page contains two forms: One for the SELECT elements; one for the output text box inside the table.

```
<SCRIPT LANGUAGE="JavaScript1.1">
var form = document.forms["input"]
var tensDigit = form.tensSelect.selectedIndex
var tensColor = form.tensSelect.options[tensDigit].text
var onesDigit = form.onesSelect.selectedIndex
var onesColor = form.onesSelect.options[onesDigit].text
var multDigit = form.multiplierSelect.selectedIndex
var multColor = form.multiplierSelect.options[multDigit].text
var tolDigit = form.toleranceSelect.selectedIndex
var tolColor = form.toleranceSelect.options[tolDigit].text

var table = "<TABLE BORDER=2><FORM NAME='output'>"
table += "<TR><TH ALIGN=middle>Resistance Value:</TH>"
table += "<TH ALIGN='middle'><INPUT TYPE='text' NAME='result' " +
    "SIZE=20 onFocus='this.blur()'>"
table += "</TH></TR><TR><TD COLSPAN=2>"
```

```
table += "<IMG SRC='resleft.gif' WIDTH=127 HEIGHT=182>" +
    "<IMG SRC='" + tensColor + ".gif' NAME='tens' WIDTH=21 " +
    "HEIGHT=182><IMG SRC='" + onesColor +
    ".gif' NAME='ones' WIDTH=21 HEIGHT=182>" +
    "<IMG SRC='" + multColor + ".gif' NAME='mult' WIDTH=21 "+
    "HEIGHT=182><IMG SRC='spacer.gif' WIDTH=17 HEIGHT=182>"+
    "<IMG SRC='" + tolColor + ".gif' NAME='tol' WIDTH=21 " +
    "HEIGHT=182><IMG SRC='resright.gif' WIDTH=127 HEIGHT=182>"
table += "</TD></TR></FORM></TABLE>"
document.write(table)
</SCRIPT>
<FONT SIZE=2>Illustration Copyright 1996 Danny Goodman. All Rights
Reserved.</FONT></CENTER>
</BODY>
</HTML>
```

As you can see, inside the images appear in one table cell (in the second row) that contains all seven image objects smashed against each other. To keep the images flush against each other, there can be no spaces or carriage returns between `<IMG>` tags.

Further Thoughts

I am very pleased with the improvements to performance and perceived quality that swappable images and image precaching bring to the current version of this calculator. Images change crisply. Network latency is no longer an issue.

In the layout department, however, annoying differences still exist among different platforms. At one point in the design process, I considered trying to align the pop-up menus with images of the resistor (or callout line images), but the differences in platform rendering of pop-up menus made that idea impractical. At best, I now separate the three left SELECT objects from the right one by way of hard-coded spaces (` `).

You should notice from this exercise that I look for ways to blend JavaScript object data structures with my own data's structure. For example, the SELECT objects serve multiple duties in these scripts. Not only does the text of each option point to an image file of the same name, but the index values of the same options are applied to the calculations. Things don't always work out that nicely, but whenever your scripts bring together user interface elements and data elements, look for algorithmic connections involving names or index integers that you can leverage to create elegant, concise code.

✦ ✦ ✦

CHAPTER 54

Application: Intelligent "Updated" Flags

✦ ✦ ✦ ✦

In This Chapter

Temporary and persistent cookies

World time calculations

CGI-like intelligence

✦ ✦ ✦ ✦

It happens to every active Web user all the time: You visit a site periodically and never know for sure what material is new since your last visit. Often, Web page authors may flag items with "New" or "Updated" `.gif` images after they update those items themselves. But if you fail to visit the site over a few modification sessions, the only items you find flagged are those that are new as of the most recent update by the page's author. Several new items from a few weeks back may be of vital interest to you, but you won't have the time to look through the whole site in search of material that is more recent than *your* last visit. Even if the items display their modification dates, do you remember for sure the date and time of your last visit to the page?

As much as I might expect a CGI program and database on a Web site to keep track of my last visit, that really is asking a great deal of the Web site. Besides, not every Web site has the wherewithal to build such a database system — if it can even put up its own CGIs. Plus, some users won't visit sites if they need to identify themselves or register.

After surveying the way scriptable browsers store cookie information and how time calculations are performed under NN3+ and IE4+, I found that a feasible alternative is to build this functionality into HTML documents and let the scripting manage the feature for users. The goal is to save in the visitor's cookie file the date and time of the last visit to a page and then use that point as a measure against items that have an authorship time stamp in the HTML document.

The Cookie Conundrum

Managing the cookie situation in this application is a bit more complicated than you may think. The reason is that you have to take into account the possible ways visitors may come and go from your site while surfing the Web. You cannot use just one cookie to store the last time a user visits the site, because you cannot predict when you should update that information with today's date and time. For example, if you have a cookie with the previous visit in it, you eventually need to store today's visit. But you cannot afford to overwrite the previous visit immediately (say in `onLoad`) because your scripts need that information to compare against items on the page not only right now, but even after the visitor vectors off from a link and comes back later. That also means you cannot update that last visit cookie solely via an `onUnload` event handler, because that, too, would overwrite information that you need when the visitor comes back a minute later.

To solve the problem, I devised a system of two cookies. One is written to the cookie that is given an expiration date of some time out in the future — the *hard cookie,* I call it. The other is a temporary *soft cookie*, which stays in cookie memory but is never written to the file. Such temporary cookies are automatically erased as the browser quits.

The hard cookie stores the time stamp when a visitor first loads the page since the last launch of the browser. In other words, the hard cookie contains a time stamp of the current visit. Before the previous entry is overwritten, however, it is copied into the soft cookie. That soft cookie maintains the time stamp of the previous visit and becomes the measure against which author time stamps in the HTML document are compared. To guard against inadvertent overwriting of both cookies, a function triggered by the document's `onLoad` event handler looks to see if the soft cookie has any data in it. If so, then the function knows that the visitor has been to this page in the current session and leaves the current settings alone. Thus, the visitor can come to the site and see what's new, vector off to some other location, and come back to see the same new items flagged and pick up from there.

One potential downside to this system is that if a user never quits the browser (or if the browser quits only by crashing), the cookies will never be updated. If you discover that a great deal of your users keep their computers and browsers running all the time, you can build in a kind of timeout that invalidates the soft cookie if the hard cookie is more than, say, 12 hours old.

Time's Not on Your Side

Thanks to over fifteen years' experience programming applications that involve tracking time, I am overly sensitive to the way computers and programming languages treat time on a global basis. This issue is a thorny one, what with the vagaries of Daylight Savings Time and time zones in some parts of the world that differ from their neighbors by increments other than whole hours.

In the case of working with time in JavaScript, you're at the mercy of how the browser and JavaScript interpreter deal with times as reflected by often imperfect operating systems. Those scripters who tried to script time-sensitive data in NN2 must have certainly experienced the wide fluctuations in the way each platform tracked time internally (over and above the outright bugs, especially in the Mac version of NN2). Fortunately, the situation improved significantly with NN3 and has only gotten better in all scriptable browsers. That's not to say all the bugs are gone, but at least they're manageable.

To accomplish a time tracking scheme for this application, I had to be aware of two times: the local time of the visitor and the local time of the page author. Making times match up in what can be widely disparate time zones, I use one time zone—GMT—as the reference point.

When a visitor arrives at the page, the browser needs to save that moment in time so that it can be the comparison measure for the *next* visit. Fortunately, whenever you create a new date object in JavaScript, it does so internally as the GMT date and time. Even though the way you attempt to read the date and time created by JavaScript shows you the results in your computer's local time, the display is actually filtered through the time zone offset as directed by your computer's time control panel. In other words, the millisecond value of every date object you create is maintained in memory in its GMT form. That's fine for the visitor's cookie value.

For the page author, however, I was presented with a different problem. Rather than force the author to convert the time stamps throughout the document to GMT, I wanted to let the author enter dates and times in local time. Aside from the fact that many people have trouble doing time zone conversions, looking at an existing item in the HTML with a local time stamp and instantly recognizing when that was last updated is much easier.

The problem, then, is how to let the visitor's browser know what time the author's time stamp is in GMT terms. To solve the issue, the author's time stamp needs to include a reference to the author's time zone relative to GMT. An Internet convention provides a couple of ways to do this: specifying the number of hours and minutes difference from GMT or, where supported by the browser, the abbreviation of the time zone. In JavaScript, you can create a new date object out of one of the specially formatted strings containing the date, time, and time zone. Three examples follow for the Christmas Eve dinner that starts at 6 p.m. in the Eastern Standard Time zone of North America:

```
var myDate = new Date("24 Dec 1997 23:00:00 GMT")
var myDate = new Date("24 Dec 1997 18:00:00 GMT-0500")
var myDate = new Date("24 Dec 1997 18:00:00 EST")
```

The first assumes you know the Greenwich Mean Time for the date and time that you want to specify. But if you don't, you can use the GMT designation and offset value. The syntax indicates the date and time is in a time zone exactly five hours west of GMT (values to the east would be positive numbers) in `hhmm` format. Browsers also know all of the time zone abbreviations for North America (EST, EDT, CST, CDT, MST, MDT, PST, and PDT, where "S" is for standard time and "D" is for daylight time).

When a user visits a page with this application embedded in it, the visitor's browser converts the author's time stamp to GMT (with the help of the author's zone offset parameter), so that both the author time stamp and last visit time stamp (in the soft cookie) are comparing apples to apples.

The Application

All of this discussion may make the application sound complicated. That may be true, internally. But the goal, as in most of the samples in this book, is to make the application easy to use in your site, even if you're not sure how everything works inside.

The sample page described in this chapter and on the CD-ROM (`whatsnew.htm`) is pretty boring to look at, because the power all lies in the scripting that users don't see (see Figure 54-1). Though this figure may be the most uninspired graphic presentation of the book, the functionality may be the most valuable addition that you make to your Web site.

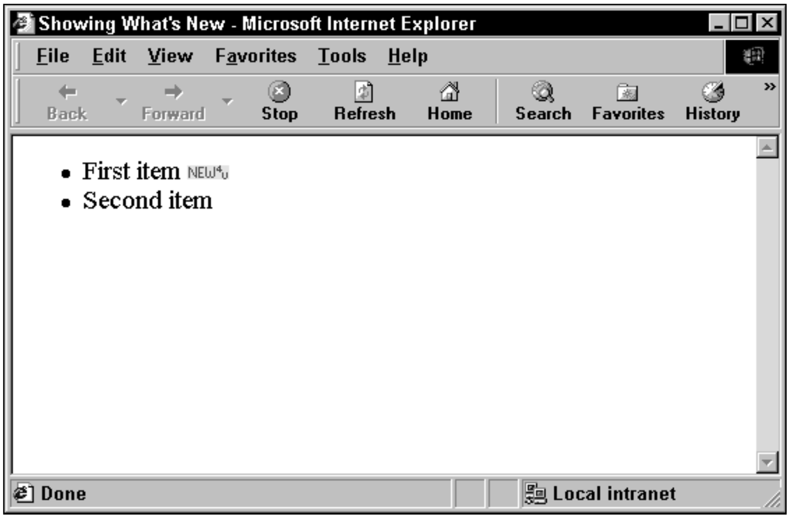


Figure 54-1: An item flagged as being new since my last visit to the page

When you first open the document (do so from a copy on your hard disk so that you can modify the author time stamp in a moment), all you see are the two items on the page without any flags. Although both entries have author time stamps that pre-date the time you're viewing the page, a soft cookie does not yet exist against which to compare those times. But the act of making the first visit to the page has created a hard cookie of the date and time that you first opened the page.

Quit the browser to get that hard cookie officially written to the cookie file. Then open the `whatsnew.htm` file in your script editor. Scroll to the bottom of the document, where you see the `<BODY>` tag and the interlaced scripts that time stamp anything that you want on the page. This application is designed to display a special `.gif` image that says "NEW 4U" whenever an item has been updated since your last visit.

Each interlaced script looks like this:

```
<SCRIPT LANGUAGE="JavaScript1.1">
document.write(newAsOf("12 Oct 2001 13:36:00 PDT"))
</SCRIPT>
```

By virtue of all scripts in this page being at the JavaScript 1.1 level, only those browsers so equipped will bother with the scripting (which also means that others lose out on this great visitor service). The `document.write()` method writes to the page whatever HTML comes back from the `newAsOf()` function. The parameter to the `newAsOf()` function is what holds the author time stamp and zone offset information. The time stamp value must be in the string format, as shown in the preceding example, with the date and time following the exact order ("`dd mmm yyyy hh:mm:ss`"). Month abbreviations are in English (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec).

As you see in the code that follows, the `newAsOf()` function returns an `<IMG>` tag with the "NEW 4U" image if the author time stamp (after appropriate conversion) is later than the soft cookie value. This image can be placed anywhere in a document. For example, at my Web site, I sometimes place the image before a contents listing rather than at the end. This means, too, that if part of your page is written by `document.write()` methods, you can just insert the `newAsOf()` function call as a parameter to your own `document.write()` calls.

If you want to see the author time stamping work, edit one of the time stamps in the `whatsnew.htm` file to reflect the current time. Save the document and relaunch the browser to view the page. The item whose author time stamp you modified should now show the bright "NEW 4U" image.

The Code

The sample page starts by initializing three global variables that are used in the statements that follow. One variable is a Boolean value indicating whether the visitor has been to the page before. Another variable, `lastVisit`, holds the value of the soft cookie whenever the visitor is at this page. One other variable, `dateAdjustment`, is (unfortunately) necessary to take into account a date bug that persists in Macintosh versions of Navigator (times of new date objects can be off by one hour). I use this variable to automatically handle any discrepancies.

```
<HTML>
<HEAD>
<TITLE>Showing What's New</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
<!-- begin hiding

// globals
var repeatCustomer = false
var lastVisit = 0 // to hold date & time of previous access in GMT
milliseconds
var dateAdjustment = 0 // to accommodate date bugs on some platforms
```

For reading and writing cookie data, I use virtually the same cookie functions from the outline table of contents (see Chapter 52). The only difference is that the cookie writing function includes an expiration date, because I want this cookie to hang around in the cookie file for a while — at least until the next visit, whenever that may be.

```
// shared cookie functions
var mycookie = document.cookie
// read cookie data
function getCookieData(name) {
    var label = name + "="
    var labelLen = label.length
    var cLen = mycookie.length
    var i = 0
```

```
    while (i < cLen) {
        var j = i + labelLen
        if (mycookie.substring(i,j) == label) {
            var cEnd = mycookie.indexOf(";",j)
            if (cEnd ==    -1) {
                cEnd = mycookie.length
            }
            return unescape(mycookie.substring(j,cEnd))
        }
        i++
    }
    return ""
}

// write cookie data
function setCookieData(name,dateData,expires) {
    mycookie = document.cookie = name + "=" +
        dateData + "; expires=" + expires
}
```

Notice that the `setCookieData()` function still maintains a level of reusability by requiring a name for the cookie to be passed as a parameter along with the data and expiration date. I could have hard-wired the name into this function, but that goes against my philosophy of designing for reusability.

Next comes a function that figures out if any problems with JavaScript date accuracy exist on any platform. Essentially, the function creates two date objects, one to serve as a baseline. Even the baseline date can be bad (as it is on Mac versions of NN3), so to test against it, you want to use the second object to create another date using the first date object's own values as a parameter. If any major discrepancies occur, they will show up loud and clear.

```
// set dateAdjustment to accommodate Mac bug in Navigator 3
function adjustDate() {
    var base = new Date()
    var testDate = base
    testDate = testDate.toLocaleString()
    testDate = new Date(testDate)
    dateAdjustment = testDate.getTime() - base.getTime()
}
```

In truth, this function always shows some adjustment error, because both the baseline date and test date cannot be created simultaneously. Even in an accurate system, the two will vary by some small number of milliseconds. For the purposes here, this amount of variance is insignificant.

Setting the stage

Functions in the next part of the script get your cookies all in a row. The first function (`saveCurrentVisit()`) deals with the visitor's local time, converting it to a form that will be useful on the next visit. Although one of the local variables is called `nowGMT`, all the variable does is take the new date object and convert it to the GMT milliseconds value (minus any `dateAdjustment` value) by invoking the `getTime()` method of the date object. I use this name in the variable to help me remember what the value represents:

```
// write date of current visit (in GMT time) to cookie
function saveCurrentVisit() {
    var visitDate = new Date()
    var nowGMT = visitDate.getTime() - dateAdjustment
    var expires = nowGMT + (180 * 24 * 60 * 60 *1000)
    expires = new Date(expires)
    expires = expires.toGMTString()
    setCookieData("lastVisit", nowGMT, expires)
}
```

From the current time, I create an expiration date for the cookie. The example shows a date roughly six months (180 days, to be exact) from the current time. I leave the precise expiration date up to your conscience and how long you want the value to linger in a user's cookie file.

The final act of the `saveCurrentVisit()` function is to pass the relevant values to the function that actually writes the cookie data. I assign the name `lastVisit` to the cookie. If you want to manage this information for several different pages, then assign a different cookie name for each page. This setup can be important in case a user gets to only part of your site during a visit. On the next visit, the code can point to page-specific newness of items.

The bulk of what happens in this application takes place in an initialization function. All the cookie swapping occurs there, as well as the setting of the `repeatCustomer` global variable value:

```
// set up global variables and establish whether user is a newbie
function initialize() {
    var lastStoredVisit = getCookieData("lastVisit")
    var nextPrevStoredVisit = getCookieData("nextPrevVisit")

    adjustDate()

    if (!lastStoredVisit) {
        // never been here before
        saveCurrentVisit()
        repeatCustomer = false
    } else {
        // been here before...
        if (!nextPrevStoredVisit) {
            // but first time this session
            // so set cookie only for current session
            setCookieData("nextPrevVisit",lastStoredVisit,"")
            lastVisit = parseFloat(lastStoredVisit)
            saveCurrentVisit()
            repeatCustomer = true
        } else {
            // back again during this session (perhaps reload or Back)
            lastVisit = parseFloat(nextPrevStoredVisit)
            repeatCustomer = true
        }
    }
}
initialize()
```

The first two statements retrieve both hard (lastVisit) and soft (nextPrevVisit) cookie values. After calling the function that sets any necessary date adjustment, the script starts examining the values of the cookies to find out where the visitor stands upon coming to the page.

The first test is whether the person has ever been to the page before. You do this by checking whether a hard cookie value (which would have been set in a previous visit) exists. If no such cookie value exists, then the current visit time is written to the hard cookie and repeatCustomer is set to false. These actions prepare the visitor's cookie value for the *next* visit.

Should a user already be a repeat customer, you have to evaluate whether this visit is the user's first visit since launching the browser. You do that by checking for a value in the soft cookie. If that value doesn't exist, then it means the user is here for the first time "today." You then grab the hard cookie and drop it into the soft cookie before writing today's visit to the hard cookie.

For repeat customers who have been here earlier in this session, you update the lastVisit global variable from the cookie value. The variable value will have been destroyed when the user left the page just a little while ago, whereas the soft cookie remains intact, enabling you to update the variable value now.

Outside of the function definition, the script automatically executes the initialize() function by that single statement. This function runs every time the page loads.

The date comparison

Every interlaced script in the body of the document calls the newAsOf() function to find out if the author's time stamp is after the last visit of the user to the page. This function is where the time zone differences between visitor and author must be neutralized so that a valid comparison can be made:

```
function newAsOf(authorDate) {
    authorDate = new Date(authorDate)
    var itemUpdated = authorDate.getTime()
    return ((itemUpdated > lastVisit) && repeatCustomer) ?
        "<IMG SRC='updated.gif' HEIGHT=10 WIDTH=30>" : ""
}
// end hiding -->
</SCRIPT>
</HEAD>
```

As you saw earlier, calls to this function require one parameter: a specially formatted date string that includes time zone information. The first task in the function is to re-cast the author's date string to a date object. You reuse the variable name (authorDate) because its meaning is quite clear. The date object created here is stored internally in the browser in GMT time, relative to the time zone data supplied in the parameter. To assist in the comparison against the lastVisit time (stored in milliseconds), the getTime() method converts authorDate to GMT milliseconds.

The last statement of the function is a conditional expression that returns the <IMG> tag definition for the "NEW 4U" image only if the author's time stamp is later than the soft cookie value and the visitor has been here before. Otherwise, the function returns an empty string. Any `document.write()` method that calls this function and executes via this branch writes an empty string—nothing—to the page.

A live <BODY>

For the sample document, I have you create a simple bulleted list of two entries, imaginatively called "First item" and "Second item." Interlaced into the HTML are scripts that are ready to insert the "NEW 4U" image if the author time stamp is new enough:

```
<BODY>
<UL>
<LI>First item
<SCRIPT LANGUAGE="JavaScript1.1">
<!--
document.write(newAsOf("20 Oct 2000 09:36:00 PDT"))
//-->
</SCRIPT>
<LI>Second item
<SCRIPT LANGUAGE="JavaScript1.1">
<!--
document.write(newAsOf("18 Oct 2000 17:40:00 PDT"))
//-->
</SCRIPT>
</UL>
</BODY>
</HTML>
```

All these script tags make the HTML a bit hard to read, but I believe the functionality is worth the effort. Moreover, by specifying the JavaScript 1.1 language attribute, the scripts are completely ignored by older JavaScript-enabled browsers. Only the now very rare, exceedingly brain-dead browsers, which get tripped up on the SGML comment lines, would know that something out of the ordinary is taking place.

Further Thoughts

You can, perhaps, go overboard with the way that you use this technique at a Web site. Like most features in JavaScript, I recommend using it in moderation and confining the flags to high-traffic areas that repeat visitors frequent. One hazard is that you can run out of the 20 cookies if you have too many page-specific listings.

You can share the same cookie among documents in related frames. Locate all the functions from the script in this chapter's Head section into a Head section of a framesetting document. Then, modify the call to the `newAsOf()` function by pointing it to the parent:

```
document.write(parent.newAsOf("18 Oct 2000 17:40:00 PDT"))
```

That way, one cookie can take care of all documents that you display in that frameset.

✦ ✦ ✦

55

CHAPTER

Application: Decision Helper

✦ ✦ ✦ ✦

In This Chapter

Multiple frames

Multiple-document applications

Multiple windows

Persistent storage (cookies)

Scripted image maps

Scripted charts

✦ ✦ ✦ ✦

The list of key concepts for this chapter's application looks like the grand finale to a fireworks show. As JavaScript implementations go, the application is, in some respects, over the top, yet not out of the question for presenting a practical interactive application on a Web site without any server programming.

The Application

I wanted to implement a classic application (listed at the right) often called a *decision support system*. My experience with the math involved here goes back to the first days of Microsoft Excel. Rather than design a program that had limited appeal (covering only one possible decision tree), I set out to make a completely user-customizable decision helper. All the user has to do is enter values into fields on a series of screens; the program performs the calculations to let the user know how the various choices rank against each other.

Although I won't be delving too deeply into the math inside this application, you will find it helpful to understand how a user approaches this program and what the results look like. The basic scenario is a user who is trying to evaluate how well a selection of choices measure up to his or her expectations of performance. User input includes:

- The name of the decision
- The names of up to five alternatives (people, products, ideas, and so on)
- The factors or features of concern to the user
- The importance of each of the factors to the user
- A user ranking of the performance of every alternative in each factor

What makes this kind of application useful is that it forces the user to rate and weigh a number of often-conflicting factors. By assigning hard numbers to these elements, the user leaves the difficult process of figuring out the weights of various factors to the computer.

Results come in the form of floating-point numbers between 0 and 100. As an extra touch, I've added a graphical charting component to the results display.

The Design

With so much user input necessary for this application, conveying the illusion of simplicity was important. Rather than lump all text objects on a single scrolling page, I decided to break them into five pages, each consisting of its own HTML document. As an added benefit, I could embed information from early screens into the HTML of later screens, rather than having to create all changeable items out of text objects so that the application would work with older browsers. This "good idea" presented one opportunity and one rather large challenge.

The opportunity was to turn the interface for this application into something resembling a multimedia application using multiple frames. The largest frame would contain the forms the user fills out as well as the results page. Another frame would contain a navigation panel with arrows for moving forward and backward through the sequence of screens, plus buttons for going back to a home page and getting information about the program. I also thought a good idea would be to add a frame that provides instructions or suggestions for the users at each step. And so, the three-frame window was born, as shown in the first entry screen in Figure 55-1.

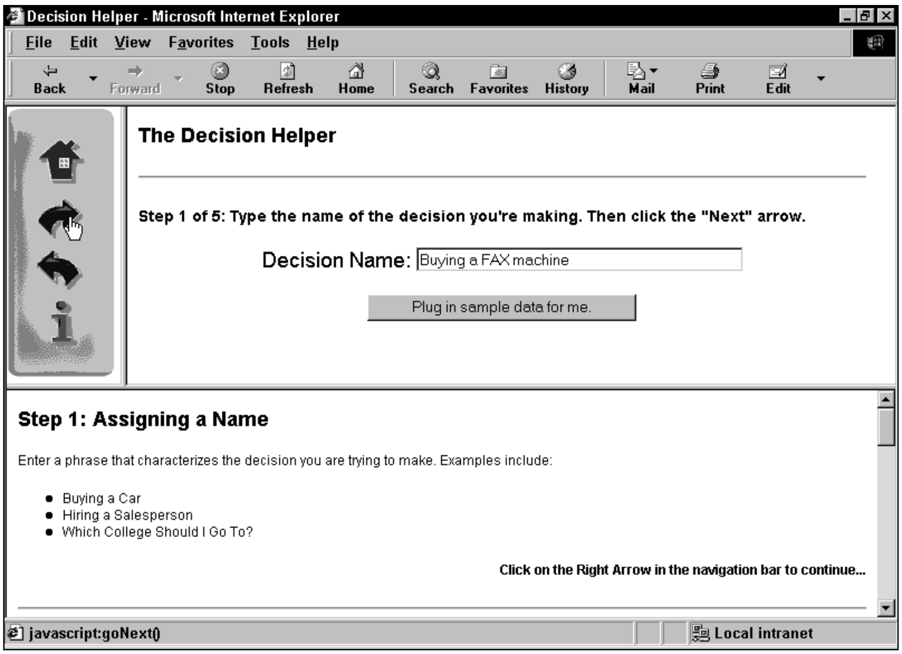


Figure 55-1: The Decision Helper window consists of three frames.

Using a navigation bar also enables me to demonstrate how to script a client-side image map — not an obvious task with JavaScript.

On the challenge side of this design, finding a way to maintain data globally as the user navigates from screen to screen was necessary. Every time one of the entry pages unloads, none of its text fields is available to a script. My first attack at this problem was to store the data as global variable data (mostly arrays) in the parent document that creates the frames. Because JavaScript enables you to reference any parent document's object, function, or variable (by preceding the reference with `parent`), I thought this task would be a snap. A nasty bug in Navigator 2 (the prominent browser when this application was first developed) got in the way at the time: If a document in any child window unloaded, the variables in the parent window got jumbled. The other hazard here is that a reload of the frameset could erase the current state of those variables.

My next hope was to use the `document.cookie` as the storage bin for the data. A major problem I faced was that this program needs to store a total of 41 individual data points, yet no more than 20 uniquely named cookies can be allotted to a given domain. But the cookie proved to be the primary solution for this application (although see the "Further Thoughts" section at the end of the chapter about a non-cookie version on your CD-ROM). For some of the data points (which are related in an array-like manner), I fashioned my own data structures so that one named cookie could contain up to five related data points. That reduced my cookie demands to 17.

The Files

Before I get into the code, let me explain the file structure of this application. Table 55-1 gives a rundown of the files used in the Decision Helper.

Table 55-1 Files Comprising the Decision Helper Application

File	*Description*
`index.htm`	Framesetting parent document
`dhNav.htm`	Navigation bar document which contains some scripting
`dhNav.gif`	Image displayed in `dhNav.htm`
`dh1.htm`	First Decision Helper entry page
`dh2.htm`	Second Decision Helper entry page
`dh3.htm`	Third Decision Helper entry page
`dh4.htm`	Fourth Decision Helper entry page
`dh5.htm`	Results page
`chart.gif`	Tiny image file used to create bar charts in `dh5.htm`
`dhHelp.htm`	Sample data and instructions document for lower-right frame
`dhAbout.htm`	Document that loads into a second window

A great deal of interdependence exists among these files. As you see later, assigning the names to some of these files was strategic for the implementation of the image map.

The Code

With so many JavaScript-enhanced HTML documents in this application, you can expect a great deal of code. To best grasp what's going on here, first try to understand the structure and interplay of the documents, especially the way the entry pages rely on functions defined in the parent document. My goal in describing this structure is not to teach you how to implement this application, but rather how to apply the lessons I learned while building this application to the more complex ideas that may be aching to get out of your head and into JavaScript.

index.htm

Taking a top-down journey through the JavaScript and HTML of the Decision Helper, start at the document that loads the frames. Unlike a typical framesetting document, however, this one contains JavaScript code in its Head section — code that many other documents rely on.

```
<HTML>
<HEAD>
<TITLE>Decision Helper</TITLE>
```

An important consideration to remember is that in a multiple-frame environment, the title of the parent window's document is the name that appears in the window's title bar, no matter how many other documents are open inside its subframes.

The first items of the script control a global variable, `currTitle`, which is set by a number of the subsidiary files as the user navigates through the application. This variable ultimately helps the navigation bar buttons do their jobs correctly. Because this application relies on the `document.cookie` so heavily, the cookie management functions (slightly modified versions of Bill Dortch's Cookie Functions — Chapter 18) are located in the parent document so they load only once. I simplified the cookie writing function because this application uses default settings for pathname and expiration. With no expiration date, the cookies don't survive the current browser session, which is perfect for this application.

```
<SCRIPT LANGUAGE="JavaScript">
<!-- start
// global variable settings of current dh document number
var currTitle = ""
function setTitleVar(titleVal) {
    currTitle = "" + titleVal
}
function getCookieVal (offset) {
    var endstr = mycookie.indexOf (";", offset)
    if (("" + endstr) == "" || endstr == -1)
        endstr = mycookie.length
    return unescape(mycookie.substring(offset, endstr))
}
```

```
function getCookie (name) {
    var arg = name + "=";
    var alen = arg.length;
    var clen = mycookie.length;
    var i = 0;
    while (i < clen) {
        var j = i + alen;
        if (mycookie.substring(i, j) == arg) {
            return getCookieVal (j);
        }
        i = mycookie.indexOf(" ", i) + 1;
        if (i == 0) break;
    }
    return null;
}

var mycookie = document.cookie
function setCookie (name, value) {
    mycookie = document.cookie = name + "=" + escape (value) + ";"
}
```

When this application loads (or a user elects to start a new decision), it's important to grab the cookies you need and initialize them to basic values that the entry screens will use to fill entry fields when the user first visits them. All statements inside the `initializeCookies()` function call the `setCookie()` function, defined in the preceding listing. The parameters are the name of each cookie and the initial value — mostly empty strings. Before going on, study the cookie labeling structure carefully. I refer to it often in discussions of other documents in this application.

```
function initializeCookies() {
    setCookie("decName","")
    setCookie("alt0","")
    setCookie("alt1","")
    setCookie("alt2","")
    setCookie("alt3","")
    setCookie("alt4","")
    setCookie("factor0","")
    setCookie("factor1","")
    setCookie("factor2","")
    setCookie("factor3","")
    setCookie("factor4","")
    setCookie("import","0")
    setCookie("perf0","")
    setCookie("perf1","")
    setCookie("perf2","")
    setCookie("perf3","")
    setCookie("perf4","")
}
```

The following functions should look familiar to you. They were borrowed either wholesale or with minor modification from the data-entry validation section of the

Social Security number database lookup in Chapter 50. I'm glad I wrote these as generic functions, making them easy to incorporate into this script. Because many of the entry fields on two screens must be integers between 1 and 100, I brought the data validation functions to the parent document rather than duplicating them in each of the subdocuments.

```
// JavaScript sees numbers with leading zeros as octal values, so
// strip zeros
function stripZeros(inputStr) {
    return (parseFloat(inputStr, 10)).toString()
}

// general purpose function to see if a suspected numeric input
// is a positive integer
function isNumber(inputStr) {
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = charAt(i)
        if (oneChar < "0" || oneChar > "9") {
            return false
        }
    }
    return true
}

// function to determine if value is in acceptable range for this
// application
function inRange(inputStr) {
    num = parseInt(inputStr)
    if (num < 1 || num > 100) {
        return false
    }
    return true
}
```

To control the individual data-entry validation functions in the master controller, I again was able to borrow heavily from the application in Chapter 50.

```
// Master value validator routine
function isValid(inputStr) {
    if (inputStr != "" ) {
        inputStr = stripZeros(inputStr)
        if (!isNumber(inputStr)) {
            alert("Please make sure entries are numbers only.")
            return false
        } else {
            if (!inRange(inputStr)) {
                alert("Entries must be numbers between 1 and 100.  Try another 
value.")
                return false
            }
        }
    }
    return true
}
```

Each of the documents containing entry forms retrieves and stores information in the cookie. Because all cookie functions are located in the parent document, it simplifies coding in the subordinate documents to have functions in the parent document acting as interfaces to the primary cookie functions. For each category of data stored as cookies, the parent document has a pair of functions for getting and setting data. The calling statements pass only the data to be stored when saving information; the interface functions handle the rest, such as storing or retrieving the cookie with the correct name.

In the following pair of functions, the decision name (from the first entry document) is passed back and forth between the cookie and the calling statements. Not only must the script store the data, but if the user returns to that screen later for any reason, the entry field must retrieve the previously entered data.

```
function setDecisionName(str) {
    setCookie("decName",str)
}
function getDecisionName() {
    return getCookie("decName")
}
```

The balance of the storage and retrieval pairs does the same thing for their specific cookies. Some cookies are named according to index values (`factor1`, `factor2`, and so on), so their cookie-accessing functions require parameters for determining which of the cookies to access, based on the request from the calling statement. Many of the cookie retrieval functions are called to fill in data in tables of later screens during the user's trip down the decision path.

```
// values for alternatives
function setAlternative(i,str) {
    setCookie("alt" + i,str)
}
function getAlternative(i) {
    return getCookie("alt" + i)
}

// values for decision factors
function setFactor(i,str) {
    setCookie("factor" + i,str)
}
function getFactor(i) {
    return getCookie("factor" + i)
}

// values for importance (decision factor weights)
function setImportance(str) {
    setCookie("import",str)
}
function getImportance(i) {
    return getCookie("import")
}
```

```
// values for performance ratings
function setPerformance(i,str) {
    setCookie("perf" + i,str)
}
function getPerformance(i) {
    return getCookie("perf" + i)
}
```

One sequence of code that runs when the parent document loads is the one that looks to see if a cookie structure is set up. If no such structure is set up (the retrieval of a designated cookie returns a `null` value), the script initializes all cookies via the function described earlier.

```
if (getDecisionName() == null) {
    initializeCookies()
}
// end -->
</SCRIPT>
</HEAD>
```

The balance of the parent document source code defines the frameset for the browser window. It establishes some hard-wired pixel sizes for the navigation panel. This ensures that the entire `.gif` file is visible whenever the frameset loads, without a ton of unwanted white space if the browser window is large.

```
<FRAMESET ROWS="250,*">
    <FRAMESET COLS="104,*">
        <FRAME NAME="navBar" SRC="dhNav.htm" SCROLLING=no
        MARGINHEIGHT=2 MARGINWIDTH=1>
        <FRAME NAME="entryForms" SRC="dh1.htm">
    </FRAMESET>
    <FRAMESET ROWS="100%">
        <FRAME NAME="instructions" SRC="dhHelp.htm">
    </FRAMESET>
</FRAMESET>
</HTML>
```

I learned an important lesson about scripting framesets along the way. Older browsers, especially NN through Version 4, do not respond to changes in frameset-ting size attributes through a simple reload of the page. I found it necessary to reopen the frameset file from time to time. I also found it necessary to sometimes quit early Navigators altogether and relaunch it to make some changes visible. Therefore, if you seem to be making changes, but reloading the frameset doesn't make the changes appear, try reopening or — as a last resort — quitting the browser.

dhNav.htm

Because of its crucial role in controlling the activity around this program, look into the navigation bar's document next. To accomplish the look and feel of a multi-media program, this document was designed as a client-side image map that has four regions scripted corresponding to the locations of the four buttons (see Figure 55-1). One function is connected to each button.

The first function is linked to the graphical Home button. For the listing here, I just present an alert dialog box replicating the action of navigating back to a real Web site's home page.

```
<HTML>
<HEAD>
<TITLE>Navigation Bar</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
function goHome() {
    alert("Navigate back to home page on a real site.")
}
```

Each of the arrow navigation buttons brings the user to the next or previous entry screen in the sequence. To facilitate this without building tables of document titles and names, you call upon the `currTitle` global variable in the parent document. This value contains an integer in the range between 1 and 5, corresponding to the main content documents, `dh1.htm`, `dh2.htm`, and so on. As long as the offset number is no higher than the next-to-last document in the sequence, the `goNext()` function increments the index value by one and concatenates a new location for the frame. At the same time, the script advances the help document (in the bottom frame) to the anchor corresponding to the chosen entry screen by setting the `location.hash` property of that frame. Similar action navigates to the previous screen of the sequence through the `goPrev()` function. This time, the index value is decremented by one, and an alert warns the user if the current page is already the first in the sequence.

```
function goNext() {
    var currOffset = parseInt(parent.currTitle)
    if (currOffset <= 4) {
        ++currOffset
        parent.entryForms.location.href = "dh" + currOffset + ".htm"
        parent.instructions.location.hash = "help" + currOffset
    } else {
        alert("This is the last form.")
    }
}
function goPrev() {
    var currOffset = parseInt(parent.currTitle)
    if (currOffset > 1) {
        --currOffset
        parent.entryForms.location.href = "dh" + currOffset + ".htm"
        parent.instructions.location.hash = "help" + currOffset
    } else {
        alert("This is the first form.")
    }
}
```

Clicking the Info button displays a smaller window containing typical About-box data for the program (see Figure 55-2).

```
function goInfo() {
    var newWindow =
```

```
        window.open("dhAbout.htm","","HEIGHT=250,WIDTH=300")
}
// end -->
</SCRIPT>
</HEAD>
```

The Body of the navigation document contains the part that enables you to script a client-side image map. Mouse `click` events weren't available to AREA elements until Version 4 browsers, so to let these image maps work with older versions, mouse action is converted to script action by assigning a `javascript:` pseudo-URL to the `HREF` attribute for each AREA element. Instead of pointing to an entirely new URL (as AREA elements usually work), the attributes point to the JavaScript functions defined in the Head portion of this document. After a user clicks the rectangle specified by an `<AREA>` tag, the browser invokes the function instead.

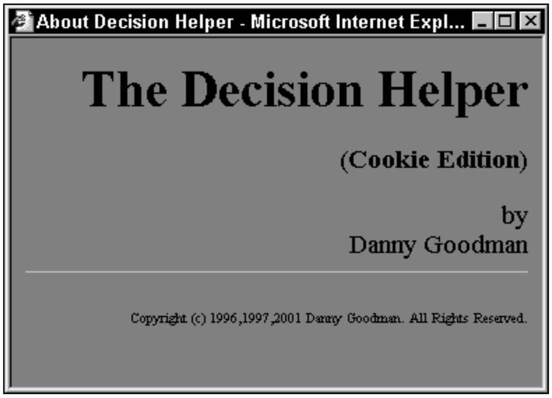


Figure 55-2: The About Decision Helper screen appears in a separate window.

```
<BODY>
<MAP NAME="navigation">
<AREA SHAPE="RECT" COORDS="23,22,70,67" HREF="javascript:goHome()">
<AREA SHAPE="RECT" COORDS="25,80,66,116" HREF="javascript:goNext()">
<AREA SHAPE="RECT" COORDS="24,125,67,161" HREF="javascript:goPrev()">
<AREA SHAPE="RECT" COORDS="35,171,61,211" HREF="javascript:goInfo()">
</MAP>
<IMG SRC="dhNav.gif" BORDER HEIGHT=240 WIDTH=96 ALIGN="left"
USEMAP="#navigation">
</BODY>
</HTML>
```

Although not shown here, you can assign `onMouseOver` event handlers to each AREA element for NN3+ and IE4+ to display a friendly message about the action of each button.

dh1.htm

Of the five documents that display in the main frame, `dh1.htm` is the simplest (refer to Figure 55-1). It contains a single entry field in which the user is invited to enter the name for the decision.

Only one function adorns the Head. This function summons one of the cookie interface functions in the parent window. A test is located here in case there is a problem with initializing the cookies. Rather than show `null` in the field, the conditional expression substitutes an empty string.

```
<HTML>
<HEAD>
<TITLE>DH1</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
function loadDecisionName() {
    var result = parent.getDecisionName()
    result = (result == null) ? "" : result
    document.forms[0].decName.value = result
}
// end -->
</SCRIPT>
</HEAD>
```

After the document loads, it performs three tasks (in the `onLoad` event handler). The first task is to set the global variable in the parent to let it know which number of the five main documents is currently loaded. Next, the script must fill the field with the decision name stored in the cookie. This task is important because users will want to come back to this screen to review what they entered previously. A third statement in the `onLoad` event handler sets the focus of the entire browser window to the one text object. This task is especially important in a multi-frame environment, such as this design. After a user clicks on the navigation panel, that frame has the focus. To begin typing into the field, the user has to tab (repeatedly) or click the text box to give the text box focus for typing. By setting the focus in the script when the document loads, you save the user time and aggravation.

```
<BODY onLoad="parent.setTitleVar(1);loadDecisionName();
document.forms[0].decName.focus()">
<H2>The Decision Helper</H2>
<HR>
<H4>Step 1 of 5: Type the name of the decision you're making. Then click the
"Next" arrow.</H4>
```

In the text field itself, an `onChange` event handler saves the value of the field in the parent's cookie for the decision name. No special Save button or other instruction is necessary here because any navigation that the user does via the navigation bar automatically causes the text field to lose focus and triggers the `onChange` event handler.

```
<CENTER>
<FORM>
Decision Name:
<INPUT TYPE="text" NAME="decName" SIZE="40"
onChange="parent.setDecisionName(this.value)">
</FORM>
</CENTER>
</BODY>
</HTML>
```

The copy of this file on the CD-ROM also has code that allows for plugging in sample data (as seen on my Web site) and a (commented out) textarea object that you can use for debugging cookie data.

dh2.htm

For the second data-entry screen (shown in Figure 55-3), five fields invite the user to enter descriptions of the alternatives under consideration. As with the decision name screen, the scripting for this page must both retrieve and save data displayed or entered in the fields.

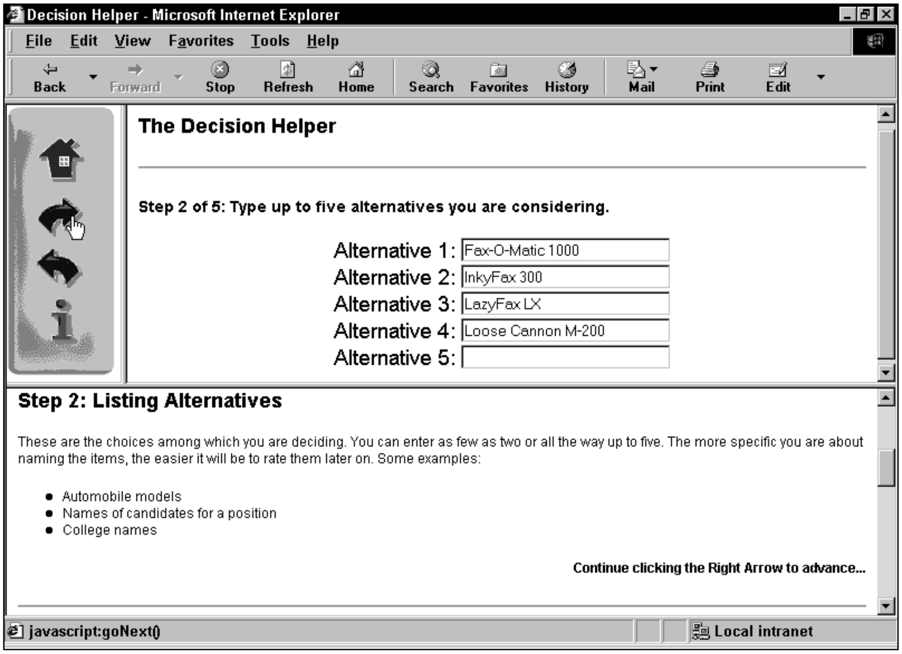


Figure 55-3: The second data-entry screen

In one function, the script retrieves the alternative cookies (five total) and stuffs them into their respective text fields (as long as their values are not `null`). This function script uses a `for` loop to cycle through all five items — a common process throughout this application. Whenever a cookie is one of a set of five, the parent function has been written (in the following example) to store or extract a single cookie, based on the index value. Text objects holding like data (defined in the following listing) are all assigned the same name, so that JavaScript lets you treat them as array objects — greatly simplifying the placement of values into those fields inside a `for` loop.

```
<HTML>
<HEAD>
<TITLE>DH2</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
<!-- start
function loadAlternatives() {
    for (var i = 0; i < 5; i++) {
    var result = parent.getAlternative(i)
        result = (result == null) ? "" : result
        document.forms[0].alternative[i].value = result
    }
}
// end -->
</SCRIPT>
</HEAD>
```

After the document loads, the document number is sent to the parent's global variable, its fields are filled by the function defined in the Head, and the first field is handed the focus to assist the user in entering data the first time.

```
<BODY onLoad="parent.setTitleVar(2);loadAlternatives();
document.forms[0].alternative[0].focus()">
<H2>The Decision Helper</H2>
<HR>
<H4>Step 2 of 5: Type up to five alternatives you are considering.</H4>
```

Any change that a user makes to a field is stored in the corresponding cookie. Each `onChange` event handler passes its indexed value (relative to all like-named fields) plus the value entered by the user as parameters to the parent's cookie-saving function.

```
<CENTER>
<FORM>
Alternative 1:
<INPUT TYPE="text" NAME="alternative" SIZE="25"
onChange="parent.setAlternative(0,this.value)"><BR>
Alternative 2:
<INPUT TYPE="text" NAME="alternative" SIZE="25"
onChange="parent.setAlternative(1,this.value)"><BR>
Alternative 3:
<INPUT TYPE="text" NAME="alternative" SIZE="25"
onChange="parent.setAlternative(2,this.value)"><BR>
Alternative 4:
<INPUT TYPE="text" NAME="alternative" SIZE="25"
onChange="parent.setAlternative(3,this.value)"><BR>
Alternative 5:
<INPUT TYPE="text" NAME="alternative" SIZE="25"
onChange="parent.setAlternative(4,this.value)"><BR>
</BODY>
</HTML>
```

dh3.htm

With the third screen, the complexity increases a bit. Two factors contribute to this increase in difficulty. One is that the limitation on the number of cookies available for a single domain forces you to join into one cookie the data that might normally be distributed among five cookies. Second, with the number of text objects on the page (see Figure 55-4), it becomes more efficient (from the standpoint of tedious HTML writing) to let JavaScript deploy the fields. The fact that two sets of five related fields exist facilitates using `for` loops to lay out and populate them.

One initial function here is reminiscent of Head functions in previous entry screens. This function retrieves a single factor cookie from the set of five cookies.

```
<HTML>
<HEAD>
<TITLE>DH3</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
function getdh3Factor (i) {
    var result = parent.getFactor(i)
    if (result == null) {
        return ""
    }
    return result
}
```

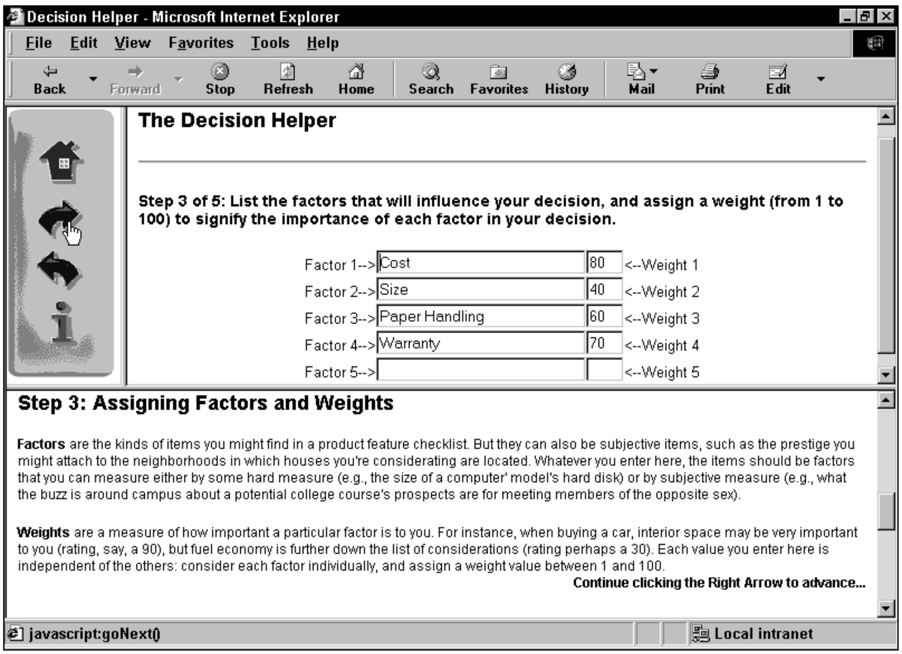


Figure 55-4: Screen for entering decision factors and their weights

Values for the five possible weight entries are stored together in a single cookie. To make this work, I had to determine a data structure for the five "fields" of a single cookie "record." Because all entries are integers, I can choose any nonnumeric character. I arbitrarily selected the period.

```
function setdh3Importance () {
    var oneRecord = ""
    for (var i = 0; i < 5; i++) {
        var dataPoint = document.forms[0].importance[i].value
        if (!parent.isValid(dataPoint)) {
            document.forms[0].importance[i].focus()
            document.forms[0].importance[i].select()
            return
        }
        oneRecord += dataPoint + "."
    }
    parent.setImportance(oneRecord)
    return
}
```

The purpose of the `setdh3Importance()` function is to assemble all five values from the five Weight entry fields (named "importance") into a period-delimited record that is ultimately sent to the cookie for safekeeping. Another of the many `for` loops in this application cycles through each of the fields, checking for validity and then appending the value with its trailing period to the variable (`oneRecord`) that holds the accumulated data. As soon as the loop finishes, the entire record is sent to the parent function for storage.

Although the function shows two `return` statements, the calling statement does not truly expect any values to be returned. Instead, I use the `return` statement inside the `for` loop as a way to break out of the `for` loop without any further execution whenever an invalid entry is found. Just prior to that, the script sets the focus and select to the field containing the invalid entry. JavaScript, however, is sensitive to the fact that a function with a `return` statement in one possible outcome doesn't have a `return` statement for other outcomes (an error message to this effect appears in some browsers if you try the function without balanced returns). By putting a `return` statement at the end of the function, all other possibilities are covered to the browser's satisfaction.

The inverse of storing the weight entries is retrieving them. Because the `parent.getImportance()` function returns the entire period-delimited record, this function must break apart the pieces and distribute them into their corresponding Weight fields. A combination of string methods determines the offset of the period and how far the data extraction should go into the complete record. Before the `for` loop repeats each time, it is shortened by one "field's" data. In other words, as the `for` loop executes, the copy of the cookie data returned to this function is pared down one entry at a time as each entry is stuffed into its text object for display.

```
function getdh3Importance () {
    var oneRecord = parent.getImportance()
    if (oneRecord != null) {
        for (var i = 0; i < 5; i++) {
            var recLen = oneRecord.length
            var offset = oneRecord.indexOf(".")
            var dataPoint = (offset >= 0 ) ?
                oneRecord.substring(0,offset) : ""
            document.forms[0].importance[i].value = dataPoint
            oneRecord = oneRecord.substring(offset+1,recLen)
```

```
            }
        }
    }

// end -->
</SCRIPT>
</HEAD>
```

Upon loading the document, the only tasks that the `onLoad` event handler need to do are to update the parent global variable about the document number and to set the focus to the first entry field of the form.

```
<BODY onLoad=" parent.setTitleVar(3);document.forms[0].factor[0].focus()">
<H2>The Decision Helper</H2>
<HR>
<H4>Step 3 of 5: List the factors that will influence your decision,
and assign a weight (from 1 to 100) to signify the importance of each factor in
your decision.</H4>
```

Assembling the HTML for the form and its ten data-entry fields needs only a few lines of JavaScript code. Performed inside a `for` loop, the script assembles each line of the form, which consists of a label for the Factor (and its number), the factor input field, the importance input field, and the label for the Weight (and its number). A `document.write()` method writes each line to the document.

```
<SCRIPT LANGUAGE="JavaScript">
<!-- start
var output = "<CENTER><FORM>"
for (i = 0; i < 5; i++) {
    output += "Factor " + (i+1) +
        "--><INPUT TYPE='text' NAME='factor' SIZE='25' "
    var eHandler = " onChange=\'parent.setFactor(" + i + ",this.value)\'"
    output += eHandler + "VALUE=" + getdh3Factor (i) + ">"

    output += "<INPUT TYPE='text' NAME='importance' SIZE='3' "
    var eHandler = " onChange=\ setdh3Importance ()\'"
    output += eHandler + "VALUE=''>"
    output += "<--Weight " + (i+1) + "<BR>"
    document.write(output)
    output = ""
}
document.write("</FORM></CENTER>")
getdh3Importance ()
// end -->
</SCRIPT>
</BODY>
</HTML>
```

Each of the scripted text objects has an event handler. Notice that each event handler is first defined as a variable on a statement line just above its insertion into the string being assembled for the INPUT object definition. One reason for this fact is that the nested quote situation gets quite complex when you are doing these tasks all in one massive assignment statement. Rather than mess with matching several pairs of deeply nested quotes, I found it easier to break out one portion (the event handler definition) as a variable value and then insert that preformatted expression into the concatenated string for the INPUT definition.

Notice, too, how the different ways of storing the data in the cookies influence the ways the existing cookie data is filled into the fields as the page draws itself. For the factors, which have one cookie per factor, the `VALUE` attribute of the field is set with a specific indexed call to the parent factor cookie retriever, one at a time. But for the importance values, which are stored together in the period-delimited chunk, a separate function call (`getdh3Importance()`) executes after the fields are already drawn (with initial values of empty strings) and fills all the fields in a batch operation.

dh4.htm

Step 4 of the decision process (shown in Figure 55-5) is the most complex step because of the sheer number of entry fields: 25 in all. Notice that this screen retrieves data from two of the previous screens (or rather from the cookies preserving the entries) and embeds the values into the fixed parts of the table. All these tasks are possible when you create those tables with JavaScript.

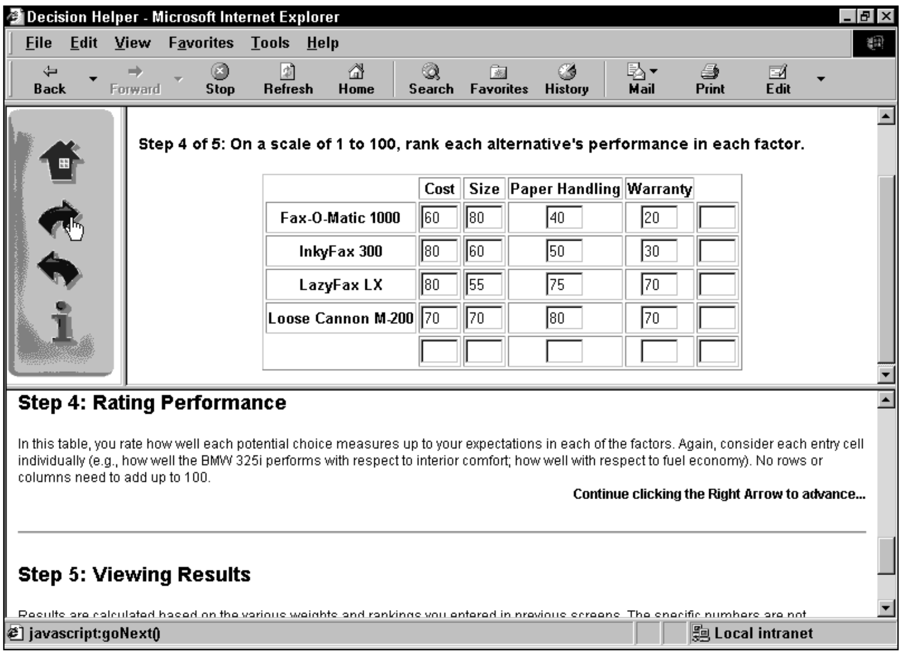


Figure 55-5: A massive table includes label data from earlier screen entries.

Functions for getting and setting performance data are complex because of the way I was forced to combine data into five "field" records. In other words, one parent cookie exists for each row of data cells in the table. To extract cell data for storage in the cookie, I use nested `for` loop constructions. The outer loop counts the rows of the table, whereas the inner loop (with the `j` counter variable) works its way across the columns for each row.

Because all cells are named identically, they are indexed with values from 0 to 24. Calculating the row (`i * 5`) plus the column number establishes the cell index value. After you check for validity, each cell's value is added to the row's accumulated data. Each row is then saved to its corresponding cookie. As in the code for `dh3.htm`, the `return` statement is used as a way to break out of the function if an entry is deemed invalid.

Retrieving the data and populating the cells for the entire table requires an examination of each of the five performance cookies, and for each labeled cookie's data, a parsing for each period-delimited entry. After a given data point is in hand (one entry for a cell), it must go into the cell with the proper index.

```
<HTML>
<HEAD>
<TITLE>DH4</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!-- start
function getdh4Performance () {
    var oneRecord = ""
    for (var i = 0; i < 5; i++) {
        oneRecord = parent.getPerformance(i)
        if (oneRecord == null) {
            continue
        }
        for (var j = 0; j < 5; j++) {
            var recLen = oneRecord.length
            var offset = oneRecord.indexOf(".")
            var dataPoint = oneRecord.substring(0,offset)
            var cellNum = j + (i * 5)
            document.forms[0].ranking[cellNum].value = dataPoint
            oneRecord = oneRecord.substring(offset+1,recLen)
        }
    }
}
// end -->
</SCRIPT>
</HEAD>
function setdh4Performance () {
    for (var i = 0; i < 5; i++) {
        var oneRecord = ""
        for (var j = 0; j < 5; j++) {
            var cellNum = j + (i * 5)
            var dataPoint = document.forms[0].ranking[cellNum].value
            if (!parent.isValid(dataPoint)) {
                document.forms[0].ranking[cellNum].focus()
                document.forms[0].ranking[cellNum].select()
                return
            }
            oneRecord += dataPoint + "."
        }
        parent.setPerformance(i,oneRecord)
    }
    return
}
```

After the document is loaded, the onLoad event handler sends the document number to the parent global variable and brings focus to the first field of the table.

```
<BODY
onLoad=" parent.setTitleVar(4);document.forms[0].ranking[0].focus()">
<H2>The Decision Helper</H2>
<HR>
<H4>Step 4: On a scale of 1 to 100, rank each alternative's
performance in each factor.</H4>
<P><P>
```

To lessen the repetitive HTML for all tables, JavaScript again assembles and writes the HTML that defines the tables. In the first batch, the script uses yet another for loop to retrieve the factor entries from the parent cookie so that the words can be embedded into <TH> tags of the first row of the table. If every factor field is not filled in, the table cell is set to empty.

```
<SCRIPT LANGUAGE="JavaScript">
<!-- start
var output = "<CENTER><FORM NAME='perfRankings'><TABLE BORDER>"
output += "<TR><TD></TD><TD>"
for (var i = 0; i < 5; i++) {
    var oneFactor = parent.getFactor(i)
    oneFactor = (oneFactor == null) ? "" : oneFactor
    output += "<TH>" + oneFactor + "</TH>"
}
output += "</TD>"
```

Next comes the assembly of subsequent rows of the table. The first column displays the name of each alternative (within <TH> tags). The remaining columns are text boxes, all with the same name and event handler. As each row of table definition is completed, it is written to the document. After the table and form closing tags are also written, the getdh4Performance() function retrieves all cookie data for the fields and distributes it accordingly.

```
for (var i = 0; i < 5; i++) {
    var oneAlt = parent.getAlternative(i)
    oneAlt = (oneAlt == null) ? "" : oneAlt
    output += "<TR><TD><TH>" + oneAlt + "</TH>"
    for (var j = 0; j < 5; j++) {
        output += "<TD ALIGN=CENTER><INPUT TYPE='text' SIZE=3 " +
        "NAME='ranking' VALUE='' onChange='setPerformance()'></TD>"
    }
    output += "</TR>"
    document.write(output)
    output = ""
}
document.write("</TABLE></FORM></CENTER>")
getdh4Performance ()
// end -->
</SCRIPT>
</BODY>
</HTML>
```

dh5.htm

From a math standpoint, dh5.htm's JavaScript gets pretty complicated. But because the complexity is attributed to the decision support calculations that turn the user's entries into results, I treat the calculation script shown here as a black box. You're free to examine the details, if you're so inclined.

Results appear in the form of a table (see Figure 55-6) with columns showing the numeric results and an optional graphical chart.

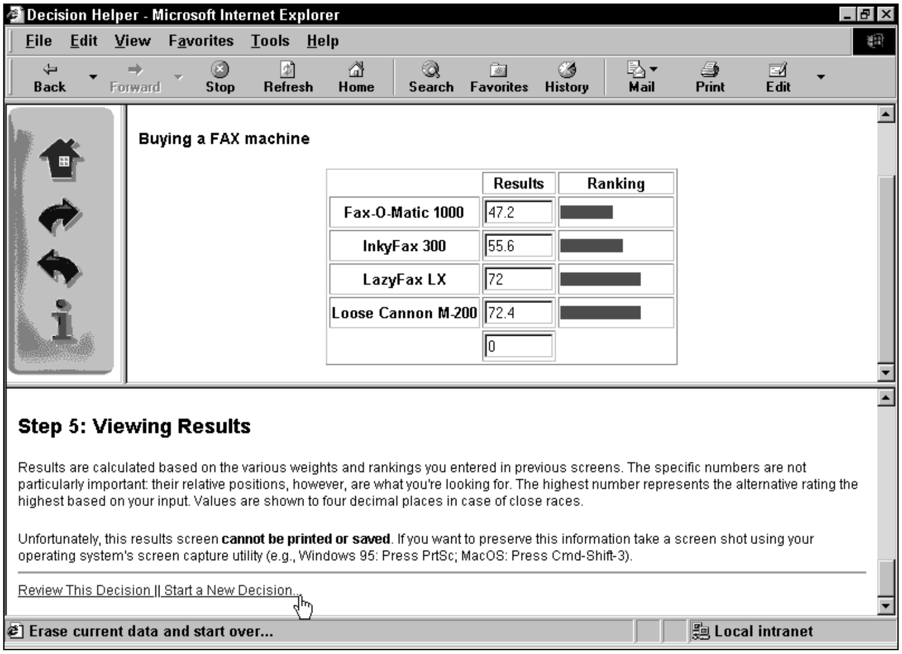


Figure 55-6: The results screen for a decision

For the purposes of this example, you only need to know a couple of things about the `calculate()` function. First, this function calls all the numeric data stored in parent cookies to fulfill values in its formulas. Second, results are tabulated and placed into a five-entry indexed array called `itemTotal[i]`. This array is defined as a global variable, so that its contents are available to scripts coming up in the Body portion of the document.

```
<HTML>
<HEAD>
<TITLE>DH5</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
<!-- start
var itemTotal = new Array()
function calculate() {
    var scratchpad = ""
    var importanceSum = 0
```

```
    var oneRecord = parent.getImportance()
    var weight = new Array()
    for (var i = 0; i < 5; i++) {
        var recLen = oneRecord.length
        var offset = oneRecord.indexOf(".")
        scratchpad = oneRecord.substring(0,offset)
        importanceSum += (scratchpad == "" || scratchpad == "NaN") ?
            0 : parseInt(scratchpad)
        oneRecord = oneRecord.substring(offset+1,recLen)
    }
    oneRecord = parent.getImportance()
    for (var i = 0; i < 5; i++) {
        recLen = oneRecord.length
        offset = oneRecord.indexOf(".")
        scratchpad = oneRecord.substring(0,offset)
        weight[i] = (scratchpad == "" && scratchpad == "NaN") ?
            0 : parseInt(scratchpad)/importanceSum * 100
        oneRecord = oneRecord.substring(offset+1,recLen)
    }
    for (var i = 0; i < 5; i++) {
        oneRecord = parent.getPerformance(i)
        if (oneRecord == null) {
            continue
        }
        scratchpad = 0
        for (var j = 0; j < 5; j++) {
            var recLen = oneRecord.length
            var offset = oneRecord.indexOf(".")
            var dataPoint = oneRecord.substring(0,offset)
            scratchpad += (dataPoint != "" || dataPoint == "NaN") ?
                parseInt(dataPoint) * weight[j] / 100 : 0
            oneRecord = oneRecord.substring(offset+1,recLen)
        }
        itemTotal[i] = scratchpad
    }
}
calculate()
// end -->
</SCRIPT>
</HEAD>
```

Constructing this function served up many reminders about keeping data types straight. Because the data stored in cookies was in the form of strings, when it comes time to do some real math with those values, careful placement of the `parseInt()` function is essential for getting the math operators to work.

An `onLoad` event handler sends the document number to the global variable, as usual. The results display in this document relies heavily on stored and calculated values, so the table is constructed entirely out of JavaScript. That also means it can redisplay the decision name as part of the page.

```
<BODY onLoad="parent.setTitleVar(5)">
<H2>The Decision Helper</H2>
<HR>
```

```
<SCRIPT LANGUAGE="JavaScript">
<!-- start
document.write("<H4>" + parent.getDecisionName() + "</H4><P><P>")
var output = "<CENTER><FORM NAME='Results'><TABLE BORDER>"
output += "<TR><TD></TD><TD><TH>Results</TH><TH>Ranking</TH>"
output += "</TD>"
```

I need to break up the discussion of the `for` loop that produces the results because there are two distinct parts of this HTML assembly. The first, shown in the following script segment, assembles the first two cells of each row of the table. The first cell contains an embedded listing of the alternative name (in `<TH>` tags). To highlight the calculated values — and enable the `SIZE` attribute to do the artificial job of truncating the floating-point number — the results are shown in text boxes. For each row, the corresponding result in `itemTotal[i]` is inserted as the `VALUE` attribute of the text box. The `SIZE` attribute is set to 7, which allows the typical double-digit results, a decimal point, and four digits to the right of the decimal (an extra pixel shows on the Macintosh version, however).

```
for (var i = 0; i < 5; i++) {
    var oneAlt = parent.getAlternative(i)
    oneAlt = (oneAlt == null) ? "" : oneAlt
    itemTotal[i] = (oneAlt == "") ? 0 : itemTotal[i]
    output += "<TR><TD><TH>" + oneAlt + "</TH>"
    output += "<TD ALIGN=CENTER><INPUT TYPE='text' SIZE=7 " +
        "NAME='ranking' VALUE=" + itemTotal[i] + "></TD>"
```

For extra pizzazz, a third column "draws" a bar chart within a 100-pixel-wide cell. The bars are actually scalings of a one-pixel-wide `.gif` file (an orange line, 12 pixels tall). A single-color `.gif` image scales to fill whatever width is assigned in the `WIDTH` attribute. This method is faster and far better than a more tedious method (tedious from the Web page author's point of view) of creating 100 different `.gif` files, one for each possible width of the bar. I also could have used a one-pixel square `.gif` file with equal ease.

```
    output += "<TD WIDTH=100>"
    chartWidth = Math.round(itemTotal[i])
    if (chartWidth > 0) {
       output += "<IMG SRC='chart.gif' HEIGHT=12 WIDTH=" +
           chartWidth + ">"
    }
    output += "</TD></TR>"
    document.write(output)
    output = ""
}
document.write("</TABLE></FORM></CENTER>")
// end -->
</SCRIPT>
</BODY>
</HTML>
```

dhHelp.htm

The only other code worth noting in this application is in the `dhHelp.htm` document, which appears in the lower-right frame of the window. At the end of this document are two links that call separate JavaScript functions in this document's Head section. The Head functions are as follows:

```
<HEAD>
<TITLE>Decision Helper Help</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function goFirst() {
    parent.entryForms.location = "dh1.htm"
    self.location.hash = "help1"
}
function restart() {
    if (confirm("Erase current decision and start a new one?")) {
        parent.initializeCookies()
        parent.entryForms.location = "dh1.htm"
        self.location.hash = "help1"
    }
}

// -->
</SCRIPT>
</HEAD>
```

One function merely returns the user to the beginning of the sequences for both the entry screens and the help screen. The second function is a rare instance in which a confirm dialog box makes sense: It is about to erase all entered data. If the user says it's okay to go ahead, the parent window's function for initializing all cookies is called, and the navigation for both the entry and help screens goes back to the beginning.

The links at the bottom of the document (see Figure 55-6) are coded to trigger JavaScript functions (rather than navigate to URLs) and include `onMouseOver` event handlers to provide more information about the link in the statusbar:

```
<A HREF="javascript:goFirst()" onMouseOver="window.status='Go back
to beginning to review data...';return true"">Review This Decision
</A>||<A HREF="javascript:restart()"
onMouseOver="window.status='Erase current data and start over...';return true">
Start a New Decision...  </A>
```

Further Thoughts

If you've managed to follow through with this application's discussions, you will agree that it's quite a JavaScript workout. But this application proves that, without a ton of code, JavaScript provides enough functionality to add a great deal of interactivity and pseudo-intelligence to an otherwise flat HTML document.

As an alternative to using cookies for data storage, I have also implemented a version of the application that uses text boxes defined in a frame defined with a row height of 0. This technique further challenges the synchronization of frames during reloading when a user resizes the browser window or navigates with the Back or Forward browser buttons. This alternate version is located on the CD-ROM for your own investigation and comparison.

Dynamic HTML also offers some possibilities for this application. The entire program can be presented in a no-frame window, with the navigation, interactive content, and instructions frames incorporated into individual positionable objects. The interactive content area can be treated almost like a slide show, with successive pages flying in from one edge.

Not only is this application instructive for many JavaScript techniques, but it is also fun to play with as a user. Some financial Web sites have adapted it to assist visitors with investment decisions. You can use it to dream about where to go on a dream vacation, or help you decide the most ethical of a few paths confronting you in a personal dilemma. There's something about putting in data, turning a crank, and watching results (with a bar chart to boot!) magically appear on the screen.

✦ ✦ ✦

CHAPTER 56

Application: Cross-Browser DHTML Map Puzzle

In This Chapter

Applying a DHTML API

Scripting, dragging, and layering of multiple elements

Event handling for three DOMs at once

Dynamic HTML allows scripts to position, overlap, and hide or show elements under the control of style sheets and scripting. To demonstrate modern cross-browser DHTML development techniques, this chapter describes the details of a jigsaw puzzle game using pieces of a map of the "lower 48" United States (I think everyone would guess where Alaska and Hawaii go on a larger map of North America). I chose this application because it allows me to demonstrate several typical tasks you might want to script in DHTML: hiding and showing elements; handling events for multiple elements; tracking the position of an element with the mouse cursor; absolute positioning of elements; changing the z-order of elements; changing element colors; and animating movement of elements.

As with virtually any programming task, the example code here is not laid out as the quintessential way to accomplish a particular task. Each author brings his or her own scripting style, experience, and implementation ideas to a design. Very often, you have available several ways to accomplish the same end. If you find other strategies or tactics for the operations performed in these examples, it means you are gaining a good grasp of both JavaScript and Dynamic HTML.

The Puzzle Design

Figure 56-1 shows the finished map puzzle with the game in progress. To keep the code to a reasonable length, the example provides positionable state maps for only seven western states. Also, the overall design is intentionally Spartan so as to place more emphasis on the positionable elements and their scripting, rather than on fancy design.

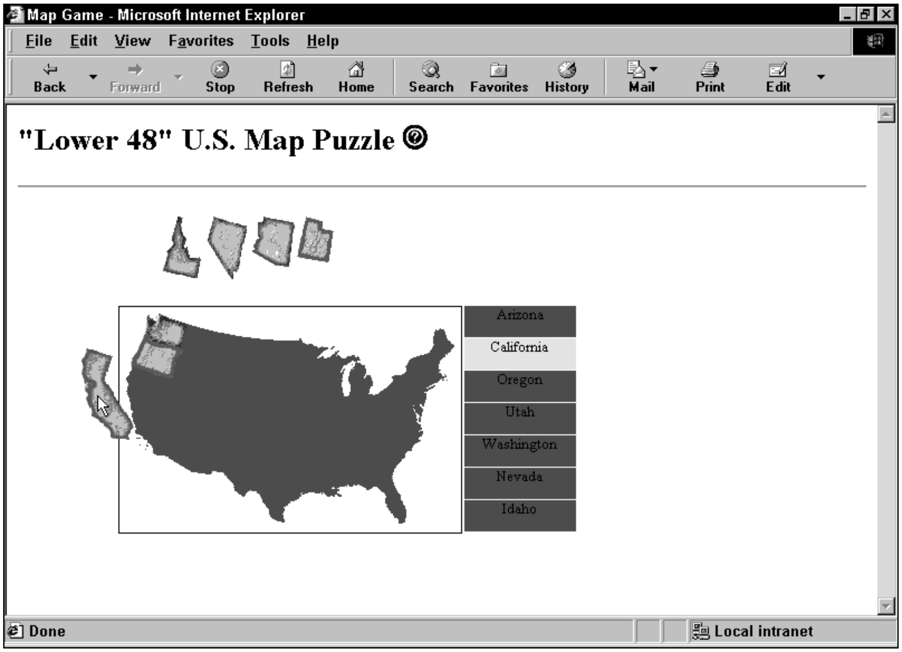


Figure 56-1: The map puzzle game DHTML example (Images courtesy Map Resources — www.mapresources.com)

When the page initially loads, all the state maps are presented across the top of the puzzle area. The state labels all have a red background, and the silhouette of the continental United States has no features in it. To the right of the title is a question mark icon. A click of this icon causes a panel of instructions to glide to the center of the screen from the right edge of the browser window. That panel has a button that hides the panel.

To play the game (no scoring or time keeping is in this simplified version), a user clicks and drags a state with the goal of moving it into its rightful position on the silhouette. While the user drags the state, its label background to the right of the main map turns yellow to highlight the name of the state being worked on. To release the state in its trial position, the user releases the mouse button. If the state is within a four-pixel square region around its true location, the state snaps into its correct position and the corresponding label background color turns green. If the state is not dropped close enough to its destination, the label background reverts to red, meaning that the state still needs to be placed.

After the last state map is dropped into its proper place, all the label backgrounds will be green, and a congratulatory message is displayed where the state map pieces originally lay. Should a user then pick up a state and drop it out of position, the congratulatory message disappears.

I had hoped that all versions of the application would look the same on all platforms. They do, with one small exception. Because the labels are generated as positioned DIV elements for all browsers, NN4 (especially on the Windows version) doesn't do as good a rendering job as other browsers. If I were to use genuine LAYER elements for the labels just for NN4, they'd look better. And, while the code could use scripts to generate LAYERs for NN4 and DIVs for others, the choice here was to stay with DIV elements alone. If you try this game on NN4 and other DHTML browsers, you will see minor differences in the way the labels are colored (red, yellow, and green) during game play. All other rendering and behavior is identical (although a rendering bug in NN6 is discussed later).

Implementation Details

Due to the number of different scripted properties being changed in this application, I decided to implement a lot of the cross-platform scripting as a custom API loaded from an external `.js` file library. The library, whose code is dissected and explained in Chapter 47, contains functions for most of the scriptable items you can access in DHTML. Having these functions available simplified what would have been more complex functions in the main part of the application.

Although I frown on using global variables except where absolutely necessary, I needed to assign a few globals for this application. All of them store information about the state map currently picked up by the user and the associated label. This information needs to survive the invocations of many functions between the time the state is picked up until it is dropped and checked against the "database" of state data.

That database is another global object — a global that I don't mind using at all. Constructed as a multidimensional array, each "record" in the database stores several fields about the state, including its destination coordinates inside the outline map and a Boolean field to store whether the state has been correctly placed in position.

Out of necessity for NN4, the state map images are encased in individual DIV elements. This makes their positionable characteristics more stable, as well as making it possible to capture mouse events that NN4's image objects do not recognize. If the application were being done only for IE4+ and W3C DOMs, the images themselves could be positionable, and the DHTML API could be used without modification.

The custom API

To begin the analysis of the code, you should be familiar with the API that is linked in from an external `.js` library file. Listing 47-2 contains that code and its description.

The main program

Code for the main program is shown in Listing 56-1. The listing is a long document, so I interlace commentary throughout the listing. Before diving into the code, however, allow me to present a preview of the structure of the document. With two exceptions (the map silhouette and the help panel), all positionable elements have their styles set via style sheets in the HEAD of the document. Notice the way class and id selectors are used to minimize the repetitive nature of the styles across so many similar items. After the style sheets come the scripts for the page. All of this material is inside the <HEAD> tag section. I leave the <BODY> section to contain the visible content of the page. This approach is an organization style that works well for me, but you can adopt any style you like, provided various elements that support others on the page are loaded before the dependent items (for example, define a style before assigning its name to the corresponding content tag's ID attributes).

Listing 56-1: **The Main Program (mapgame.htm)**

```
<HTML>
<HEAD><TITLE>Map Game</TITLE>
```

Most of the positionable elements have their CSS properties established in the <STYLE> tag at the top of the document. Positionable elements whose styles are defined here include a text label for each state, a map for each state, and a congratulatory message. Notice that the names of the label and state map objects begin with a two-letter abbreviation of the state. This labeling comes in handy in the scripts when synchronizing the selected map and its label.

The label objects are nested inside the background map object. Therefore, the coordinates for the labels are relative to the coordinate system of the background map, not the page. That's why the first label has a `top` property of zero.

While both the background map and help panel are also positionable elements, scripts need to read the positions of these elements without first setting the values. Recall that in the IE4+ and W3C DOMs, the `style` property of an object does not reveal property values that are set in remote style sheet rules. While IE5 offers a `currentStyle` property to obtain the effective property attributes, neither IE4 nor the W3C DOM afford that luxury. Therefore, the style sheet rules for the background map and help panel are specified as `STYLE` attributes in those two elements' tags later in the listing.

```
<STYLE TYPE="text/css">
    .labels {position:absolute;
             background-color:red; layer-background-color:red;
             width:100; height:28; border:none; text-align:center}
    #azlabel {left:310; top:0}
    #calabel {left:310; top:29}
    #orlabel {left:310; top:58}
    #utlabel {left:310; top:87}
    #walabel {left:310; top:116}
    #nvlabel {left:310; top:145}
    #idlabel {left:310; top:174}

    #camap {position:absolute; left:20; top:100; width:1;}
    #ormap {position:absolute; left:60; top:100; width:1;}
    #wamap {position:absolute; left:100; top:100; width:1;}
    #idmap {position:absolute; left:140; top:100; width:1;}
    #nvmap {position:absolute; left:180; top:100; width:1;}
    #azmap {position:absolute; left:220; top:100; width:1;}
    #utmap {position:absolute; left:260; top:100; width:1;}
```

```
    #congrats {position:absolute; visibility:hidden; left:20; top:100; width:1;
color:red}
</STYLE>
```

The next statement loads the external .js library file that contains the API described in Chapter 47. I tend to load external library files before listing any other JavaScript code in the page, just in case the main page code relies on global variables or functions in its initializations.

```
<SCRIPT LANGUAGE="JavaScript" SRC="DHTMLapi.js"></SCRIPT>
```

Now comes the main script, which contains all the document-specific functions and global variables. Global variables here are ready to hold information about the selected state object (and associated details), as well as the offset between the position of a click inside a map object and the top-left corner of that map object. You will see that this offset is important to allow the map to track the cursor at the same offset position within the map. And because the tracking is done by repeated calls to a function (triggered by numerous mouse events), these offset values must have global scope.

```
// global declarations
var offsetX = 0
var offsetY = 0
var selectedObj
var states = new Array()
var statesIndexList = new Array()
var selectedStateLabel
```

As you will see later in the code, an onLoad event handler for the document invokes an initialization function, whose main job is to build the array of objects containing information about each state. The fields for each state object record are for the two-letter state abbreviation, the full name (not used in this application, but included for use in a future version), the x and y coordinates (within the coordinate system of the background map) for the exact position of the state, and a Boolean flag to be set to true whenever a user correctly places a state. I come back to the last two statements of the constructor function in a moment.

Getting the data for the x and y coordinates required some legwork during development. As soon as I had the pieces of art for each state and the code for dragging them around the screen, I disengaged the part of the script that tested for accuracy. Instead, I added a statement to the code that revealed the x and y position of the dragged item in the statusbar (rather than being bothered by alerts). When I carefully positioned a state in its destination, I copied the coordinates from the statusbar into the statement that created that state record. Sure, it was tedious, but after I had that info in the database, I could adjust the location of the background map and not have to worry about the destination coordinates, because they were based on the coordinate system inside the background map.

```
// object constructor for each state; preserves destination
// position; invokes assignEvents()
function state(abbrev, fullName, x, y) {
    this.abbrev = abbrev
    this.fullName = fullName
```

```
    this.x = x
    this.y = y
    this.done = false
    assignEvents(this)
    statesIndexList[statesIndexList.length] = abbrev
}
// initialize array of state objects
function initArray() {
    states["ca"] = new state("ca", "California", 7, 54)
    states["or"] = new state("or", "Oregon", 7, 24)
    states["wa"] = new state("wa", "Washington", 23, 8)
    states["id"] = new state("id", "Idaho", 48, 17)
    states["az"] = new state("az", "Arizona", 45, 105)
    states["nv"] = new state("nv", "Nevada", 27, 61)
    states["ut"] = new state("ut", "Utah", 55, 69)
}
```

The act of creating each `state` object causes all statements in the constructor function to execute. Moreover, they were executing within the context of the object being created. That opened up channels for two important processes in this application. One was to maintain a list of abbreviations as its own array. This becomes necessary later on when the script needs to loop through all objects in the `states` array to check their `done` properties. Because the array is set up like a hash table (with string index values), a `for` loop using numeric index values is out of the question. So, this extra `statesIndexList` array provides a numerically indexed array that can be used in a `for` loop; values of that array can then be used as index values of the `states` array. Yes, it's a bit of indirection, but other parts of the application benefit greatly by having the state information stored in a hash-table-like array.

One more act of creating each state object is the invocation of the `assignEvents()` function. Because each call to the constructor function bears a part of the name of a positionable map object (composed of the state's lowercase abbreviation and "map"), that value can be passed to the `assignEvents()` function, whose job is to assign event handlers to each of the map layers. While the actual assignment statements are the same for all supported browsers, assembling the references to the objects in each of the three DOM categories required object detection and associated syntax, very similar to the `getObject()` function of the API. In fact, if it weren't for the NN4-specific mechanism for turning on event capture, this function could have used `getObject()` from the library.

Here you can see the three primary user events that control state map dragging: Engage the map on `mousedown`; drag it on `mousemove`; release it on `mouseup`. These functions are described in a moment.

```
// assign event handlers to each map layer
function assignEvents(layer) {
    var obj
    if (document.layers) {
        obj = document.layers[layer.abbrev + "map"]
        obj.captureEvents(Event.MOUSEDOWN | Event.MOUSEMOVE | Event.MOUSEUP)
    } else if (document.all) {
        obj = document.all(layer.abbrev + "map")
    } else if (document.getElementById) {
```

```
        obj = document.getElementById(layer.abbrev + "map")
    }
    if (obj) {
        obj.onmousedown = engage
        obj.onmousemove = dragIt
        obj.onmouseup = release
    }
}
```

The `engage()` function invokes the following function, `setSelectedMap()`. It receives as its sole parameter an event object that is of the proper type for the browser currently running (that's done in the `engage()` function, described next). This function has three jobs to do, two of which set global variables. The first global variable, `selectedObj`, maintains a reference to the layer being dragged by the user. At the same time, the `selectedStateLabel` variable holds onto a reference to the layer that holds the label (recall that its color changes during dragging and release). All of this requires DOM-specific references that are generated through the aid of object detecting branches of the function. The last job of this function is to set the stacking order of the selected map to a value higher than the others so that while the user drags the map, it is in front of everything else on the page.

To assist in establishing references to the map and label layers, naming conventions of the HTML objects (shown later in the code) play an important role. Despite the event handlers being assigned to the DIVs that hold the images, the mouse events are actually targeted at the image objects. The code must associate some piece of information about the event target with the DIV that holds it ("parent" types of references don't work across all browsers, so we have to make the association the hard way). To prevent conflicts with so many objects on this page named with the lowercase abbreviations of the states, the image objects are assigned uppercase abbreviations of the state names. As `setSelectedMap()` begins to execute, it uses object detection to extract a reference to the element object regarded as the target of the event (`target` in NN4 and NN6, `srcElement` in IE). To make sure that the event being processed comes from an image, the next statement makes sure that the target has both `name` and `src` properties, in which case a lowercase version of the name is assigned to the `abbrev` local variable (if only IE4+ and W3C DOMs were in play here, a better verification is checking that the `tagName` property of the event target is `IMG`). That `abbrev` variable then becomes the basis for element names used in references to objects assigned to `selectedObj` and `selectedStateLabel`. Notice how the NN4 version requires a double-layer nesting to the reference for the label because labels are nested inside the `bgmap` layer.

The presence of a value assigned to `selectedObj` becomes an important case for all three drag-related functions later. That's why the `setSelectedMap()` function nulls out the value if the event comes from some other source.

```
/*************************************************
 BEGIN INTERACTION FUNCTIONS
**************************************************/
```

```
// set global reference to map being engaged and dragged
function setSelectedMap(evt) {
    var target = (evt.target) ? evt.target : evt.srcElement
    var abbrev = (target.name && target.src) ?
        target.name.toLowerCase() : ""
    if (abbrev) {
        if (document.layers) {
            selectedObj = document.layers[abbrev + "map"]
            selectedStateLabel = document.layers["bgmap"].document.
                layers[abbrev + "label"]
        } else if (document.all) {
            selectedObj = document.all(abbrev + "map")
            selectedStateLabel = document.all(abbrev + "label")
        } else if (document.getElementById) {
            selectedObj = document.getElementById(abbrev + "map")
            selectedStateLabel = document.getElementById(abbrev + "label")
        }
        setZIndex(selectedObj, 100)
        return
    }
    selectedObj = null
    selectedStateLabel = null
    return
}
```

Next comes the `engage()` function definition. This function is invoked by `mousedown` events inside any of the state map layers. NN4 and NN6 pass an event object as the sole parameter to the function (picked up by the `evt` parameter variable). If that parameter contains a value, then it stands as the event object for the rest of the processing; but for IE, the `window.event` object is assigned to the `evt` variable. After setting the necessary object globals through `setSelectedMap()`, the next major task for `engage()` is to calculate and preserve in global variables the number of pixels within the state map layer at which the `mousedown` event occurred. By preserving these values, the `dragIt()` function makes sure that the motion of the state map layer keeps in sync with the mouse cursor at the very same point within the state map. If it weren't for taking the offset into account, the layer would jump unexpectedly to bring the top-left corner of the layer underneath the cursor. That's not how users expect to drag items on the screen.

The calculations for the offsets require a variety of DOM-specific properties. For example, both NN4 and NN6 offer `pageX` and `pageY` properties of the `event` object, but the coordinates of the layer itself require `left`/`top` properties for NN4 and `offsetLeft`/`offsetTop` properties for NN6. A nested object detection takes place in each assignment statement. The IE branch has some additional branching within each of the assignment statements. These extra branches cover a disparity in the way IE/Windows and IE/Mac report the offset properties of an event. IE/Windows ignores window scrolling, while IE/Mac takes scrolling into account. Later calculations for positioning must take window scrolling into account, so that scrolling is factored into the preserved offset global values if there are indications that the window has scrolled and the values are being affected by the scroll (in which case the offset values go very negative). The logic is confusing, and it won't make much sense until you see later how the positioning is invoked. Conceptually, all of these offset value calculations may seem like a can of worms, but they are essential, and are performed amazingly compactly.

After the offsets are established, the state's label layer's background color is set to yellow. The function ends with `return false` to make sure that the `mousedown` event doesn't propagate through the page (causing a contextual menu to appear on the Macintosh, for instance).

```
// set relevant globals onmousedown; set selected map
// object global; preserve offset of click within
// the map coordinates; set label color to yellow
function engage(evt) {
    evt = (evt) ? evt : event
    setSelectedMap(evt)
    if (selectedObj) {
        if (evt.pageX) {
            offsetX = evt.pageX - ((selectedObj.offsetLeft) ?
                selectedObj.offsetLeft : selectedObj.left)
                offsetY = evt.pageY - ((selectedObj.offsetTop) ?
                selectedObj.offsetTop : selectedObj.top)
        } else if (evt.offsetX || evt.offsetY) {
            offsetX = evt.offsetX - ((evt.offsetX < -2) ?
                0 : document.body.scrollLeft)
            offsetY = evt.offsetY - ((evt.offsetY < -2) ?
                0 : document.body.scrollTop)
        }
        setBGColor(selectedStateLabel,"yellow")
        return false
    }
}
```

The `dragIt()` function, compact as it is, provides the main action in the application by keeping a selected state object under the cursor as the user moves the mouse. This function is called repeatedly by the `mousemove` events, although the actual event handling methodology varies with platform (precisely the same way as with `engage()`, as shown previously). Regardless of the event property detected, event coordinates (minus the previously preserved offsets) are passed the `shiftTo()` function in the API.

Before the dragging action branch of the function ends, the event object's `cancelBubble` property is set to `true`. In truth, only the IE4+ and W3C DOM event objects have such a property, but assigning a value to a nonexistent object property for NN4 does no harm. It's important that this function operate as quickly as possible, because it must execute with each `mousemove` event. Canceling event bubbling helps in a way, but more important, the cancellation allows the `mousemove` event to be used for other purposes, as described in a moment.

```
// move DIV on mousemove
function dragIt(evt) {
    evt = (evt) ? evt : event
    if (selectedObj) {
        if (evt.pageX) {
            shiftTo(selectedObj, (evt.pageX - offsetX), (evt.pageY - offsetY))
        } else if (evt.clientX || evt.clientY) {
            shiftTo(selectedObj, (evt.clientX - offsetX), (evt.clientY - 
offsetY))
```

```
        }
        evt.cancelBubble = true
        return false
    }
}
```

When a user drops the currently selected map object, the `release()` function invokes the `onTarget()` function to find out if the current location of the map is within range of the desired destination. If it is in range, the background color of the state label object is set to green, and the `done` property of the selected state's database entry is set to `true`. One additional test (the `isDone()` function call) looks to see if all the done properties are `true` in the database. If so, the `congrats` object is shown. But if the object is not in the right place, the label reverts to its original red color. In case the user moves a state that was previously okay, its database entry is also adjusted. No matter what the outcome, however, the user has dropped the map, so key global variables are set to `null` and the layer order for the item is set to zero (bottom of the heap) so that it doesn't interfere with the next selected map.

One more condition is possible in the `release()` function. As shown later in the initialization function, the `document` object's `onmousemove` event handler is assigned to the `release()` function (to compare the `onmousemove` events for the state maps go to `dragIt()`). The reasoning behind this document-level event assignment is that no matter how streamlined the dragging function may be, it is possible for the user to move the mouse so fast that the map can't keep up. At that point, `mousemove` events are firing at the `document` (or other object, eventually bubbling up to the `document`), and not the state map. If that happens while a state map is registered as the selected object, but the image is no longer the target of the event, the code performs the same act as if the user had released the map. The label reverts to red, and all relevant globals are set to `null`, preventing any further interaction with the map until the user mouses down again on the map.

```
// onmouseup, see if dragged map is near its destination
// coordinates; if so, mark it as 'done' and color label green
function release(evt) {
    evt = (evt) ? evt : event
    var target = (evt.target) ? evt.target : evt.srcElement
    var abbrev = (target.name && target.src) ?
        target.name.toLowerCase() : ""
    if (abbrev && selectedObj) {
        if (onTarget(evt)) {
            setBGColor(selectedStateLabel, "green")
            states[abbrev].done = true
            if (isDone()) {
                show("congrats")
            }
        } else {
            setBGColor(selectedStateLabel, "red")
            states[abbrev].done = false
            hide("congrats")
        }
```

```
        setZIndex(selectedObj, 0)
    } else if (selectedStateLabel) {
        setBGColor(selectedStateLabel, "red")
    }
    selectedObj = null
    selectedStateLabel = null
}
```

To find out if a dropped map is in (or near) its correct position, the `onTarget()` function first calculates the target spot on the page by adding the location of the `bgmap` object to the coordinate positions stored in the `states` database. Because the `bgmap` object doesn't come into play in other parts of this script, it is convenient to pass merely the object name to the two API functions that get the object's left and top coordinate points.

Next, the script uses platform-specific properties to get the recently dropped state map object's current location. A large `if` condition checks whether the state map object's coordinate point is within a four-pixel square region around the target point. If you want to make the game easier, you can increase the cushion values from 2 to 3 or 4.

If the map is within the range, the script calls the `shiftTo()` API function to snap the map into the exact destination position and reports back to the `release()` function the appropriate Boolean value.

```
// compare position of dragged element against the destination
// coordinates stored in corresponding state object; after shifting
// element to actual destination, return true if item is within
// 2 pixels.
function onTarget(evt) {
    evt = (evt) ? evt : event
    var target = (evt.target) ? evt.target : evt.srcElement
    var abbrev = (target.name && target.src) ?
        target.name.toLowerCase() : ""
    if (abbrev && selectedObj) {
        var x = states[abbrev].x + getObjectLeft("bgmap")
        var y = states[abbrev].y + getObjectTop("bgmap")
        var objX, objY
        if (selectedObj.pageX) {
            objX = selectedObj.pageX
            objY = selectedObj.pageY
       } else if (selectedObj.style) {
            objX = parseInt(selectedObj.style.left)
            objY = parseInt(selectedObj.style.top)
        }
        if ((objX >= x-2 && objX <= x+2) &&
            (objY >= y-2 && objY <= y+2)) {
            shiftTo(selectedObj, x, y)
            return true
        }
        return false
    }
    return false
}
```

A `for` loop cycles through the `states` database (with the help of the hash table values stored indirectly in the `statesIndexList` array) to see if all of the done properties are set to `true`. When they are, the `release()` function (which calls the `isDone()` function) displays the congratulatory object. Do note that NN6.0 may exhibit rendering difficulties when hiding and showing the `congrats` object. This problem should be fixed in a subsequent release of the browser.

```
// test whether all state objects are marked 'done'
function isDone() {
    for (var i = 0; i < statesIndexList.length; i++) {
        if (!states[statesIndexList[i]].done) {
            return false
        }
    }
    return true
}
```

The help panel is created differently than the map and label objects (details coming up in a moment). When the user clicks the Help button at the top of the page, the instructions panel flies in from the right edge of the window (see Figure 56-2). The `showHelp()` function begins the process by setting its location to the current right window edge, bringing its layer to the very front of the heap, showing the object. To assist `moveHelp()` in calculating the center position on the screen, the `showHelp()` function retrieves (just once per showing) the DOM-specific property for the width of the help panel. That value is passed as a parameter to `moveHelp()` as it is repeatedly invoked through the `setInterval()` mechanism.

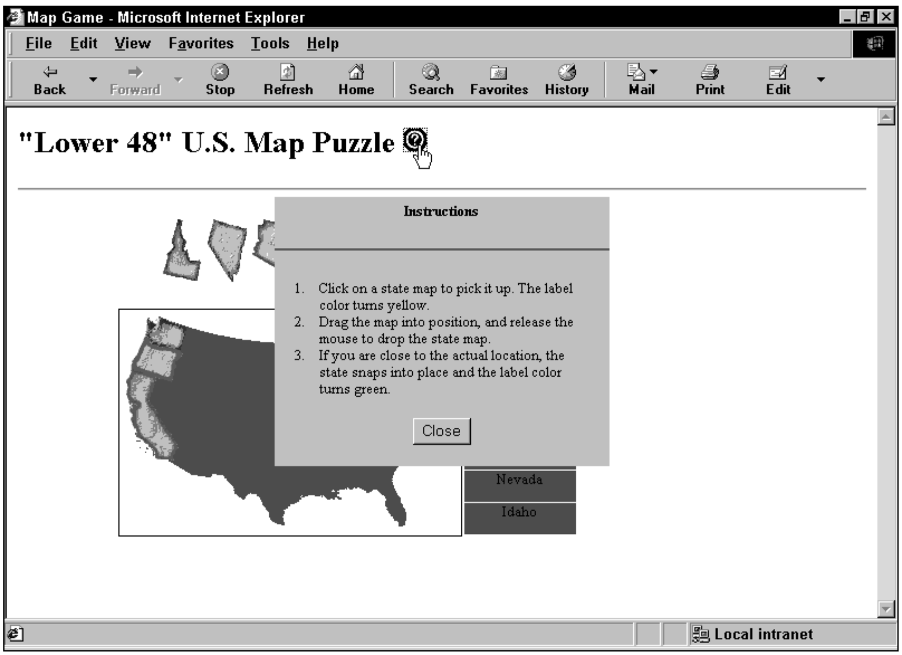


Figure 56-2: Instructions panel "flies" in from left to center screen.

```
/**********************************************
 BEGIN HELP ELEMENT FUNCTIONS
**********************************************/
// initiate show action
function showHelp() {
    var objName = "help"
    var helpWidth = 0
    shiftTo(objName, insideWindowWidth, 80)
    setZIndex(objName,1000)
    show(objName)
    if (document.layers) {
        helpWidth = document.layers[objName].document.width
    } else if (document.all) {
        helpWidth = document.all(objName).offsetWidth
    } else if (document.getElementById) {
        if (document.getElementById(objName).offsetWidth >= 0) {
            helpWidth = document.getElementById(objName).offsetWidth
        }
    }
    intervalID = setInterval("moveHelp(" + helpWidth + ")", 1)
}
```

In the `moveHelp()` function, the help object is shifted in five-pixel increments to the left. The ultimate destination is the spot where the object is in the middle of the browser window. That midpoint must be calculated each time the page loads, because the window may have been resized. The width of the `help` object, received as a parameter to the function, gets a workout in the mid-point calculation.

This function is called repeatedly under the control of a `setInterval()` method in `showHelp()`. But when the object reaches the middle of the browser window, the interval ID is canceled, which stops the animation.

The help object processes a mouse event to hide the object. An extra `clearInterval()` method is called here in case the user clicks the object's Close button before the object has reached mid-window (where `moveHelp()` cancels the interval). The script also shifts the position to the right edge of the window, but it isn't absolutely necessary, because the `showHelp()` method positions the window there.

```
// iterative move help DIV to center of window
function moveHelp(w) {
    shiftBy("help",-5,0)
    var objectLeft = getObjectLeft("help")
    if (objectLeft <= (insideWindowWidth/2) - w/2) {
        clearInterval(intervalID)
    }
}
// hide the help DIV
function hideMe() {
    clearInterval(intervalID)
    hide("help")
    shiftTo("help", insideWindowWidth, 80)
}
```

The document's onLoad event handler invokes the init() function, which, in turn, calls two functions and assigns the document object's onmousemove event handler. The first is initArray(), which builds the states[] database and assigns event handlers to the state map layers. Because the layers are defined so late in the document, initializing their events after the page has loaded is safest.

For convenience in moving the help window to the center of the browser window, the setWinWidth() function sets a global variable (insideWindowWidth) to hold the width of the browser window. This function is also invoked by the onResize event handler for the window to keep the value up to date.

```
// calculate center of window for help DIV
function setWinWidth() {
    if (window.innerWidth) {
        insideWindowWidth = window.innerWidth
    } else if (document.body.scrollWidth) {
        insideWindowWidth = document.body.scrollWidth
    } else if (document.width) {
        insideWindowWidth = document.width
    }
}

/***********************************************
 INITIALIZE THE APPLICATION
************************************************/
// initialize application
function init() {
    initArray()
    setWinWidth()
    document.onmousemove = release
}
</SCRIPT>
</HEAD>
```

Now comes the part of the document that generates the visible content. The <BODY> tag contains the two event handlers just discussed. An image rollover for the help icon simply displays a message in the statusbar.

```
<BODY onLoad="init()" onResize="setWinWidth()">
<H1>"Lower 48" U.S. Map Puzzle <A HREF="javascript:void showHelp()"
onMouseOver="status='Show help panel...';return true"
onMouseOut="status='';return true"><IMG SRC="info.gif" HEIGHT=22 WIDTH=22
BORDER=0></A></H1>
<HR>
```

Next come tags for all of the DIV elements. The STYLE attribute for the bgmap DIV lets scripts read the positioned values to assist in calculating positions in the onTarget() function, as shown previously. The bgmap layer also contains all labels so that if the design calls for moving the map to another part of the page, the labels follow automatically. Notice how the lowercase state abbreviations are part of the names of both the label and map layers. As you saw in a few functions shown previously, a systematic approach to object naming can offer powerful shortcuts in determining references to elements.

```
<DIV ID=bgmap STYLE="position:absolute; left:100; top:180; width:406"><IMG
SRC="us11.gif" WIDTH=306 HEIGHT=202 BORDER=1> </IMG>
<DIV CLASS="labels" ID=azlabel>Arizona</DIV>
<DIV CLASS="labels" ID=calabel>California</DIV>
<DIV CLASS="labels" ID=orlabel>Oregon</DIV>
<DIV CLASS="labels" ID=utlabel>Utah</DIV>
<DIV CLASS="labels" ID=walabel>Washington</DIV>
<DIV CLASS="labels" ID=nvlabel>Nevada</DIV>
<DIV CLASS="labels" ID=idlabel>Idaho</DIV>
</DIV>

<DIV ID=camap><IMG NAME="CA" SRC="ca.gif" WIDTH=47 HEIGHT=82 BORDER=0></DIV>
<DIV ID=ormap><IMG NAME="OR" SRC="or.gif" WIDTH=57 HEIGHT=45 BORDER=0></DIV>
<DIV ID=wamap><IMG NAME="WA" SRC="wa.gif" WIDTH=38 HEIGHT=29 BORDER=0></DIV>
<DIV ID=idmap><IMG NAME="ID" SRC="id.gif" WIDTH=34 HEIGHT=55 BORDER=0></DIV>
<DIV ID=azmap><IMG NAME="AZ" SRC="az.gif" WIDTH=38 HEIGHT=45 BORDER=0></DIV>
<DIV ID=nvmap><IMG NAME="NV" SRC="nv.gif" WIDTH=35 HEIGHT=56 BORDER=0></DIV>
<DIV ID=utmap><IMG NAME="UT" SRC="ut.gif" WIDTH=33 HEIGHT=41 BORDER=0></DIV>

<DIV ID=congrats><H1>Congratulations!</H1></DIV>
```

In developing this application, I encountered an unfriendly NN4 bug. When defining the help panel as a positioned DIV element in NN4, the browser exhibited unwanted behavior after the instruction panel was shown and flown into place under script control. Even after hiding the help layer, the page no longer received mouse events, making it impossible to pick up a state map after the instructions appeared. The problem did not surface, however, if the help object was defined in the document with a `<LAYER>` tag.

Therefore, I did what I don't like to do unless absolutely necessary: I created branches in the content that used `document.write()` to create the same content with different HTML syntax, depending on the browser. For non-LAYER browsers, the page creates the same kind of block (with the `<DIV>` tag pair) used elsewhere in the document. Positioning properties are assigned to this block via a STYLE attribute in the `<DIV>` tag. You cannot assign a style in the `<STYLE>` tag that is visible to the entire document, because that specification and a like-named `<LAYER>` tag get confused.

For NN4, the page uses the `<LAYER>` tag and loads the content of the object from a separate HTML file (`instrux.htm`). One advantage I had with the `<LAYER>` tag was that I could assign an initial horizontal position of the help object with a JavaScript entity. The entity reaches into the `window.innerWidth` property to set the `LEFT` attribute of the layer.

```
<SCRIPT LANGUAGE="JavaScript">
var output = ""
if (document.layers) {
    output = "<LAYER ID='help' TOP=80 LEFT=&{window.innerWidth}; WIDTH=300
VISIBILITY='HIDDEN' SRC='instrux.htm'></LAYER>"
} else {
    output = "<DIV ID='help' onClick='hideMe()' STYLE='position:absolute;
visibility:hidden; top:80; width:300; border:none; background-
color:#98FB98;'>\n"
```

```
    output += "<P STYLE='margin-
top:5'><CENTER><B>Instructions</B></CENTER></P>\n"
    output += "<HR COLOR='seagreen'>\n<OL STYLE='margin-right:20'>"
    output += "<LI>Click on a state map to pick it up. The label color turns
yellow.\n"
    output += "<LI>Drag the map into position, and release the mouse to drop the
state map.\n"
    output += "<LI>If you are close to the actual location, the state snaps into
place and the label color turns green.\n"
    output += "</OL>\n<FORM>\n<CENTER><INPUT TYPE='button'
VALUE='Close'>\n</FORM></DIV>"
}
document.write(output)
</SCRIPT>
</BODY>
</HTML>
```

This page has a lot of code to digest in one reading. Run the application, study the structure of the source code listing file, and re-read the previous explanations. It may take several readings for a mental picture of the application to form.

Lessons Learned

As soon as the external cross-platform API was in place, it helped frame a lot of the other code in the main program. The APIs provided great comfort in that they encouraged me to reference a complex object fully in the main code as a platform-shared value (for example, the `selectedObj` and `selectedStateLabel` global variables). At the same time, I could reference top-level elements (that is, non-nested objects) simply by their names when passing them to API functions.

In many respects, the harder task was defining the style sheet attributes and syntax that both browsers would treat similarly. In the case of the label objects, I couldn't reach complete parity in a cross-platform environment (the labels look different in NN4), and in the case of the `help` object, I had to code the HTML separately for each platform. Therefore, when approaching this kind of project, work first with the HTML and CSS syntax to build the look that works best for all platforms. Then start connecting the scripted wires. You may have to adjust the CSS code if you find odd behavior in one platform or the other with your scripting, but starting with a good layout is still easier.

But without a doubt the biggest lesson you learn from working on a project like this is how important it is to test an application on as many browsers and operating systems as possible. Designing a cross-platform application on one browser and having it run flawlessly on the other the first time is nearly impossible. Be prepared to go back and forth among multiple browsers, breaking and repairing existing working code along the way until you eventually reach a version that works on every browser that you can test.

✦ ✦ ✦

57

CHAPTER

Application: Transforming XML Data Islands

✦ ✦ ✦ ✦

In This Chapter

Designing XML data islands

Complex JavaScript data structures

Advanced array sorting

Dynamic tables

✦ ✦ ✦ ✦

Chapter 52 ends with an example of an interactive outliner whose data arrives in XML format. The data is embedded in an HTML document inside an XML data island, which is thus far supported only on the Windows versions of IE5 and later. The application described in this chapter picks up from there.

As you recall from the Chapter 52 outline, the node structure of the XML data was used as a guide to the structure for a one-time rendering of HTML elements. There was a one-to-one correlation between XML element nesting and the HTML element nesting. Adjusting style sheet properties for displaying or hiding elements controlled all interactivity. What you're about to see here is a case for converting XML into JavaScript objects that can be used multiple times as a convenient data source for HTML that is displayed in any number of formats. In particular, you see how JavaScript's array sorting prowess supplies XML-supplied data with extraordinary flexibility in presentation.

You will see a lot of code in this chapter. The code is presented here as a way to demonstrate the potential for rich data handling. At the same time, the code may provide ideas for server-side processing of XML data being output to the client. If a server program can convert the XML data into the shortcut object and array notation of Version 4 browsers or later, suddenly a broader range of browsers is capable of dealing with data stored as XML on the server.

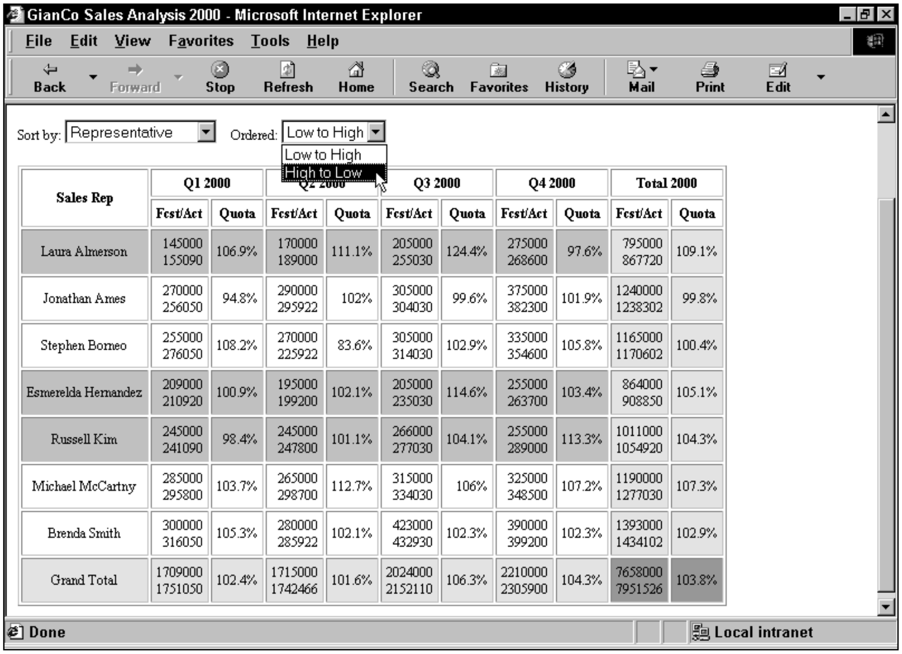
Application Overview

Understanding the data is a good place to start in describing this application. The scenario is a small American company (despite its grandiose name: GiantCo) that has divided the country into three sales regions. Two of the regions have two sales representatives, while the third region has three reps. The time is at the end of a fiscal year, at which point the management wants to review and present the performance of each salesperson. An XML report delivers the sales forecast and actual sales per quarter for each sales rep. A single HTML and JavaScript page (with the XML data embedded as a data island inside an IE <XML> tag) is charged with not only displaying the raw tabular data, but also allowing for a variety of views and sorting possibilities so that management can analyze performance by sales rep and region, as well as by quarter.

A server-based searching and reporting program collects the requested data and outputs each sales rep's record in an XML structure, such as the following one:

```
<SALESREP>
    <EMPLOYEEID>12345</EMPLOYEEID>
    <CONTACTINFO>
        <FIRSTNAME>Brenda</FIRSTNAME>
        <LASTNAME>Smith</LASTNAME>
        <EMAIL>brendas@giantco.com</EMAIL>
        <PHONE>312-555-9923</PHONE>
        <FAX>312-555-9901</FAX>
    </CONTACTINFO>
    <MANAGER>
        <EMPLOYEEID>02934</EMPLOYEEID>
        <FIRSTNAME>Alistair</FIRSTNAME>
        <LASTNAME>Renfield</LASTNAME>
    </MANAGER>
    <REGION>Central</REGION>
    <SALESRECORD>
        <PERIOD>
            <ID>Q1_2000</ID>
            <FORECAST>300000</FORECAST>
            <ACTUAL>316050</ACTUAL>
        </PERIOD>
        <PERIOD>
            <ID>Q2_2000</ID>
            <FORECAST>280000</FORECAST>
            <ACTUAL>285922</ACTUAL>
        </PERIOD>
        <PERIOD>
            <ID>Q3_2000</ID>
            <FORECAST>423000</FORECAST>
            <ACTUAL>432930</ACTUAL>
        </PERIOD>
        <PERIOD>
            <ID>Q4_2000</ID>
            <FORECAST>390000</FORECAST>
            <ACTUAL>399200</ACTUAL>
        </PERIOD>
    </SALESRECORD>
</SALESREP>
```

As you can see, the data consists of several larger blocks, such as contact information, a pointer to the rep's manager, and then the details of each quarterly period's forecast and actual sales. The goal is to present the data in table form with a structure similarly shown in Figure 57-1. Not only is the raw data presented, but numerous calculations are also made on the results, such as the percentage of quota attained for each reporting period, plus totals along each axis of the spreadsheet-like table.



Sales Rep	Q1 2000		Q2 2000		Q3 2000		Q4 2000		Total 2000	
	Fcst/Act	Quota	Fcst/Act	Quota	Fcst/Act	Quota	Fcst/Act	Quota	Fcst/Act	Quota
Laura Almerson	145000 155090	106.9%	170000 189000	111.1%	205000 255030	124.4%	275000 268600	97.6%	795000 867720	109.1%
Jonathan Ames	270000 256050	94.8%	290000 295922	102%	305000 304030	99.6%	375000 382300	101.9%	1240000 1238302	99.8%
Stephen Borneo	255000 276050	108.2%	270000 225922	83.6%	305000 314030	102.9%	335000 354600	105.8%	1165000 1170602	100.4%
Esmerelda Hernandez	209000 210920	100.9%	195000 199200	102.1%	205000 235030	114.6%	255000 263700	103.4%	864000 908850	105.1%
Russell Kim	245000 241090	98.4%	245000 247800	101.1%	266000 277030	104.1%	255000 289000	113.3%	1011000 1054920	104.3%
Michael McCartny	285000 295800	103.7%	265000 298700	112.7%	315000 334030	106%	325000 348500	107.2%	1190000 1277030	107.3%
Brenda Smith	300000 316050	105.3%	280000 285922	102.1%	423000 432930	102.3%	390000 399200	102.3%	1393000 1434102	102.9%
Grand Total	1709000 1751050	102.4%	1715000 1742466	101.6%	2024000 2152110	106.3%	2210000 2305900	104.3%	7658000 7951526	103.8%

Figure 57-1: One view of the XML data output

Just above the table are two SELECT elements. These controls' labels indicate that the table's data can be sorted by a number of criteria and the results of each sort can be ordered in different ways. Sorting in the example offers the following possibilities:

```
Representative's Name
Sales Region
Q1 Forecast
Q1 Actual
Q1 Performance
[the last three also for Q2, Q3, Q4]
Total Forecast
Total Actual
Total Performance
```

Ordering of the sorted results is a choice between "Low to High" or "High to Low." While ordering of most sort categories is obviously based on numeric value, the sorting of the representatives' names is based on the alphabetical order of the last names. One other point about the user interface is that the design needs to signify via table cell background color the sales region of each representative. The colors aren't easily distinguishable in Figure 57-1, but if you open the actual example listing in IE5+/Windows on your computer, you will see the coloration.

Implementation Plan

Clearly all the data needed for numerous sorted and ordered views arrives in one batch in the XML island. Despite the element and node referencing properties and methods of the W3C DOM, trying to use the XML elements as the sole data store for scripts to sort the data each time would be impractical. For one thing, none of the elements have ID attributes — there's no need for it in the XML stored on the server database. And even if they did have IDs, how would scripts that you desire to write for generalizability make use of them unless the IDs were generated in a well-known sequence? Moreover, after a sales rep's record is rendered in the table, how easy would it be to dive back into that record and drill down for further information, such as the name of a representative's manager?

A solution that can empower the page author in this case is to use the node-walking properties and methods of the W3C DOM to assemble a JavaScript-structured database while the page loads. In other words, the conversion is performed just once during page loading, and the JavaScript version is preserved in an array (of XML "records" in this case) as a global variable. Any transformations on the data can be done from the JavaScript database with the help of additional powers of the language.

Given that route, the basic operation of the scripting of the page is schematically simple:

1. Convert the XML into an array of objects at load time.
2. Predefine all necessary sorting functions based on properties of those objects.
3. Provide a function that rebuilds the HTML table each time data is sorted.

With this sequence in mind, now look into the code that does the job.

The Code

Rather than work through the long document in source code order, the following descriptions follow a more functional order. You can open the actual source code file to see where the various functions are positioned. To best understand this application, seeing the "how" rather than the "where" is more important. Also, many of the code lines (even some single expressions) are too wide for the printed page and therefore break unnaturally in the listings that follow. Trust the formatting of the source file on the CD-ROM.

Style sheets

For the example provided on the CD-ROM, one set of style sheet rules is embedded in the HTML document. As you can see from the rule selectors, many are tied to very specific classes of table-related elements used to render the content. In a production version of this application, I would expect that there would be more and quite different views of the data available to the users, such as bar charts for each salesperson or region. Each view would likely require its own unique set of style sheet rules. In such a scenario, the proper implementation would be to use the LINK element to bring in a different external style sheet file for each view type. All could be linked in at the outset, but only the current `styleSheet` object would be enabled.

```
<STYLE TYPE="text/css">
XML {display:none}
TD {text-align:right}
TD.rep, TD.grandTotalLabel {text-align:center}
TR.East {background-color:#FFFFCC}
TR.Central {background-color:#CCFFFF}
TR.West {background-color:#FFCCCC}
TR.QTotal {background-color:#FFFF00}
TD.repTotal {background-color:#FFFF00}
TD.grandTotal{background-color:#00FF00}
H1 {font-family:"Comic Sans MS",Helvetica,sans-serif}
</STYLE>
```

One style sheet rule is essential: The one that suppresses the rendering of any XML element. That data is hidden from the user's view.

Initialization sequence

An `onLoad` event handler invokes the `init()` function, which sets a lot of machinery in motion to get the document ready for user interaction. Its most important job is running a `for` loop that builds the JavaScript database from the XML elements. Next, it sorts the database based on the current choice in the sorting SELECT element. The sorting function ends by triggering the rendering of the table. These three actions correspond to the fundamental operation of the entire application.

```
// initialize global variable that stores JavaScript data
var db = new Array()

// Initialization called by onLoad
function init() {
    for (var i = 0;
    i <
document.getElementById("reports").getElementsByTagName("SALESREP").length;
    i++) {
        db[db.length] = getOneSalesRep(i)
    }
    selectSort(document.getElementById("sortChooser"))
}
```

Converting the data

The controlling factor for creating the JavaScript database is the structure of the XML data island. As you may recall, the elements inside the XML data island can be accessed only through a reference to the XML container. The ID of that element in this application is `reports`. Data for each sales rep is contained by a SALESREP element. The number of SALESREP elements determines how many records (JavaScript objects) are to be added to the `db` array. A call to the `getOneSalesRep()` function creates an object for each sales representative's data.

Despite the length of the `getOneSalesRep()` function, its operation is very straightforward. Most of the statements do nothing more than retrieve the data inside the various XML elements within a SALESREP container and assign that data to a like-named property of the custom object. Following the structure of the XML example shown earlier in this chapter, you can see where some properties of a JavaScript object representing the data are, themselves, objects or arrays. For example, one of the properties is called `manager`, corresponding to the MANAGER element. But that element has nested items inside. Then, making those nested elements properties of a `manager` object is only natural. Similarly, the repetitive nature of the data within each of the four quarterly periods calls for even greater nesting: The object property named `sales` is an array, with each item of the array corresponding to one of the periods. Each period also has three properties (a period ID, forecast sales, and actual sales). Thus, the `sales` property is an array of objects.

```
function getOneSalesRep(i) {
    // create new, empty object
    var oneRecord = new Object()
    // get a shortcut reference to one SALESREP element
    var oneElem =
document.getElementById("reports").getElementsByTagName("SALESREP")[i]
    // start assigning element data to oneRecord object properties
    oneRecord.id =
oneElem.getElementsByTagName("EMPLOYEEID")[0].firstChild.data
    var contactInfoElem =
oneElem.getElementsByTagName("CONTACTINFO")[0]
    oneRecord.firstName =
contactInfoElem.getElementsByTagName("FIRSTNAME")[0].firstChild.data
    oneRecord.lastName =
contactInfoElem.getElementsByTagName("LASTNAME")[0].firstChild.data
    oneRecord.eMail =
contactInfoElem.getElementsByTagName("EMAIL")[0].firstChild.data
    oneRecord.phone =
contactInfoElem.getElementsByTagName("PHONE")[0].firstChild.data
    oneRecord.fax =
contactInfoElem.getElementsByTagName("FAX")[0].firstChild.data
    // make the manager property its own object
    oneRecord.manager = new Object()

    // get a shortcut reference to the MANAGER element
    var oneMgrElem = oneElem.getElementsByTagName("MANAGER")[0]
    // start assigning element data to manager object properties
    oneRecord.manager.id =
oneMgrElem.getElementsByTagName("EMPLOYEEID")[0].firstChild.data
        oneRecord.manager.firstName =
oneMgrElem.getElementsByTagName("FIRSTNAME")[0].firstChild.data
        oneRecord.manager.lastName =
oneMgrElem.getElementsByTagName("LASTNAME")[0].firstChild.data
    oneRecord.region =
```

```
oneElem.getElementsByTagName("REGION")[0].firstChild.data

    // make the sales property a new array
    oneRecord.sales = new Array()
    // get a shortcut reference to the collection of
    // periods in the SALESRECORD element
    var allPeriods =
oneElem.getElementsByTagName("SALESRECORD")[0].childNodes
    var temp
    var accumForecast = 0, accumActual = 0
    // loop through periods
    for (var i = 0; i < allPeriods.length; i++) {
        if (allPeriods[i].nodeType == 1) {
            // make new object for a period's data
            temp = new Object()
            // start assigning period data to the new object
            temp.period =
allPeriods[i].getElementsByTagName("ID")[0].firstChild.data
            temp.forecast =
parseInt(allPeriods[i].getElementsByTagName("FORECAST")[0].firstChild.data)
            temp.actual =
parseInt(allPeriods[i].getElementsByTagName("ACTUAL")[0].firstChild.data)
            // run analysis on two properties and preserve result
            temp.quotaPct = getPercentage(temp.actual, temp.forecast)
            oneRecord.sales[temp.period] = temp
            // accumulate totals for later
            accumForecast += temp.forecast
            accumActual += temp.actual
        }
    }
    // preserve accumulated totals as oneRecord properties
    oneRecord.totalForecast = accumForecast
    oneRecord.totalActual = accumActual
    // run analysis on accumulated totals
    oneRecord.totalQuotaPct = getPercentage(accumActual, accumForecast)
     // hand back the stuffed object to be put into the db array
    return oneRecord
}
// calculate percentage of actual/forecast
function getPercentage(actual, forecast) {
    var pct = (actual/forecast * 100) + ""
    pct = pct.match(/\d*\.\d/)
    return parseFloat(pct)
}
```

Assuming that the raw XML database stores only the sales forecast and actual dollar figures, it is up to analysis programs to perform their own calculations, such as how the actual sales compare against the forecasts. As you saw in the illustration of the rendered table, this application not only displays the percentage differences between the pairs of values, but it also provides sorting facilities on those percentages. To speed the sorting, the percentages are calculated as the JavaScript database is being accumulated, and the percentages are stored as properties of each object. Percentage calculation is called upon in two different statements of the getOneSalesRep() function, so that the calculation is broken out to its own function, getPercentage(). In that function, the two passed values are massaged to calculate the percentage value, and then the string result is formatted to no more than one digit to the right of the decimal (by way of a regular expression). The value returned for the property assignment is converted to a number data type, because sorting on these values needs to be done according to numeric sorting, rather than string sorting.

You can already get a glimpse at the contribution JavaScript is making to the scripted representation of the data transmitted in XML form. By virtue of planning for subsequent calculations, the JavaScript object contains considerably more information than was originally delivered, yet all the properties are derived from "hard" data supplied by the server database.

Sorting the JavaScript database

With so many sorting keys for the user to choose from, it's no surprise that sorting code occupies a good number of script lines in this application. All sorting code consists of two major blocks: *dispatching* and *sorting*.

The dispatching portion is nothing more than one gigantic switch construction that sends execution to one of the seventeen (!) sorting functions that match whichever sort key is chosen in the SELECT element on the page. This dispatcher function, selectSort(), is also invoked from the init() function at load time. Thus, if the user makes a choice in the page, navigates to another page, and then returns with the page still showing the previous selection, the onLoad event handler will reconstruct the table precisely as it was. When sorting is completed, the table is drawn, as you see shortly.

```
// begin sorting routines
function selectSort(chooser) {
    switch (chooser.value) {
        case "byRep" :
            db.sort(sortDBByRep)
            break
        case "byRegion" :
            db.sort(sortDBByRegion)
            break
        case "byQ1Fcst" :
            db.sort(sortDBByQ1Fcst)
            break
        case "byQ1Actual" :
            db.sort(sortDBByQ1Actual)
            break
        case "byQ1Quota" :
            db.sort(sortDBByQ1Quota)
            break
        case "byQ2Fcst" :
            db.sort(sortDBByQ2Fcst)
            break
        case "byQ2Actual" :
            db.sort(sortDBByQ2Actual)
            break
```

```
        case "byQ2Quota" :
            db.sort(sortDBByQ2Quota)
            break
        case "byQ3Fcst" :
            db.sort(sortDBByQ3Fcst)
            break
        case "byQ3Actual" :
            db.sort(sortDBByQ3Actual)
            break
        case "byQ3Quota" :
            db.sort(sortDBByQ3Quota)
            break
        case "byQ4Fcst" :
            db.sort(sortDBByQ4Fcst)
            break
        case "byQ4Actual" :
            db.sort(sortDBByQ4Actual)
            break
        case "byQ4Quota" :
            db.sort(sortDBByQ4Quota)
            break
        case "byTotalFcst" :
            db.sort(sortDBByTotalFcst)
            break
        case "byTotalActual" :
            db.sort(sortDBByTotalActual)
            break
        case "byTotalQuota" :
            db.sort(sortDBByTotalQuota)
            break
    }
    drawTextTable()
}
```

Each specific sorting routine is a function that automatically works repeatedly on pairs of entries of an array (see Chapter 37). Array entries here (from the `db` array) are objects — and rather complex objects at that. The benefit of using JavaScript array sorting is that the sorting can be performed on any property of objects stored in the array. For example, sorting on the `lastName` property of each `db` array object is based on a comparison of the `lastName` property for each of the pairs of array entries passed to the `sortDBByRep()` sort function. But looking down a little further, you can see that the mechanism allows sorting on even more deeply nested properties, such as the `sales.Q1_2000.forecast` property of each array entry. If a property in an object can be referenced, it can be used as a sorting property inside one of these functions.

```
function sortDBByRep(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.lastName < b.lastName) ? -1 : 1
    } else {
        return (a.lastName > b.lastName) ? -1 : 1
    }
}
```

```
function sortDBByRegion(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.region < b.region) ? -1 : 1
    } else {
        return (a.region > b.region) ? -1 : 1
    }
}
function sortDBByQ1Fcst(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q1_2000.forecast - b.sales.Q1_2000.forecast)
    } else {
        return (b.sales.Q1_2000.forecast - a.sales.Q1_2000.forecast)
    }
}
function sortDBByQ1Actual(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q1_2000.actual - b.sales.Q1_2000.actual)
    } else {
        return (b.sales.Q1_2000.actual - a.sales.Q1_2000.actual)
    }
}
function sortDBByQ1Quota(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q1_2000.quotaPct - b.sales.Q1_2000.quotaPct)
    } else {
        return (b.sales.Q1_2000.quotaPct - a.sales.Q1_2000.quotaPct)
    }
}
function sortDBByQ2Fcst(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q2_2000.forecast - b.sales.Q2_2000.forecast)
    } else {
        return (b.sales.Q2_2000.forecast - a.sales.Q2_2000.forecast)
    }
}
function sortDBByQ2Actual(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q2_2000.actual - b.sales.Q2_2000.actual)
    } else {
        return (b.sales.Q2_2000.actual - a.sales.Q2_2000.actual)
    }
}
function sortDBByQ2Quota(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q2_2000.quotaPct - b.sales.Q2_2000.quotaPct)
    } else {
        return (b.sales.Q2_2000.quotaPct - a.sales.Q2_2000.quotaPct)
    }
}
function sortDBByQ3Fcst(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q3_2000.forecast - b.sales.Q3_2000.forecast)
```

```
    } else {
        return (b.sales.Q3_2000.forecast - a.sales.Q3_2000.forecast)
    }
}
function sortDBByQ3Actual(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q3_2000.actual - b.sales.Q3_2000.actual)
    } else {
        return (b.sales.Q3_2000.actual - a.sales.Q3_2000.actual)
    }
}
function sortDBByQ3Quota(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q3_2000.quotaPct - b.sales.Q3_2000.quotaPct)
    } else {
        return (b.sales.Q3_2000.quotaPct - a.sales.Q3_2000.quotaPct)
    }
}
function sortDBByQ4Fcst(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q4_2000.forecast - b.sales.Q4_2000.forecast)
    } else {
        return (b.sales.Q4_2000.forecast - a.sales.Q4_2000.forecast)
    }
}
function sortDBByQ4Actual(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q4_2000.actual - b.sales.Q4_2000.actual)
    } else {
        return (b.sales.Q4_2000.actual - a.sales.Q4_2000.actual)
    }
}
function sortDBByQ4Quota(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.sales.Q4_2000.quotaPct - b.sales.Q4_2000.quotaPct)
    } else {
        return (b.sales.Q4_2000.quotaPct - a.sales.Q4_2000.quotaPct)
    }
}
function sortDBByTotalFcst(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.totalForecast - b.totalForecast)
    } else {
        return (b.totalForecast - a.totalForecast)
    }
}
function sortDBByTotalActual(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.totalActual - b.totalActual)
    } else {
        return (b.totalActual - a.totalActual)
    }
}
```

```
function sortDBByTotalQuota(a, b) {
    if (document.getElementById("orderChooser").value == "inc") {
        return (a.totalQuotaPct - b.totalQuotaPct)
    } else {
        return (b.totalQuotaPct - a.totalQuotaPct)
    }
}
```

For this application, all sorting functions branch in their execution based on the choice made in the "Ordered" SELECT element on the page. The relative position of the two array elements under test in these simple subtraction comparison statements reverses when the sort order is from low to high (increasing) and when it is from high to low (decreasing). This kind of array sorting is extremely powerful in JavaScript and probably escapes the attention of most scripters.

Constructing the table

As recommended back in Chapter 27's discussion of TABLE and related elements, it is best to manipulate the structure of a TABLE element by way of the specialized methods for tables, rather than mess with nodes and elements. The `drawTextTable()` function is devoted to employing those methods to create the rendered contents of the table below the headers (which are hard-wired in the document's HTML). Composing an eleven-column table requires a bit of code, and the `drawTextTable()`'s length attests to that fact. You can tell by just glancing at the code, however, that for big chunks of it, there is a comfortable regularity that is aided by the JavaScript object that holds the data.

Additional calculations take place while the table's elements are being added to the TABLE element. Column totals are accumulated during the table assembly (row totals are calculated as the object is generated and preserved as properties of the object). A large `for` loop cycles through each (sorted) row of the `db` array; each row of the `db` array corresponds to a row of the table. Class names are assigned to various rows or cells so that they will pick up the style sheet rules defined earlier in the document. Another subtlety of this version is that the `region` property of a sales rep is assigned to the `title` property of a row. If the user pauses the mouse pointer anywhere in that row, the name of the region pops up briefly.

```
function drawTextTable() {

    var newRow
    var accumQ1F = 0, accumQ1A = 0, accumQ2F = 0, accumQ2A = 0
    var accumQ3F = 0, accumQ3A = 0, accumQ4F = 0, accumQ4A = 0
    deleteRows(document.getElementById("mainTableBody"))
    for (var i = 0; i < db.length; i++) {
        newRow = document.getElementById("mainTableBody").insertRow(i)
        newRow.className = db[i].region
        newRow.title = db[i].region + " Region"
        appendCell(newRow, "rep", db[i].firstName + " " + db[i].lastName)
        appendCell(newRow, "Q1", db[i].sales.Q1_2000.forecast + "<BR>" +
            db[i].sales.Q1_2000.actual)
        appendCell(newRow, "Q1", db[i].sales.Q1_2000.quotaPct + "%")
        appendCell(newRow, "Q2", db[i].sales.Q2_2000.forecast + "<BR>" +
            db[i].sales.Q2_2000.actual)
```

```
        appendCell(newRow, "Q2", db[i].sales.Q2_2000.quotaPct + "%")
        appendCell(newRow, "Q3", db[i].sales.Q3_2000.forecast + "<BR>" +
            db[i].sales.Q3_2000.actual)
        appendCell(newRow, "Q3", db[i].sales.Q3_2000.quotaPct + "%")
        appendCell(newRow, "Q4", db[i].sales.Q4_2000.forecast + "<BR>" +
            db[i].sales.Q4_2000.actual)
        appendCell(newRow, "Q4", db[i].sales.Q4_2000.quotaPct + "%")
        accumQ1F += db[i].sales.Q1_2000.forecast
        accumQ1A += db[i].sales.Q1_2000.actual
        accumQ2F += db[i].sales.Q2_2000.forecast
        accumQ2A += db[i].sales.Q2_2000.actual
        accumQ3F += db[i].sales.Q3_2000.forecast
        accumQ3A += db[i].sales.Q3_2000.actual
        accumQ4F += db[i].sales.Q4_2000.forecast
        accumQ4A += db[i].sales.Q4_2000.actual
        appendCell(newRow, "repTotal", db[i].totalForecast + "<BR>" +
            db[i].totalActual)
        appendCell(newRow, "repTotal", db[i].totalQuotaPct + "%")
    }
    newRow = document.getElementById("mainTableBody").insertRow(i)
    newRow.className = "QTotal"
    newRow.title = "Totals"
    appendCell(newRow, "grandTotalLabel", "Grand Total")
    appendCell(newRow, "Q1", accumQ1F + "<BR>" + accumQ1A)
    appendCell(newRow, "Q1", getPercentage(accumQ1A, accumQ1F) + "%")
    appendCell(newRow, "Q2", accumQ2F + "<BR>" + accumQ2A)
    appendCell(newRow, "Q2", getPercentage(accumQ2A, accumQ2F) + "%")
    appendCell(newRow, "Q3", accumQ3F + "<BR>" + accumQ3A)
    appendCell(newRow, "Q3", getPercentage(accumQ3A, accumQ3F) + "%")
    appendCell(newRow, "Q4", accumQ4F + "<BR>" + accumQ4A)
    appendCell(newRow, "Q4", getPercentage(accumQ4A, accumQ4F) + "%")
    var grandTotalFcst = accumQ1F + accumQ2F + accumQ3F + accumQ4F
    var grandTotalActual = accumQ1A + accumQ2A + accumQ3A + accumQ4A
    appendCell(newRow, "grandTotal", grandTotalFcst + "<BR>" + grandTotalActual)
    appendCell(newRow, "grandTotal",
        getPercentage(grandTotalActual, grandTotalFcst) +  "%")
}
// insert a cell and its content to a recently added row
function appendCell(Trow, Cclass, txt) {
    var newCell = Trow.insertCell(Trow.cells.length)
    newCell.className = Cclass
    newCell.innerHTML = txt
}
// clear previous table content if there is any
function deleteRows(tbl) {
    while (tbl.rows.length > 0) {
        tbl.deleteRow(0)
    }
}
```

Many standalone statements at the end of the `drawTextTable()` function are devoted exclusively to generating the Grand Total row, in which the accumulated column totals are entered. At the same time, the `getPercentage()` function, described earlier, is invoked several times again to derive the quota percentage for the accumulated grand total values in each quarter as well as the complete year.

SELECT controls

To round out the code listing for this application, the values assigned to the two SELECT elements obviously have a lot to do with the execution of numerous functions in this application. Nothing magic takes place here, but you can see the extent of the detail required in assigning script-meaningful hidden values, and human-meaningful text for both SELECT elements. For example, dividing lines help organize the long sort key list into three logical blocks.

```
<P>Sort by: <SELECT ID="sortChooser" onChange="selectSort(this)">
    <OPTION VALUE="byRep">Representative
    <OPTION VALUE="byRegion">Sales Region
    <OPTION VALUE="">---------------------
    <OPTION VALUE="byQ1Fcst">Q1 Forecast
    <OPTION VALUE="byQ1Actual">Q1 Actual
    <OPTION VALUE="byQ1Quota">Q1 Performance
    <OPTION VALUE="byQ2Fcst">Q2 Forecast
    <OPTION VALUE="byQ2Actual">Q2 Actual
    <OPTION VALUE="byQ2Quota">Q2 Performance
    <OPTION VALUE="byQ3Fcst">Q3 Forecast
    <OPTION VALUE="byQ3Actual">Q3 Actual
    <OPTION VALUE="byQ3Quota">Q3 Performance
    <OPTION VALUE="byQ4Fcst">Q4 Forecast
    <OPTION VALUE="byQ4Actual">Q4 Actual
    <OPTION VALUE="byQ4Quota">Q4 Performance
    <OPTION VALUE="">---------------------
    <OPTION VALUE="byTotalFcst">Total Forecast
    <OPTION VALUE="byTotalActual">Total Actual
    <OPTION VALUE="byTotalQuota">Total Performance
</SELECT>
  
Ordered: <SELECT ID="orderChooser" onChange="selectOrder()">
    <OPTION VALUE="inc">Low to High
    <OPTION VALUE="dec">High to Low
</SELECT>
</P>
```

Dreams of Other Views

Confining the example to just one type of view — a table of numbers — should help you grasp the important processes taking place. But with the XML data converted to JavaScript objects, you can build many other views of the same data into the same page. For example, a script could completely hide the numeric table, and generate a different one that draws bar charts for each sales representative or each region (see Chapter 55 for a scripted bar chart example). The horizontal axis would be the four quarters, and the vertical axis would be dollars or quota percentages. Clicking a bar opens a small window or layer to reveal more detail from the sales representative's record, such as the name of the person's manager. More SELECT elements can let the user select any combination of subsets of the data in either bar chart or numeric table form to facilitate visual comparisons. You might be even more creative and devise ways of showing the data by way of overlapping positioned elements.

The point is that despite the kinds of rendering opportunities afforded by the XSL Transform mechanism (even if you can get comfortable in the syntax and mental model it presents to authors), JavaScript's detailed access to the DOM offers far more potential. Eventually plenty of content authors will mix the two technologies by embedding JavaScript into XSL style sheets to supplement XSL features.

What About NN6?

Microsoft's XML data islands are not (yet anyway) part of the W3C DOM. As NN6 was being readied for release, there was little imperative to implement this feature in the browser (very few convenience features of the IE4+ DOM were adopted in NN6). And, as mentioned elsewhere, without the XML data islands, combining XML and HTML in the same document is not strictly "legal." Oddly enough, the example in this chapter works in NN6, but it is an accident. For one thing, the tag names in the XML data do not overlap with any HTML tag names. But don't take this to mean you can get away with these kinds of constructions. Even if you can force fit your XML into an HTML document to get it to work, you have no guarantee it will work in subsequent browser versions.

To combine the powers of JavaScript and the W3C DOM to operate on XML data in NN6, we have to keep our eyes on availability of the browser's built-in capabilities for standard XSL Transform facilities. Some of it works even in the earliest releases of the new browser, but what works in NN6 doesn't work (or work well) in IE5+, and vice versa. Veteran scripters, who bear scars from battles with DOM incompatibilities, may choose to delay deployments of such content until there is more unanimity among the latest browsers. Browser incompatibilities are responsible for a massive inflation of object model vocabulary (not to mention the thickness of this book). Perhaps the day will come when the code we write for even complex applications will run cleanly on a broad range of installed browsers on a broad range of devices. Don't give up on the dream.

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P A R T

VI

Appendixes

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In This Part

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APPENDIX A

JavaScript and Browser Object Quick Reference

The following pages contain reduced printouts of a handy pamphlet whose Adobe Acrobat (`.pdf`) file you can find on the companion CD-ROM. I modified the arrangement of the following material for printing in this appendix. The `.pdf` files on the CD-ROM, which you can print for quick reference, contain all of the pages you see in this appendix.

This compact guide enables you to see at a glance the breadth of each object's properties, methods, and event handlers. The core JavaScript language section applies to all scriptable browsers. The document object model, however, is divided into the three basic model types that developers must support:

- Fully compatible with all browsers
- Internet Explorer proprietary object model
- W3C DOM-compatible browsers

As a measure of how much the language — and especially the object models — have grown in recent times, the same quick reference for the previous edition of this book amounted to four printable sides. This edition requires no fewer than 12 sides.

The large vocabularies and divisive nature of the existing object models (complicated ever further in the IE browser due to operating system incompatibilities) create a major challenge in designing a portable, quick reference like the one shown on the following pages. Object model groupings in the Quick Reference are designed to be as consistent as possible across the three models; so if you attempt to build applications for multiple object models, you can find, say, the `document` object's property listings in similar positions in each of the three model references. Development for the IE4+ and W3C DOM environments still requires knowledge about the original object model because that legacy model persists in current practice.

To conserve space in the IE4+ and W3C DOM sections, I do not list all HTML element objects (even though I cover them in chapters of this book). A large percentage of HTML elements share the same properties, methods, and event handlers — all of which are listed in each object model's section (in a box labeled "All HTML Elements"). For example, the DIV element has a specific role and behavior from the point of view of the HTML rendering engine; however, as a scriptable object, it has no properties, methods, or event handlers beyond the ones it shares with all HTML elements. Therefore, the only HTML elements that I list within the IE4+ and W3C DOM sections are those that have one or more properties, methods, and event handlers that are either unique to that object or are shared by only a few related elements. Once you are acquainted with the items in common with all elements, it is easier to find the items that are special to a listed object.

If you choose to print the Acrobat files, first read the CD-ROM file `Choose a Version.txt` to determine the format you'd like to print. Then read the `howtoprt.txt` file in the folder dedicated to your chosen format. This file contains printing and assembly directions for optimum convenience with respect to the format you choose.

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Core JavaScript/JScript/ECMAScript (NN2+, IE3+) Quick Reference

JSB4

Array[N3,J2] 37

constructor [N4, IE4]
length
prototype

concat(*array2*)[N4, IE4]
join("*char*")
push()[N4, IE5.5]
pop()[N4, IE5.5]
reverse()
shift()[N4, IE5.5]
slice(i,[j]) [N4, IE4]
sort(*compareFunc*)
splice(i,j[, *items*])[N4, IE5.5]
toLocaleString() [N6, IE5.5]
toString()
unshift()[N4, IE5.5]

Date 36

constructor [N4, IE4]
prototype [N3, IE4]

getFullYear()[N4, J2]
getYear()
getMonth()
getDate()
getDay()
getHours()
getMinutes()
getSeconds()
getTime()
getMilliseconds() [N4, J2]
getUTCFullYear()[N4, J2]
getUTCMonth()[N4, J2]
getUTCDate()[N4, J2]
getUTCDay()[N4, J2]
getUTCHours()[N4, J2]
getUTCMinutes()[N4, J2]
getUTCSeconds()[N4, J2]
getUTCMilliseconds() [N4, J2]
setYear(*val*)
setFullYear(*val*)[N4, J2]
setMonth(*val*)
setDate(*val*)
setDay(*val*)
setHours(*val*)
setMinutes(*val*)
setSeconds(*val*)
setMilliseconds(*val*)[N4, J2]
setTime(*val*)
setUTCFullYear(*val*)[N4, J2]
setUTCMonth(*val*)[N4, J2]
setUTCDate(*val*)[N4, J2]
setUTCDay(*val*)[N4, J2]
setUTCHours(*val*)[N4, J2]
setUTCMinutes(*val*)[N4, J2]
setUTCSeconds(*val*)[N4, J2]
setUTCMilliseconds(*val*)[N4, J2]
getTimezoneOffset()
toDateString()[IE5.5]
toGMTString()
toLocaleDateString() [IE5.5, N6]
toLocaleString()
toLocaleTimeString() [IE5.5, N6]
toString()
toTimeString() [IE5.5]
toUTCString()[N4, J2]
Date.parse("*dateString*")
Date.UTC(*date values*)

String 34

constructor [N4, IE4]
length
prototype [N4, J2]

anchor("*anchorName*")
big()
blink()
bold()
charAt(*index*)
charCodeAt([*i*])[N4, IE4]
concat(*string2*)[N4, IE4]
fixed()
fontcolor(# *rrggbb*)
fontsize(1to7)
fromCharCode(*n1*...)[(1),N4, IE4]
indexOf("*str*" [,*i*])
italics()
lastIndexOf("*str*" [,*i*])
link(*URL*)
localeCompare() [N6, IE5.5]
match(*regexp*)[N4, IE4]
replace(*regexp*,*str*)[N4, IE4]
search(*regexp*)[N4, IE4]
slice(*i,j*)[N4, IE4]
small()
split(*char*)[N3, (2), IE4]
strike()
sub()
substr(*start*,*length*)[N4, IE4]
substring(*intA* , *intB*)
sup()
toLocaleLowerCase() [N6, IE5.5]
toLocaleUpperCase() [N6, IE5.5]
toLowerCase()
toString()[N4, IE4]
toUpperCase()
valueOf()[N4, IE4]

(1)Method of the static String object.
(2)Added behavior in N4 includes: ability to accept a regexp parameter; second parameter (limit integer) to limit the number of splits to be included; a space string parameter signifying any white space character.

Regular Expressions[N4,IE4] 38

global
ignoreCase
input [(1), IE5.5]
lastIndex
multiline [(1), IE5.5]
lastMatch [(1), IE5.5]
lastParen [(1), IE5.5]
leftContext [(1), IE5.5]
prototype
rightContext [(1)]
source
$1...$9

compile(*regexp*)
exec("*string*")[(2)]
test("*string*")
str.match(*regexp*)
str.replace(*regexp*,*str*)
str.search(*regexp*)
str.split(*regexp*[,*limit*])

(1)Property of the static RegExp object.
(2)Returns an array with properties: index, input, [0], [1],...[n].

Boolean[N3,J2] 35

constructor [N4, IE4]
prototype

toString()[N4, IE4]
valueOf()[N4, IE4]

Math[(1)] 35

E
LN2
LN10
LOG2E
LOG10E
PI
SQRT1_2
SQRT2

abs(*val*)
acos(*val*)
asin(*val*)
atan(*val*)
atan2(*val1* , *val2*)
ceil(*val*)
cos(*val*)
exp(*val*)
floor(*val*)
log(*val*)
max(*val1* , *val2*)
min(*val1* , *val2*)
pow(*val1* , *power*)
random()
round(*val*)
sin(*val*)
sqrt(*val*)
tan(*val*)

(1)All properties & methods are of the static Math object.

Number[N3,J2] 35

constructor [N4, IE4]
MAX_VALUE
MIN_VALUE
NaN
NEGATIVE_INFINITY
POSITIVE_INFINITY
prototype

toExponential(*n*)[N6, IE5.5]
toFixed(*n*)[N6, IE5.5]
toLocaleString() [N6, IE5.5]
toString([*radix*])[N4, IE4]
toPrecision(*n*)[N6, IE5.5]
valueOf()[N4, IE4]

Function[N3,J2] 41

arguments
arity [N4]
caller [(1)]
constructor [N4, IE4]
length
prototype

apply(*this* , *argsArray*)[N6, IE5.5]
call(*this*[,*arg1*[,...*argN*]])[N6, IE5.5]
toString()
valueOf()

(1)Discontinued for N6.

Globals 42

Functions
decodeURI("*encodedURI*")[N6, IE5.5]
decodeURIComponent(" *encComp*")[N6, IE5.5]
encodeURI("*URIString*")[N6, IE5.5]
encodeURIComponent(" *compString* ")[N6, IE5.5]
escape(" *string*" [,1])
eval("*string*")
isFinite(*number*)[N4, IE4]
isNaN(*expression*)
Number(*string*)[N4, IE4]
parseFloat("*string*")
parseInt("*string*" [,*radix*])
toString([*radix*])
unescape(" *string*")
unwatch(*prop*)[N4]
watch(*prop*, *handler*)[N4]

Statements
// /*...*/
const [N6]
var

Control Statements 39

```
if (condition ) {
    statementsIfTrue
}

if (condition ) {
    statementsIfTrue
} else {
    statementsIfFalse
}

result = condition ? expr1 : expr2

for ([init expr]; [condition]; [update expr]) {
    statements
}

for (var in object) {
    statements
}

with (object) {
    statements
}

while (condition ) {
    statements
}

do {
    statements
} while (condition )[N4, IE4]

switch ( expression ) {
    case labelN :
        statements
        [break]
    ...
    [default :
        statements ]
}[N4, IE4]

label : [N4, IE4]
continue [ label ][N4, IE4]
break [label ][N4, IE4]

try {
    statements to test
}
[catch ( errorInfo) {
    statements if exception occurs in try block
}]
[finally {
    statements to run, exception or not
}][N6, W5]

throw value [N6, W5]
```

Error [N6,W5] 39

prototype
constructor
description [W5]
fileName [N6]
lineNumber [N6]
message [N6, IE5.5]
name [N6, IE5.5]
number [W5]

toString()

JSB4

Operators 40

Comparison

==	Equals
=== [N4, IE4]	Strictly equals
!=	Does not equal
!== [N4, IE4]	Strictly does not equal
>	Is greater than
>=	Is greater than or equal to
<	Is less than
<=	Is less than or equal to

Arithmetic

+	Plus (and string concat.)
-	Minus
*	Multiply
/	Divide
%	Modulo
++	Increment
--	Decrement
-val	Negation

Assignment

=	Equals
+=	Add by value
-=	Subtract by value
*=	Multiply by value
/=	Divide by value
%=	Modulo by value
<<=	Left shift by value
>>=	Right shift by value
>>>=	Zero fill by value
&=	Bitwise AND by value
|=	Bitwise OR by value
^=	Bitwise XOR by value

Boolean

&&	AND
||	OR
!	NOT

Bitwise

&	Bitwise AND
|	Bitwise OR
^	Bitwise XOR
~	Bitwise NOT
<<	Left shift
>>	Right shift
>>>	Zero fill right shift

Miscellaneous

,	Series delimiter
delete [N4, IE4]	Property destroyer
in [N6, IE5.5]	Item in object
instanceof [N6,W5]	Instance of
new	Object creator
this	Object self-reference
typeof [N3, IE3]	Value type
void [N3, IE3]	Return no value

JavaScript and Browser Objects Quick Reference

Appendix A

JavaScript Bible, 4th Edition by Danny Goodman

How to Use This Quick Reference

This guide contains quick reference info for the core JavaScript language, the original document object model (2 pp), the IE4+DHTML object model (4 pp), and the W3C DOM object model(4 pp) as implemented in IE5+ and NN6. All-uppercase object names refer to HTML elements (IE4+ and W3C DOMs). The three columns in each box list the object's properties,methods, and event handlers in that order. Read the compatibility guides for each section.

Numbers in the upper left corners of object squares are chapter numbers in which the object is covered in detail.

Basic browser and operating system notation codes are as follows:
N — Netscape Navigator   IE — MS Internet Explorer
W — Win32 OS   M — Macintosh OS

See the accompanying file for printing and collating instructions in booklet or broadside configurations.

IE4+, NN6+ style Object Properties

style [IE4,N6] 30

Text & Fonts
color [IE4, N6]
font [IE4, N6]
fontFamily [IE4, N6]
fontSize [IE4, N6]
fontSizeAdjust [M5, N6]
fontStretch [M5, N6]
fontStyle [IE4, N6]
fontVariant [IE4, N6]
fontWeight [IE4, N6]
letterSpacing [IE4, N6]
lineBreak [IE5]
lineHeight [IE4, N6]
quotes [M5, N6]
rubyAlign [IE5]
rubyOverhang [IE5]
rubyPosition [IE5]
textAlign [IE4, N6]
textAlignLast [IE5.5]
textAutospace [W5]
textDecoration [IE4, N6]
textDecorationBlink [IE-Only]
textDecorationLineThrough [IE-Only]
textDecorationNone [IE-Only]
textDecorationOverline [IE-Only]
textDecorationUnderline [IE-Only]
textIndent [IE4, N6]
textJustify [IE5]
textJustifyTrim [IE5]
textKashidaSpace [IE5.5]
textShadow [M5, N6]
textTransform [IE4, N6]
textUnderlinePosition [IE5.5]
unicodeBidi [IE5, N6]
whiteSpace [IE4, N6]
wordBreak [W5]
wordSpacing [IE4, N6]
wordWrap [IE5.5]
writingMode [IE5.5]

Positioning
bottom [IE5, N6]
height [IE4, N6]
left [IE4, N6]
right [IE5, N6]
top [IE4, N6]
width [IE4, N6]
pixelBottom [IE/W-Only]
pixelHeight [IE-Only]
pixelLeft [IE-Only]
pixelRight [IE/W-Only]
pixelTop [IE-Only]
pixelWidth [IE-Only]
posBottom [IE/W-Only]
posHeight [IE-Only]
posLeft [IE-Only]
posRight [IE/W-Only]
posTop [IE-Only]
posWidth [IE-Only]
position [IE4, N6]
zIndex [IE4, N6]

Borders & Edges
border [IE4, N6]
borderBottom [IE4, N6]
borderLeft [IE4, N6]
borderRight [IE4, N6]
borderTop [IE4, N6]
borderBottomColor [IE4, N6]
borderLeftColor [IE4, N6]
borderRightColor [IE4, N6]
borderTopColor [IE4, N6]
borderBottomStyle [IE4, N6]
borderLeftStyle [IE4, N6]
borderRightStyle [IE4, N6]
borderTopStyle [IE4, N6]
borderBottomWidth [IE4, N6]
borderLeftWidth [IE4, N6]
borderRightWidth [IE4, N6]
borderTopWidth [IE4, N6]
borderColor [IE4, N6]
borderStyle [IE4, N6]
borderWidth [IE4, N6]
margin [IE4, N6]
marginBottom [IE4, N6]
marginLeft [IE4, N6]
marginRight [IE4, N6]
marginTop [IE4, N6]
outline [M5, N6]
outlineColor [M5, N6]
outlineStyle [M5, N6]
outlineWidth [M5, N6]
padding [IE4, N6]
paddingBottom [IE4, N6]
paddingLeft [IE4, N6]
paddingRight [IE4, N6]
paddingTop [IE4, N6]

Tables
borderCollapse [M5, N6]
borderSpacing [M5, N6]
captionSide [M5, N6]
emptyCells [M5, N6]
tableLayout [IE5, N6]

Lists
listStyle [IE4, N6]
listStyleImage [IE4, N6]
listStylePosition [IE4, N6]
listStyleType [IE4, N6]

Background
background [IE4, N6]
backgroundAttachment [IE4, N6]
backgroundColor [IE4, N6]
backgroundImage [IE4, N6]
gackgroundPosition [IE4, N6]
backgroundPositionX [IE-Only]
backgroundPositionY [IE-Only]
backgroundRepeat [IE4, N6]

Inline Display & Layout
clear [IE4, N6]
clip [IE4, N6]
clipBottom [W5]
clipLeft [W5]
clipRight [W5]
clipTop [W5]
content [M5, N6]
counterIncrement [M5, N6]
counterReset [M5, N6]
cssFloat [M5, N6]
cursor [IE4, N6]
direction [IE5, N6]
display [IE4, N6]
filter [W4]
floatStyle [M4]
layoutGrid [W5]
layoutGridChar [W5]
layoutGridLine [W5]
layoutGridMode [W5]
layoutGridType [W5]
markerOffset [M5, N6]
marks [M5, N6]
maxHeight [M5, N6]
maxWidth [M5, N6]
minHeight [M5, N6]
minWidth [M5, N6]
overflow [IE4, N6]
overflowX [W5]
overflowY [W5]
styleFloat [IE-Only]
verticalAlign [IE4, N6]
visibility [IE4, N6]
width [IE4, N6]
zoom [IE5.5]

Printing
orphans [M5, N6]
widows [M5, N6]
page [M5, N6]
pageBreakAfter [IE4, N6]
pageBreakBefore [IE4, N6]
pageBreakInside [M5, N6]
size [N6]

Miscellaneous
accelerator [W5]
behavior [W5]
cssText [IE4, N6]
imeMode [W5]

Scrollbars
scrollbar3dLightColor [IE5.5]
scrollbarArrowColor [IE5.5]
scrollbarBaseColor [IE5.5]
scrollbarDarkShadowColor [IE5.5]
scrollbarFaceColor [IE5.5]
scrollbarHighlightColor [IE5.5]
scrollbarShadowColor [IE5.5]
scrollbarTrackColor [IE5.5]

Original DOM (NN2+, IE3+) Quick Reference — Page 1 of 2

JSB4

window 16

_content[N6]	alert("*msg*")	onAbort[N6]
appCore[N6]	attachEvent("*evt*",*func*)[IE5]	onAfterPrint[W5]
clientInformation[IE4]	back()[N4]	onBeforePrint[W5]
clipboardData[W5]	blur()[N3, IE4]	onBeforeUnload[IE4]
closed[N3, IE4]	captureEvents(type)[N4-Only]	onBlur[N3, IE4]
Components[][N6]	clearInterval(ID)[N4, IE4]	onChange[N6]
controllers[][N6]	clearTimeout(ID)	onClick[N6]
crypto[N6]	close()	onClose[N6]
defaultStatus	confirm("*msg*")	onDragDrop[N4,(S)]
dialogArguments[W4]	createPopup()[IE5.5]	onError[N3, IE4]
dialogHeight[W4]	detachEvent("*evt*",*func*)[IE5]	onFocus[N3, IE4]
dialogLeft[W4]	disableExternalCapture()[N4-Only]	onHelp[IE4]
dialogTop[W4]	enableExternalCapture()[N4-Only]	onKeyDown[N6]
dialogWidth[W4]	execScript("*exprs*"[,*lang*])[IE4]	onKeyPress[N6]
directories[N4,(S)]	find(["*str*"][,*case*, *bkwd*])[N4-Only]	onKeyUp[N6]
document	fireEvent("*evt*"[,*evtObj*])[IE5.5]	onLoad
event[IE4]	focus()[N3, IE4]	onMouseDown[N6]
external[W4]	forward()[N4]	onMouseMove[N6]
frameElement[IE5.5]	handleEvent(*event*)[N4-Only]	onMouseOut[N6]
frames[]	home()[N4]	onMouseOver[N6]
history	moveBy(Δ*x*,Δ*y*)[N4, IE4]	onMouseUp[N6]
innerHeight[N4]	moveTo(*x*,*y*)[N4, IE4]	onMove[N4-Only]
innerWidth[N4]	navigate()[IE3]	onReset[N6]
length[N6, IE4]	open(*URL*,"*name*","*specs*")[(1),(S)]	onResize[N4, IE4]
loading[N4-Only]	print()[N4, IE5]	onScroll[IE4]
location	prompt("*msg*","*reply*")	onSelect[N6]
locationbar[N4,(S)]	releaseEvents(*type*)[N4-Only]	onSubmit[N6]
menubar[N4,(S)]	resizeBy(Δ*x*,Δ*y*)[N4, IE4]	onUnload
name	resizeTo(*width*,*height*)[N4, IE4]	
navigator[N6, IE4]	routeEvent(*event*)[N4-Only]	
offscreenBuffering[W4]	scroll(*x*,*y*)[N3, IE4]	
opener[IE3, N3]	scrollBy(Δ*x*,Δ*y*)[N4, IE4]	
outerHeight[N4]	scrollTo(*x*,*y*)[N4, IE4]	
outerWidth[N4]	setActive()[IE5.5]	
pageXOffset[N4]	setInterval(*func*, *msec* [,*args*])[N4,IE4,(2)]	
pageYOffset[N4]	setTimeout(*func*, *msec* [,*args*])[(2)]	
parent	showHelp()[W4]	
personalbar[N4,(S)]	showModalDialog()[W4]	
pkcs11[N6]	showModelessDialog()[W5]	
prompter[N6]	stop()[N4]	
returnValue[W4]		
screen[N6, IE4]		
screenLeft[W5]		
screenTop[W5]		
screenX[N6]		
screenY[N6]		
scrollbars[N4,(S)]		
scrollX[N6]		
scrollY[N6]		
self		
sidebar[N4,(S)]		
status		
statusbar[N4,(S)]		
toolbar[N4,(S)]		
top		
window		

(1)New window specs for all browsers: height, width, toolbar, location, directories, status, menubar, scrollbars, resizable, copyhistory. Add'l specs for N4+: alwaysLowered(S), alwaysRaised(S), dependent, hotkeys, innerHeight, innerWidth, outerHeight, outerWidth, screenX, screenY, titlebar(S), z-lock(S). Add'l specs for IE4+: channelmode, fullscreen, left, top. Add'l spec for IE5+: title.
(2)Optional args parameter added to N4; 3rd parameter in IE4 is for scripting language.

document 18

alinkColor	captureEvents(*type*)[N4-Only]	(None)
anchors[]	clear()	
applets[][N3, IE4]	close()	
bgColor	getSelection()[N4,(2)]	
cookie	handleEvent(*event*)[N4-Only]	
domain[N3, IE4]	open("*mimetype*" [,*replace*])[(3)]	
embeds[][N3, IE4]	releaseEvents(*type*)[N4-Only]	
fgColor	routeEvent(*event*)[N4-Only]	
forms[]	write("*string*")	
height[N4]	writeln("*string*")	
images[][N3, IE4]		
lastModified		
layers[][N4-Only]		
linkColor		
links[]		
location[(1)]		
referrer		
title		
URL[N3, IE4]		
vlinkColor		
width[N4]		

(1) Replaced by the URL property in Navigator 3.
(2) M4 has a document.selection property to retrieve the currently selected text.
(3) mimetype parameter new in M4, but only "text/html" type supported.

layer[N4-Only] 31

above	load("*filename*", *y*)	onBlur
background	moveAbove(*layerObj*)	onFocus
below	moveBelow(*layerObj*)	onLoad
bgColor	moveBy(Δ*x*, Δ*y*)	onMouseOut
clip.bottom	moveTo(*x*, *y*)	onMouseOver
clip.height	moveToAbsolute(*x*, y)	onMouseUp
clip.left	resizeBy(Δ*x*, Δ*y*)	
clip.right	resizeTo(*width*, *height*)	
clip.top		
clip.width		
document		
left		
name		
pageX		
pageY		
parentLayer		
siblingAbove		
siblingBelow		
src		
top		
visibility		
zIndex		

location 17

hash	assign("*URL*")	(None)
host	reload([*unconditional*])[N3,IE4]	
hostname	replace("*URL*")[N3,IE4]	
href		
pathname		
port		
protocol		

link (<A HREF=...></A>) 21

hash	(None)	onClick
host		onDblClick[N4,(1),IE4]
hostname		onMouseDown[N4, IE4]
href		onMouseOut[N4, IE4]
pathname		onMouseOver
port		onMouseUp[N4, IE4]
protocol		
search		
target		
text[N4]		
x[N4]		
y[N4]		

(1) Not implemented in NN4/Mac

anchor (<A NAME=...></A>) 21

name[N4, IE4]	(None)	(None)
text[N4]		
x[N4]		
y[N4]		

image[N3,(1),IE4] 22

border	(None)	onAbort
complete		onError
height		onLoad
hspace		
lowsrc		
name		
src		
vspace		
width		
x[N4]		
y[N4]		

(1) Implemented in IE3.01/Macintosh but not Windows until IE4.

area[N3,IE4] 22

hash	(None)	onClick[N4]
host		onMouseOut
hostname		onMouseOver
href		
pathname		
port		
protocol		
search		
target		

history 17

length	back()	(None)
current[(S),(1)]	forward()	
next[(S),(1)]	go(*int* | "*URL*")	
previous[(S),(1)]		

(1) Accessible in NN3 via a security technique no longer in use. Available in NN4+ with signed scripts.

Page 2 of 2 — Original DOM (NN2+, IE3+) Quick Reference

JSB4

form — 23

Properties	Methods	Event Handlers
action	handleEvent(*evt*)^{N4}	onReset$^{N3, IE4}$
elements[]	reset()$^{N3, IE4}$	onSubmit
encoding	submit()	
length		
method		
name		
target		

button, reset, submit — 24

Properties	Methods	Event Handlers
checked	click()	onClick
form	handleEvent(*evt*)^{N3}	onMouseDown$^{N4, IE4}$
name		onMouseUp$^{N4, IE4}$
type$^{N3, IE4}$		
value		

checkbox — 24

Properties	Methods	Event Handlers
checked	click()	onClick
defaultChecked	handleEvent(*evt*)^{N3}	onMouseDown$^{N4, IE4}$
form		onMouseUp$^{N4, IE4}$
name		
type$^{N3, IE4}$		
value		

radio — 24

Properties	Methods	Event Handlers
checked	click()	onClick
defaultChecked	handleEvent(*evt*)^{N3}	onMouseDown$^{N4, IE4}$
form		onMouseUp$^{N4, IE4}$
length		
name		
type$^{N3, IE4}$		
value		

text, textarea, password, hidden — 25

Properties	Methods	Event Handlers
defaultValue$^{(1)}$	blur()	onBlur
form	focus()	onChange
name	handleEvent(*evt*)^{N4}	onFocus
type$^{N3, IE4}$	select()	onKeyDown$^{N4, IE4}$
value$^{(2)}$		onKeyPress$^{N4, IE4}$
		onKeyUp$^{N4, IE4}$
		onSelect

(1) Not available for textarea object.
(2) Password value property returns empty string in NN2.

file input control$^{N3,(1),IE4}$ — 26

Properties	Methods	Event Handlers
form	blur()	onBlur
name	focus()	onFocus
type	handleEvent(*evt*)^{N4}	onSelect
value	select()	

(1) Netscape also calls this the fileUpload object.

select — 26

Properties	Methods	Event Handlers
length	blur()$^{N3, IE4}$	onBlur
name	focus()$^{N3, IE4}$	onChange
options[i]	handleEvent(*evt*)^{N4}	onFocus
options[i].defaultSelected		
options[i].index		
options[i].selected		
options[i].text		
options[i].value		
selectedIndex		
type$^{N3, IE4}$		

navigator — 28

Properties	Methods
appCodeName	javaEnabled()$^{N3, M4}$
appMinorVersion^{IE4}	preference(*name*[, *val*])$^{N4,(S)}$
appName	taintEnabled()$^{N3, M4}$
appVersion	
browserLanguage^{IE4}	
cookieEnabled$^{N6, IE4}$	
cpuClass^{IE4}	
language^{N4}	
mimeTypes[]$^{N3, M4}$	
onLine^{IE4}	
oscpu^{N6}	
platform$^{N4, IE4}$	
plugins[]$^{N3, M4}$	
product^{N6}	
productSub^{N6}	
securityPolicy^{N6}	
systemLanguage^{IE4}	
userAgent	
userLanguage^{IE4}	
userProfile^{IE4}	
vendor^{N6}	
vendorSub^{N6}	

mimeType^{N3,M4} — 28

Properties	Methods
description	(None)
enabledPlugin	
type	
suffixes	

plugin^{N3,M4} — 28

Properties	Methods
name	refresh()
filename	
description	
length	

screen^{N4,IE4} — 28

Properties	Methods
availHeight	(None)
availLeft$^{(1)}$	
availTop$^{(1)}$	
availWidth	
bufferDepth$^{(2)}$	
colorDepth	
fontSmoothingEnabled$^{(2)}$	
height	
pixelDepth	
updateInterval$^{(2)}$	
width	

(1)N4+ only.
(2)IE4+ only.

Original DOM Compatibility Guide

Baseline browsers for this section are NN2, IE3/J1, and IE 3.01/Mac. An item with no notation is compatible back to that level. Notations indicate the browser and version in which the property, method, or event handler was introduced. An item showing to be introduced only in IE, for example, does not exist for any NN version.

Except for the window and navigator objects (whose listings cover **all** browsers and versions), new features listed in this section cover only through NN4 (and IE4 when they matched a new NN4 feature). Notations are as follows:

- N3 — New in NN3
- N4 — New in NN4
- J2 — New in IE3, JScript.dll ver.2
- IE4 — New in IE4, all OSes
- (S) — Requires signed scripts (NN)

Additional window and navigator object notations are:

- W4 — IE4+/Windows only
- W5 — IE5+/Windows only
- IE5 — IE5+ all OSes
- IE5.5 — IE5.5+ (only Win tested)
- M4 — IE4+/Mac only
- M5 — IE5+/Mac only
- N6 — New in NN6

Except for items marked N4-Only (which are not carried over into NN6), an item listed for an early browser is also available in the IE4+ and/or W3C DOM object models.

"(None)" means that no methods or events exist for the current object through IE3 and NN4.

IE4+ DHTML DOM Quick Reference — Page 1 of 4

JSB4

All HTML Elements 15

accessKey
all[]
behaviorUrns[] W5
canHaveChildren W5
canHaveHTML IE5.5
children
className
clientHeight
clientLeft
clientTop
clientWidth
contentEditable IE5.5
currentStyle IE5
dataFld W4
dataFormatAs W4
dataSrc W4
disabled
document
filters[] W4
hideFocus IE5.5
id
innerHTML
innerText
isContentEditable IE5.5
isDisabled IE5.5
isMultiLine IE5.5
isTextEdit W4
lang
language
length (1)
offsetHeight
offsetLeft
offsetParent
offsetTop
offsetWidth
outerHTML
outerText
parentElement W4
parentTextEdit
readyState
recordNumber W4
runtimeStyle W5
scopeName W5
scrollHeight
scrollLeft
scrollTop
scrollWidth
sourceIndex
style
tabIndex
tagName
tagUrn W5
title
uniqueID W5

addBehavior("*URL*") W5
applyElement(*elem*[,*type*]) W5
attachEvent("*evt*",*func*) W5
blur()
clearAttributes() W5
click()
componentFromPoint(*x*,*y*) W5
contains(*elem*)
detachEvent("*evt*",*func*) W5
fireEvent("*evt*"[,*evt*]) IE5.5
focus()
getAdjacentText() W5
getAttribute("*attr*"[,*case*])
getBoundingClientRect() W5
getClientRects() W5
getExpression() W5
insertAdjacentElement() W5
insertAdjacentHTML()
insertAdjacentText()
item(*index*[,*subindex*]) (1)
mergeAttributes() W5
releaseCapture() W5
removeAttribute("*attr*"[,*case*])
removeBehavior(*ID*) W5
removeExpression("*prop*") W5
removeNode(*children*) W5
replaceAdjacentText("*loc*","*txt*") W5
replaceNode(*new*) W5
scrollIntoView(*top*)
setActive() IE5.5
setAttribute("*attr*",*val*[,*case*])
setCapture(*container*) W5
setExpression("*prop*","*expr*","*lang*") W5
swapNode(*node*) W5
tags("*tag*") (1)
urns("*URN*") W5,(1)

onActivate IE5.5
onBeforeCopy W5
onBeforeCut W5
onBeforeDeactivate IE5.5
onBeforeEditFocus W5
onBeforePaste W5
onBlur
onClick
onContextMenu W5
onControlSelect IE5.5
onCopy W5
onCut W5
onDblClick
onDeactivate IE5.5
onDrag W5
onDragEnd W5
onDragEnter W5
onDragLeave W5
onDragOver W5
onDragStart W5
onDrop W5
onFilterChange W4
onFocus
onHelp W4,M5
onKeyDown
onKeyPress
onKeyUp
onLoseCapture W5
onMouseDown
onMouseEnter IE5.5
onMouseLeave IE5.5
onMouseMove
onMouseOut
onMouseOver
onMouseUp
onPaste W5
onPropertyChange W5
onReadyStateChange
onResize
onResizeEnd IE5.5
onResizeStart IE5.5
onSelectStart

(1)Property or method of all object collections.

popup W5.5 16

document
isOpen

hide()
show()

(None)

FRAMESET 16

border
borderColor
cols
frameBorder
frameSpacing
rows

FRAME 16

borderColor
Document
frameBorder
height
marginHeight
marginWidth
noResize
scrolling
src
width

IFRAME 16

align
Document
frameBorder
frameSpacing
hspace
marginHeight
marginWidth
scrolling
src
vspace

BASE 20

href
target

BASEFONT 20

color
face
size

META 20

charset
content
httpEquiv
name
url

TITLE 20

text

document 18

activeElement
alinkColor
all
anchors[]
applets[]
bgColor
body
charset
cookie
defaultCharset
designMode W5
doctype
domain
embeds[]
expando
fgColor
fileCreatedDate
fileModifiedDate
fileSize
forms[]
frames[]
images[]
lastModified
linkColor
links[]
location
media IE5.5
mimeType W5
namespaces[] IE5.5
parentWindow
plugins[]
protocol
readyState
referrer
scripts[]
security IE5.5
selection
styleSheets[]
title
uniqueID
URL
URLUnencoded IE5.5
vlinkColor

attachEvent("*evt*",*func*) IE5
clear()
clearAttributes() IE5
close()
createElement("*tag*")
createEventObject([*evt*]) IE5.5
createStyleSheet(["*URL*"[,*index*]])
detachEvent("*evt*",*func*) IE5
elementFromPoint(*x*,*y*)
execCommand("*cmd*"[,*UI*][,*arg*])
focus()
mergeAttributes(*obj*) W5
open(["*mimeType*"[,*replace*])
queryCommandEnabled("*cmd*")
queryCommandIndterm("*cmd*")
queryCommandState("*cmd*")
queryCommandSupported("*cmd*")
queryCommandText("*cmd*")
queryCommandValue("*cmd*")
recalc(*allFlag*) W5
releaseCapture() IE5
setActive() IE5.5
write("*str*")
writeln("*str*")

onActivate IE5.5
onBeforeCut W5
onBeforeDeactivate IE5.5
onBeforeEditFocus W5
onBeforePaste W5
onClick
onContextMenu W5
onControlSelect IE5.5
onCut
onDblClick
onDeactivate IE5.5
onDrag W5
onDragEnd W5
onDragEnter W5
onDragLeave W5
onDragOver W5
onDragStart W5
onDrop W5
onHelp W4,M5
onKeyDown
onKeyPress
onKeyUp
onMouseDown
onMouseMove
onMouseOut
onMouseOver
onMouseUp
onPaste
onPropertyChange W5
onReadyStateChange
onResizeEnd IE5.5
onResizeStart IE5.5
onSelectionChange
onStop IE5

BODY 18

alink
background
bgColor
bgProperties
bottomMargin
leftMargin
link
noWrap
rightMargin
scroll
scrollLeft
scrollTop
text
topMargin
vLink

createControlRange() W5
createTextRange()
doScroll(["*scrollAction*"]) W5

onAfterPrint W5
onBeforePrint W5
onScroll

Page 2 of 4 — IE4+ DHTML DOM Quick Reference

JSB4

FORM — 23

Properties	Methods	Events
action	reset()	onReset
autocomplete W5	submit()	onSubmit
elements[]		
encoding		
enctype		
length		
method		
name		
target		

LABEL — 23

Properties	Methods	Events
htmlFor	(None)	(None)

BUTTON / INPUT (button, reset, submit, radio, checkbox) — 24

(See original object model button, reset, submit, radio, and checkbox object listings.)

INPUT (image) — 24

Properties	Methods	Events
complete	(None)	(None)
form		
name		
src		
type		

INPUT (text, password, hidden) — 25

(See original object model text, password, and hidden object listings.)

Properties	Methods	Events
maxLength	(None)	onAfterUpdate W4
readOnly		onBeforeUpdate W4
size		onErrorUpdate W4

TEXTAREA — 25

(See original object model textarea object listing.)

Properties	Methods	Events
cols	createTextRange()	onAfterUpdate W4
readOnly		onBeforeUpdate W4
rows		onErrorUpdate W4
wrap		

SELECT — 26

(See original object model select object listing.)

Properties	Methods	Events
length	options[i].add(*elem*[,*index*])	(None)
multiple	options[i].remove()	
size		
value		

OPTION — 26

Properties	Methods	Events
defaultSelected	(None)	(None)
form		
selected		
text		
value		

A (anchor/link) — 21

hash
host
hostname
href
Methods
mimeType
name
nameProp
pathname
port
protocol
protocolLong
rel
rev
search
target
urn

IE4+ DHTML DOM Compatibility Guide

The baseline browser for this section is MSIE 4. An item with no notation is compatible back to that level for all OS versions. Notations as follows:

W4 — IE4+/Windows only
W5 — IE5+/Windows only
IE5 — IE5+ all OSes
IE5.5 — IE5.5+ (only Win tested)
M5 — IE5+/Mac

All HTML element objects share items from "All HTML" box on Page 1. "(None)" means no special methods or events for the current object.

OL — 27

compact
start
type

UL — 27

compact
type

LI — 27

type
value

DL, DT, DD, DIR, MENU

compact

IMG — 22

Properties	Methods	Events
align	(None)	onAbort
alt		onError
border		onLoad
complete		
dynsrc		
fileCreatedDate		
fileModifiedDate		
fileSize		
fileUpdatedDate		
height		
href		
hspace		
isMap		
loop		
lowsrc		
name		
nameProp W5		
protocol		
src		
start		
useMap		
vspace		
width		

AREA — 22

Properties	Methods	Events
alt	(None)	(None)
coords		
hash		
host		
hostname		
href		
noHref		
pathname		
port		
protocol		
search		
shape		
target		

MAP — 22

Properties	Methods	Events
areas[]	(None)	onScroll
name		

MARQUEE — 19

Properties	Methods	Events
behavior	start()	onBounce
bgColor	stop()	onFinish
direction		onStart
height		
hspace		
loop		
scrollAmount		
scrollDelay		
trueSpeed		
vspace		
width		

IE4+ DHTML DOM Quick Reference Page 3 of 4

JSB4

TABLE 27

align	createCaption()	onScroll
background	createTFoot()	
bgColor	createTHead()	
border	deleteCaption()	
borderColor	deleteRow(i)	
borderColorDark	deleteTFoot()	
borderColorLight	deleteTHead()	
caption	firstPage() [W5]	
cellPadding	insertRow(*i*)	
cellSpacing	lastPage() [W5]	
cells[]	moveRow(*srcIndex*,*destIndex*) [W5]	
cols[]	nextPage() [W4]	
datePageSize	previousPage() [W4]	
frame	refresh()	
height		
rows[]		
rules		
tBodies[]		
tFoot		
tHead		
width		

TBODY, TFOOT, THEAD 27

align	deleteRow(*i*)	(None)
bgColor	insertRow(*i*)	
rows	moveRow(*srcIndex*,*destIndex*)	
vAlign		

TR 27

align	deleteCell(*i*)	(None)
bgColor	insertCell(*i*)	
borderColor		
borderColorDark		
borderColorLight		
cells[]		
height		
rowIndex		
sectionRowIndex		
vAlign		

TD, TH 27

align
background
bgColor
borderColor
borderColorDark
borderColorLight
cellIndex
colSpan
height
noWrap
rowSpan
vAlign
width

COL, COLGROUP 27

align
span
vAlign
width

CAPTION 27

align
vAlign

H1...H6 19

align

HR 19

align
color
noShade
size
width

BR 19

clear

FONT 19

color
face
size

IE4+ DHTML DOM Compatibility Guide

The baseline browser for this section is MSIE 4. An item with no notation is compatible back to that level for all OS versions. Notations as follows:

W4 — IE4+/Windows only
W5 — IE5+/Windows only
IE5 — IE5+ all OSes
IE5.5 — IE5.5+ (only Win tested)
M5 — IE5+/Mac

All HTML element objects share items from "All HTML" box on Page 1.
"(None)" means no special methods or events for the current object.
This Quick Reference does not contain listings for Microsoft's separate XML DOM.

TextRange [W4] 19

boundingHeight	collapse([*start*])	(None)
boundingLeft	compareEndPoints("*type*",*range*)	
boundingTop	duplicate()	
boundingWidth	execCommand("*cmd*"[,*UI*[,*val*]])	
htmlText	expand("*unit*")	
offsetLeft	findText("*str*"[,*scope*,*flags*])	
offsetTop	getBookmark()	
text	getBoundingClientRect()	
	getClientRects()	
	inRange(*range*)	
	isEqual(*range*)	
	move("*unit*"[,*count*])	
	moveEnd("*unit*"[,*count*])	
	moveStart("*unit*"[,*count*])	
	moveToBookmark("*bookmark*")	
	moveToElementText(*elem*)	
	moveToPoint(*x*,*y*)	
	parentElement()	
	pasteHTML("*HTMLText*")	
	queryCommandEnabled("*cmd*")	
	queryCommandIndeterm("*cmd*")	
	queryCommandState("*cmd*")	
	queryCommandSupported("*cmd*")	
	queryCommandText("*cmd*")	
	queryCommandValue("*cmd*")	
	scrollIntoView()	
	select()	
	setEndPoint("*type*",*range*)	

TextNode [IE5] 19

data	splitText(*offset*)	(None)
length		
nextSibling		
nodeName		
nodeType		
nodeValue		
parentNode		
previousSibling		

selection [M4] 19

type	clear()	(None)
	createRange()	
	empty()	

TextRectangle [IE5] 19

bottom	(None)	(None)
left		
right		
top		

Page 4 of 4 — IE4+ DHTML DOM Quick Reference

JSB4

STYLE 30

media	(None)	(None)
type		

styleSheet 30

cssText [IE5]	addImport("*URL*"[,*index*])	(None)
disabled	addRule("*selector*","*styleSpec* "[,*index*])	
href	removeRule(*index*)	
id		
imports[]		
media		
owningElement		
pages[] [IE5.5]		
parentStyleSheet		
readOnly		
rules[]		
title		
type		

currentStyle [IE5], runtimeStyle [IE5.5] 30

(See **style** object)

rule 30

readOnly	(None)	(None)
selectorText		
style		

LINK 20

disabled	(None)	onLoad
href		
hreflang		
media		
rel		
rev		
styleSheet		
target		
type		

SCRIPT 20

defer	(None)	(None)
event		
htmlFor		
language		
src		
text		
type		

event 29

altKey
altLeft [IE5.5]
behaviorCookie [W5.5]
behaviorPart [W5.5]
bookmarks [W4]
boundElements
button
cancelBubble
clientX
clientY
contentOverflow
ctrlKey
ctrlLeft [IE5.5]
dataFld [W4]
dataTransfer [W5]
fromElement
keyCode
nextPage [W5.5]
offsetX
offsetY
propertyName [W5]
qualifier [W4]
reason [W4]
recordset [W4]
repeat [W5]
returnValue
saveType [W5.5]
screenX
screenY
shiftKey
shiftLeft [IE5.5]
srcElement
srcFilter [W4]
srcUrn [W5]
toElement
type
x
y

APPLET 32

align	(None)	onCellChange [W5]
altHTML		onDataAvailable [W5]
code		onDatasetChanged [W5]
codeBase		onDatasetComplete [W5]
height		onLoad
hspace		onRowEnter [W5]
name		onRowExit [W5]
vspace		onRowsDelete [W5]
width		onRowsInserted [W5]
		onScroll

OBJECT 32

align	(None)	onCellChange [W5]
altHTML		onDataAvailable [W5]
BaseHref		onDatasetChanged [W5]
classid		onDatasetComplete [W5]
code		onLoad
codeBase		onRowEnter [W5]
codeType		onRowExit [W5]
height		onRowsDelete [W5]
hspace		onRowsInserted [W5]
name		onScroll
object		
type		
vspace		
width		

EMBED 32

align	(None)	onLoad
height		onScroll
hidden		
name		
pluginspage		
src		
units		
width		

XML [W5] 32

src	(None)	(None)
XMLDocument		

W3C DOM (IE5+, NN6+) Quick Reference — Page 1 of 4

JSB4

All HTML Elements 15

attributes[]	addEventListener("*evt*",*func*,*capt*)(2)	onBlur
childNodes[]	appendChild(*elem*)	onClick
className	blur()	onDblClick
dir	click()	onFocus
firstChild	cloneNode(*deep*)	onKeyDown
id	dispatchEvent(*evt*)(2)	onKeyPress
innerHTML(1)	focus()	onKeyUp
lang	getAttribute("*attr*")	onMouseDown
lastChild	getAttributeNode("*attr*")(2)	onMouseMove
length(3)	getElementsByTagName("*tag*")	onMouseOut
localName	hasChildNodes()	onMouseOver
namespaceURI	insertBefore(*new*[,*ref*])	onMouseUp
nextSibling	item(*index*)(3)	onResize
nodeName	normalize()(2)	
nodeType	removeAttribute("*attr*")	
nodeValue	removeAttributeNode(*node*)(2)	
offsetHeight(1)	removeChild(*node*)	
offsetLeft(1)	removeEventListener("*evt*",*func*,*capt*)(2)	
offsetParent(1)	replaceChild(*new*,*old*)	
offsetTop(1)	setAttribute("*attr*",*val*)	
offsetWidth(1)	setAttributeNode(*node*)(2)	
ownerDocument	supports("*feature*")(2)	
parentNode		
prefix		
previousSibling		
style		
tabIndex		
tagName		
title		

(1)Originating from the IE4 Object Model, this non-W3C item is implemented in N6 for convenience.
(2)Not implemented in IE through 5.5.
(3)Property or method of all object collections.

HTML 20

version(1)	(None)	(None)

(1)Not implemented in IE through 5.5.

FRAMESET 16

cols	(None)	(None)
rows		

FRAME 16

contentDocument(1)	(None)	(None)
frameBorder		
longDesc(1)		
marginHeight		
marginWidth		
noResize		
scrolling		
src		

(1)Not implemented in IE through 5.5.

HEAD 20

profile(1)

(1)Not implemented in IE through 5.5.

BASE 20

href
target

BASEFONT 20

color
face
size

META 20

charset
content
httpEquiv
name
url

TITLE 20

text

W3C DOM Compatibility Guide

Baseline browsers for this section are IE5 and NN6. An item with no notation is compatible with these browsers for all OS versions. Observe footnotes for items missing from IE.
All HTML element objects share items from "All HTML" box on Page 1.
"(None)" means no special methods or events for the current object.

IFRAME 16

align
contentDocument(1)
frameBorder
longDesc(1)
marginHeight
marginWidth
scrolling
src

(1)Not implemented in IE through 5.5.

document 18

alinkColor	clear()	onBlur
anchors[]	close()	onClick
applets[]	createAttribute("*name*")	onDblClick
attributes[]	createDocumentFragment()	onFocus
bgColor	createElement("*tag*")	onKeyDown
body	createTextNode("*txt*")	onKeyPress
characterSet(1)	focus()	onKeyUp
childNodes[]	getElementById("*ID*")	onMouseDown
cookie	getElementsByName("*name*")	onMouseMove
doctype(1)	getElementsByTagName("*tag*")	onMouseOut
documentElement	open("*mimeType*"[,*replace*])	onMouseOver
domain	write("*str*")	onMouseUp
embeds[]	writeln("*str*")	onResize
fgColor		
firstChild		
forms[]		
height(1)		
images[]		
implementation(1)		
lastChild		
lastModified		
linkColor		
links[]		
location		
namespaceURI		
nextSibling		
nodeName		
nodeType		
ownerDocument(1)		
parentNode		
plugins		
previousSibling		
referrer		
styleSheets[]		
title		
URL		
vlinkColor		
width(1)		

(1)Not implemented in IE through 5.5.

BODY 18

alink	(None)	(None)
background		
bgColor		
link		
text		
vLink		

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JSB4

FORM 23

Properties	Methods	Event Handlers
acceptCharset (1)	reset()	onReset
action	submit()	onSubmit
elements[]		
encoding		
enctype		
length		
method		
name		
target		

(1)Not implemented in IE through 5.5.

FIELDSET, LEGEND 23

Properties	Methods	Event Handlers
align	(None)	(None)
form		

LABEL 23

Properties	Methods	Event Handlers
accessKey	(None)	(None)
form(1)		
htmlFor		

(1)Not implemented in IE through 5.5.

BUTTON
INPUT (button, reset, submit, radio, checkbox) 24

(See original object model button, reset, submit, radio, and checkbox object listings.)

disabled

INPUT (image) 24

Properties	Methods	Event Handlers
disabled	(None)	(None)
form		
name		
src		
type		

INPUT (text, password, hidden) 25

(See original object model text, password, and hidden object listings.)

Properties	Methods	Event Handlers
disabled	(None)	(None)
maxLength		
readOnly		
size		

TEXTAREA 25

(See original object model textarea object listing.)

Properties	Methods	Event Handlers
cols	(None)	(None)
disabled		
readOnly		
rows		

SELECT 26

(See original object model select object listing.)

Properties	Methods	Event Handlers
disabled	item(*i*)	(None)
length	namedItem("*optionID*")	
multiple	options[*i*].remove()	
size		
value		

OPTION 26

Properties	Methods	Event Handlers
defaultSelected	(None)	(None)
disabled		
form		
label (1)		
selected		
text		
value		

(1)Not implemented in IE/Windows through 5.5, but is implemented in IE5/Mac.

OPTGROUP 26

Properties	Methods	Event Handlers
form(1)	(None)	(None)
label (1)		

(1)Not implemented in IE/Windows through 5.5, but is implemented in IE5/Mac.

IMG 22

Properties	Methods	Event Handlers
align	(None)	onAbort
alt		onError
border		onLoad
complete		
height		
href		
hspace		
isMap		
longDesc (1)		
lowsrc		
lowSrc (1)		
name		
src		
useMap		
vspace		
width		

(1)Not implemented in IE through 5.5.

OL 27

compact
start
type

UL 27

compact
type

DL, DT, DD, DIR, MENU

compact

LI 27

type
value

A (anchor/link) 21

charset (1)
coords (1)
hash
host
hostname
href
hreflang (1)
name
pathname
port
protocol
rel
rev
search
shape (1)
target
type (1)

(1)Not implemented in IE through 5.5.

AREA 22

alt
coords
hash
host
hostname
href
noHref
pathname
port
protocol
search
shape
target

MAP 22

areas
name

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JSB4

TABLE 27

align	createCaption()	onScroll
bgColor	createTFoot()	
border	createTHead()	
caption	deleteCaption()	
cellPadding	deleteRow(*i*)	
cellSpacing	deleteTFoot()	
frame	deleteTHead()	
height	insertRow(*i*)	
rows[]		
rules		
summary [1]		
tBodies		
tFoot		
tHead		
width		

(1)Not implemented in IE through 5.5.

TBODY, TFOOT, THEAD 27

align	deleteRow(*i*)	(None)
bgColor	insertRow(*i*)	
ch [1]		
chOff [1]		
rows		
vAlign		

(1)Not implemented in IE through 5.5.

TR 27

align	deleteCell(*i*)	(None)
bgColor	insertCell(*i*)	
cells[]		
ch [1]		
chOff [1]		
rowIndex		
vAlign		

(1)Not implemented in IE through 5.5.

TD, TH 27

- abbr [1]
- align
- axis [1]
- background
- bgColor
- cellIndex
- ch [1]
- chOff [1]
- colSpan
- headers [1]
- height
- noWrap
- rowSpan
- vAlign
- width

(1)Not implemented in IE through 5.5.

COL, COLGROUP 27

- align
- ch [1]
- chOff [1]
- span
- vAlign
- width

(1)Not implemented in IE through 5.5

CAPTION 27

- align
- vAlign

H1...H6 19

- align

HR 19

- align
- color
- noShade
- size
- width

BR 19

- clear

FONT 19

- color
- face
- size

BLOCKQUOTE, Q 19

- cite [1]

(1)Not implemented in IE through 5.5.

Node Types

ELEMENT_NODE	1
ATTRIBUTE_NODE	2
TEXT_NODE	3
CDATA_SECTION_NODE	4
ENTITY_REFERENCE_NODE	5
ENTITY_NODE	6
PROCESSING_INSTRUCTION_NODE	7
COMMENT_NODE	8
DOCUMENT_NODE	9
DOCUMENT_TYPE_NODE	10
DOCUMENT_FRAGMENT_NODE	11
NOTATION_NODE	12

Range[1] 19

collapsed	cloneContents() [2]	(None)
commonAncestorContainer	cloneRange()	
endContainer	collapse([*start*])	
endOffset	compareBoundaryPoints(*type*,*src*)[3]	
startContainer	createContextualFragment(" *text*")	
startOffset	deleteContents()	
	detach()	
	extractContents() [2]	
	insertNode(*node*)[2]	
	isValidFragment(" *txt*")	
	selectNode(*node*)	
	selectNodeContents(*node*)	
	setEnd(*node*,*offset*)	
	setEndAfter(*node*)	
	setEndBefore(*node*)	
	setStart(*node*,*offset*)	
	setStartAfter(*node*)	
	setStartBefore(*node*)	
	surroundContents(*node*)[2]	
	toString()	

(1)Not implemented in IE through 5.5
(2)Not implemented in NN6.0
(3)Broken in NN6.0

Text[1] 19

data	appendChild(*node*)	(None)
length	appendData("*text*")	
	cloneNode(*deep*)	
	deleteData(*offset*,*count*)	
	hasChildNodes()	
	insertBefore(*new*,*ref*)	
	insertData(*offset*,"*text*")	
	normalize()	
	removeChild()	
	replaceChild(*offset*,*count*,"*text*")	
	splitText(*offset*)	
	substringData(*offset*,*count*)	

(1)Not implemented in IE through 5.5.

selection[1],[2] 19

anchorNode	addRange(*range*)	(None)
anchorOffset	clearSelection()	
focusNode	collapse(*node*,*offset*)	
focusOffset	containsNode(*node*,*recurse*)	
isCollapsed	deleteFromDocument()	
rangeCount	extend(*node*,*offset*)	
	getRangeAt()	
	removeRange(*range*)	

(1)NN6.0 does not provide a way to create a selection object
(2)Not implemented in IE through 5.5.

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JSB4

STYLE 30

media	(None)	(None)
type		

styleSheet 30

cssRules[]	deleteRule(*index*)(1)	(None)
disabled	insertRule(" *rule* ",*index*)(1)	
href		
media		
ownerNode(1)		
ownerRule(1)		
parentStyleSheet		
title		
type		

(1)Not implemented in IE through 5.5.

cssRule 30

cssText (2)	(None)	(None)
parentStyleSheet (2)		
selectorText		
style		
type (1)		

(1)Not implemented in IE through 5.5.
(2)Not implemented in IE through 5.5, but implemented in IE5/Mac.

LINK 20

charset (1)	(None)	(None)
disabled		
href		
hreflang		
media		
rel		
rev		
target		
type		

(1)Not implemented in IE through 5.5.

SCRIPT 20

defer	(None)	(None)
event		
htmlFor		
language		
src		
text		
type		

W3C DOM Compatibility Guide

Baseline browsers for this section are IE5 and NN6. An item with no notation is compatible with these browsers for all OS versions. Observe footnotes for items missing from IE.
All HTML element objects share items from "All HTML" box on Page 1.
"(None)" means no special methods or events for the current object.

event (1) 29

altKey	initEvent(" *type* ",*bubble*,*cancelable*)	(None)
bubbles	initKeyEvent(" *type* ", *evtArgs*)	
button	initMouseEvent(" *type* ", *evtArgs*)	
cancelBubble	initUIEvent(" *type* ", *evtArgs*)	
cancelable	preventDefault()	
charCode	stopPropagation()	
clientX		
clientY		
ctrlKey		
currentTarget		
detail		
eventPhase		
isChar		
keyCode		
layerX		
layerY		
metaKey		
pageX		
pageY		
relatedTarget		
screenX		
screenY		
shiftKey		
target		
timeStamp		
type		
view		

(1)Not implemented in IE through 5.5.

EMBED 32

align	(None)	onLoad
height		onScroll
name		
src		
width		

APPLET 32

align
alt(1)
archive (1)
code
codeBase
height
hspace
name
object (1)
vspace
width

(1)Not implemented in IE through 5.5.

OBJECT 32

align
alt(1)
code
codeBase
codeType
contentDocument
height
hspace
name
object
type
vspace
width

(1)Not implemented in IE through 5.5.

APPENDIX B

JavaScript Reserved Words

Every programming language has a built-in vocabulary of keywords that you cannot use for the names of variables and the like. Because a JavaScript function is an object that uses the function name as an identifier for the object, you cannot employ reserved words for function names either. Netscape's list of reserved words closely echoes that of the Java language; thus, many of the keywords in the list do not — at least yet — apply to JavaScript. Remember that JavaScript keywords are case-sensitive. While you may get away with using these words in other cases, it may lead to unnecessary confusion for someone reading your scripts.

abstract	boolean	break	byte
case	catch	char	class
const	continue	debugger	default
delete	do	double	else
enum	export	extends	false
final	finally	float	for
function	goto	if	implements
import	in	instanceof	int
interface	long	native	new
null	package	private	protected
public	return	short	static
super	switch	synchronized	this
throw	throws	transient	true
try	typeof	var	void
while	with		

APPENDIX C

Answers to Tutorial Exercises

This appendix provides answers to the tutorial exercises that appear in Part II of this book (Chapters 4 through 12).

Chapter 4 Answers

1. The music jukebox (a) and temperature calculator (d) are good client-side JavaScript applications. Even though the jukebox relies on server storage of the music files, you can create a more engaging and responsive user interface of buttons, swappable images, and information from a plug-in, such as LiveAudio, Windows Media Player, or QuickTime. The temperature calculator is a natural, because all processing is done instantaneously on the client, rather than having to access the server for each conversion.

   The Web site visit counter (b) that accumulates the number of different visitors to a Web site is a server-side CGI application, because the count must be updated and maintained on the server. At best, a client-side counter could keep track of the number of visits the user has made to a site and report to the user how many times he or she has been to the site. The storage requires scripting the cookie (Chapter 16). A chat room application (c) done properly requires server facilities to open up communication channels among all users connected simultaneously. Client-side scripting by itself cannot create a live chat environment.

2. The first task is to determine a valid identifier for the General Motors location in the hierarchy. Then "connect the dots":

   a. General_Motors.Chevrolet.Malibu

   b. General_Motors.Pontiac.Firebird

   c. General_Motors.Pontiac.Bonneville

3. a. Valid, because it is one contiguous word. InterCap spelling is fine.

   b. Valid, because an underscore character is acceptable between words.

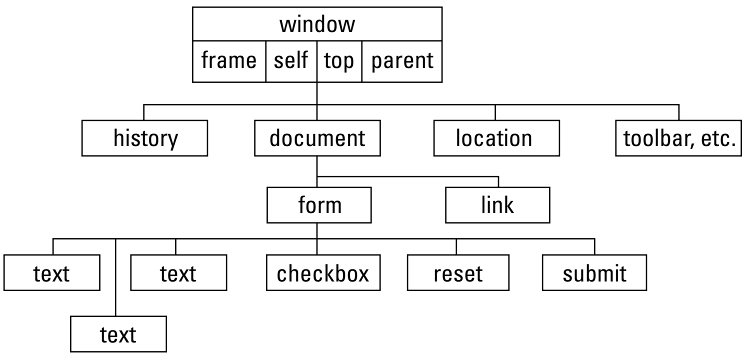
   c. Not valid, because an identifier cannot begin with a numeral.

   d. Not valid, because no spaces are allowed.

   e. Not valid, because apostrophes and most other punctuation are not allowed.

4. The names that I assign here are arbitrary, but the paths are not.

```
document.myLink
document.entryForm
document.entryForm.nameField
document.entryForm.addressField
document.entryForm.phoneField
document.entryForm.noArchiveBox
```



5.
```
<INPUT TYPE="button" NAME="Hi" VALUE="Howdy"
onClick="alert('Hello to you, too!')">
```

Chapter 5 Answers

1.
```
<SCRIPT LANGUAGE="JavaScript">
<!--
document.write("Hello, world.")
// -->
</SCRIPT>
```

2.
```
<HTML>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
<!--
document.write("Hello, world.")
// -->
</SCRIPT>
</BODY>
</HTML>
```

3.
```
<HTML>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
<!--
// write a welcome message to the world
document.write("Hello, world.")
// -->
</SCRIPT>
</BODY>
</HTML>
```

4. My answer is written so that both event handlers call separate functions. You can also have each event handler invoke the `alert()` method inline.

```
<HTML>
<HEAD>
<TITLE>An onLoad= script</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
function done() {
    alert("The page has finished loading.")
}
function alertUser() {
    alert("Ouch!")
}
// -->
</SCRIPT>
</HEAD>
<BODY onLoad="done()">
Here is some body text.
<FORM>
    <INPUT TYPE="button" NAME="oneButton" VALUE="Press Me!"
onClick="alertUser()">
</FORM>
</BODY>
</HTML>
```

5. **a.** The page displays two text fields.

   b. The user enters text into the first field and either clicks or tabs out of the field to trigger the `onChange` event handler.

   c. The function displays an all-uppercase version of one field into the other.

Chapter 6 Answers

1. **a.** Valid.

   b. Not valid. The variable needs to be a single word, such as `howMany` or `how_many`.

   c. Valid.

   d. Not valid. The variable name cannot begin with a numeral. If the variable needs a number to help distinguish it from other similar variables, then put the numeral at the end: `address1`.

2. **a.** 4

   b. 40

   c. "4020"

   d. "Robert"

3. The functions are `parseInt()` and `parseFloat()`. Strings to be converted are passed as parameters to the functions: `parseInt(document.forms[0].entry.value)`.

4. Both text field values are strings that must be converted to numbers before they can be arithmetically added together. You can use the `parseFloat()` functions either on the variable assignment expressions (for example, `var value1 = parseFloat(document.adder.inputA.value)`) or in the addition expression `(document.adder.output.value = parseFloat(value1) + parseFloat(value2))`.

5. Concatenate means to join together two strings to become one string.

Chapter 7 Answers

1. Because the references in the function point to a text field named `entry` inside a form named `entryForm`, be sure to assign those names to the `NAME` attributes in the respective HTML tags.

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
var USStates = new Array(51)
USStates[0] = "Alabama"
USStates[1] = "Alaska"
USStates[2] = "Arizona"
USStates[3] = "Arkansas"
USStates[4] = "California"
USStates[5] = "Colorado"
USStates[6] = "Connecticut"
USStates[7] = "Delaware"
USStates[8] = "District of Columbia"
USStates[9] = "Florida"
USStates[10] = "Georgia"
USStates[11] = "Hawaii"
USStates[12] = "Idaho"
USStates[13] = "Illinois"
USStates[14] = "Indiana"
USStates[15] = "Iowa"
USStates[16] = "Kansas"
USStates[17] = "Kentucky"
USStates[18] = "Louisiana"
USStates[19] = "Maine"
USStates[20] = "Maryland"
USStates[21] = "Massachusetts"
USStates[22] = "Michigan"
USStates[23] = "Minnesota"
```

```
USStates[24] = "Mississippi"
USStates[25] = "Missouri"
USStates[26] = "Montana"
USStates[27] = "Nebraska"
USStates[28] = "Nevada"
USStates[29] = "New Hampshire"
USStates[30] = "New Jersey"
USStates[31] = "New Mexico"
USStates[32] = "New York"
USStates[33] = "North Carolina"
USStates[34] = "North Dakota"
USStates[35] = "Ohio"
USStates[36] = "Oklahoma"
USStates[37] = "Oregon"
USStates[38] = "Pennsylvania"
USStates[39] = "Rhode Island"
USStates[40] = "South Carolina"
USStates[41] = "South Dakota"
USStates[42] = "Tennessee"
USStates[43] = "Texas"
USStates[44] = "Utah"
USStates[45] = "Vermont"
USStates[46] = "Virginia"
USStates[47] = "Washington"
USStates[48] = "West Virginia"
USStates[49] = "Wisconsin"
USStates[50] = "Wyoming"

var stateEntered = new Array(51)
stateEntered[0] = 1819
stateEntered[1] = 1959
stateEntered[2] = 1912
stateEntered[3] = 1836
stateEntered[4] = 1850
stateEntered[5] = 1876
stateEntered[6] = 1788
stateEntered[7] = 1787
stateEntered[8] = 0000
stateEntered[9] = 1845
stateEntered[10] = 1788
stateEntered[11] = 1959
stateEntered[12] = 1890
stateEntered[13] = 1818
stateEntered[14] = 1816
stateEntered[15] = 1846
stateEntered[16] = 1861
stateEntered[17] = 1792
stateEntered[18] = 1812
stateEntered[19] = 1820
stateEntered[20] = 1788
stateEntered[21] = 1788
stateEntered[22] = 1837
stateEntered[23] = 1858
stateEntered[24] = 1817
stateEntered[25] = 1821
stateEntered[26] = 1889
```

```
stateEntered[27] = 1867
stateEntered[28] = 1864
stateEntered[29] = 1788
stateEntered[30] = 1787
stateEntered[31] = 1912
stateEntered[32] = 1788
stateEntered[33] = 1789
stateEntered[34] = 1889
stateEntered[35] = 1803
stateEntered[36] = 1907
stateEntered[37] = 1859
stateEntered[38] = 1787
stateEntered[39] = 1790
stateEntered[40] = 1788
stateEntered[41] = 1889
stateEntered[42] = 1796
stateEntered[43] = 1845
stateEntered[44] = 1896
stateEntered[45] = 1791
stateEntered[46] = 1788
stateEntered[47] = 1889
stateEntered[48] = 1863
stateEntered[49] = 1848
stateEntered[50] = 1890

function getStateDate() {
    var selectedState = document.entryForm.entry.value
    for (var i = 0; i < USStates.length; i++) {
        if (USStates[i] == selectedState) {
            break
        }
    }
    alert("That state entered the Union in " +
stateEntered[i] + ".")
}
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="entryForm">
Enter the name of a state:
<INPUT TYPE="text" NAME="entry">
<INPUT TYPE="button" VALUE="Look Up Entry Date"
onClick="getStateDate()">
</FORM>
</BODY>
</HTML>
```

2. Several problems plague this function definition. Parentheses are missing from the first `if` construction's condition statement. Curly braces are missing from the second nested `if...else` construction. A mismatch of curly braces also exists for the entire function. The following is the correct form (changes and additions in boldface):

```
function format(ohmage) {
    var result
    if (ohmage >= 10e6) {
        ohmage = ohmage / 10e5
```

```
        result = ohmage + " Mohms"
    } else {
        if (ohmage >= 10e3) {
            ohmage = ohmage / 10e2
            result = ohmage + " Kohms"
        } else {
            result = ohmage + " ohms"
        }
    }
    alert(result)
}
```

3. Here is one possibility:

```
for (var i = 1; i < tomatoes.length; i++) {
    if (tomatoes[i].looks == "mighty tasty") {
        break
    }
}
var myTomato = tomatoes[i]
```

4. The new version defines a different local variable name for the dog.

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
var aBoy = "Charlie Brown"    // global
var hisDog = "Snoopy"         // global
function sampleFunction() {
    // using improper design to demonstrate a point
    var WallacesDog = "Gromit" // local version of hisDog
    var output = WallacesDog + " does not belong to " +
        aBoy + ".<BR>"
    document.write(output)
}
</SCRIPT>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
sampleFunction()    // runs as document loads
document.write(hisDog + " belongs to " + aBoy + ".")
</SCRIPT>
</BODY>
</HTML>
```

5. The application uses three parallel arrays and is structured very much like the solution to question 1. Learn to reuse code whenever you can.

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
var planets = new Array(4)
planets[0] = "Mercury"
planets[1] = "Venus"
planets[2] = "Earth"
planets[3] = "Mars"
```

```
var distance = new Array(4)
distance[0] = "36 million miles"
distance[1] = "67 million miles"
distance[2] = "93 million miles"
distance[3] = "141 million miles"

var diameter = new Array(4)
diameter[0] = "3100 miles"
diameter[1] = "7700 miles"
diameter[2] = "7920 miles"
diameter[3] = "4200 miles"

function getPlanetData() {
    var selectedPlanet = document.entryForm.entry.value
    for ( var i = 0; i < planets.length; i++) {
        if (planets[i] == selectedPlanet) {
            break
        }
    }
    var msg = planets[i] + " is " + distance[i]
    msg += " from the Sun and "
    msg += diameter[i] + " in diameter."
    document.entryForm.output.value = msg
}
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="entryForm">
Enter the name of a planet:
<INPUT TYPE="text" NAME="entry">
<INPUT TYPE="button" VALUE="Look Up a Planet"
onClick="getPlanetData()">
<BR>
<INPUT TYPE="text" SIZE=70 NAME="output">
</BODY>
</HTML>
```

Chapter 8 Answers

1. **a.** Close, but no cigar. Array references are always plural:

   `window.document.forms[0].`

   b. Not valid: `self` refers to a window and `entryForm` must refer to a form. Where's the `document`? It should be `self.document.entryForm.entryField.value.`

   c. Valid.

   d. Not valid. The `document` reference is missing from this one.

   e. Valid, assuming that `newWindow` is a variable holding a reference to a subwindow.

2. `window.status = "Welcome to my Web page."`

3. `document.write("<H1>Welcome to my Web page.</H1>")`

4. A script in the Body portion invokes a function that returns the text entered in a `prompt()` dialog box.

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function askName() {
    var name = prompt("What is your name, please?","")
    return name
}
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
document.write("Welcome to my web page, " + askName() + ".")
</SCRIPT>
</BODY>
</HTML>
```

5. The URL can be derived from the `href` property of the `location` object.

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function showLocation() {
    alert("This page is at: " + location.href)
}
</SCRIPT>
</HEAD>
<BODY onLoad="showLocation()">
Blah, blah, blah.
</BODY>
</HTML>
```

Chapter 9 Answers

1. For Listing 9-1, pass the text object because that's the only object involved in the entire transaction.

```
<HTML>
<HEAD>
<TITLE>Text Object value Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function upperMe(field) {
    field.value = field.value.toUpperCase()
}
</SCRIPT>
</HEAD>
<BODY>
<FORM onSubmit="return false">
```

```
<INPUT TYPE="text" NAME="convertor" VALUE="sample"
onChange="upperMe(this)">
</FORM>
</BODY>
</HTML>
```

For Listing 9-2, the button invokes a function that communicates with a different element in the form. Pass the form object.

```
<HTML>
<HEAD>
<TITLE>Checkbox Inspector</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function inspectBox(form) {
    if (form.checkThis.checked) {
        alert("The box is checked.")
    } else {
        alert("The box is not checked at the moment.")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="checkbox" NAME="checkThis">Check here<BR>
<INPUT TYPE="button" VALUE="Inspect Box"
onClick="inspectBox(this.form)">
</FORM>
</BODY>
</HTML>
```

For Listing 9-3, again the button invokes a function that looks at other elements in the form. Pass the form object.

```
<HTML>
<HEAD>
<TITLE>Extracting Highlighted Radio Button</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function fullName(form) {
    for (var i = 0; i < form.stooges.length; i++) {
        if (form.stooges[i].checked) {
            break
        }
    }
    alert("You chose " + form.stooges[i].value + ".")
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<B>Select your favorite Stooge:</B>
<INPUT TYPE="radio" NAME="stooges" VALUE="Moe Howard"
CHECKED>Moe
```

```
<INPUT TYPE="radio" NAME="stooges" VALUE="Larry Fine"> Larry
<INPUT TYPE="radio" NAME="stooges" VALUE="Curly Howard">
Curly<BR>
<INPUT TYPE="button" NAME="Viewer" VALUE="View Full Name..."
onClick="fullName(this.form)">
</FORM>
</BODY>
</HTML>
```

For Listing 9-4, all action is triggered by and confined to the SELECT object. Pass only that object to the function.

```
<HTML>
<HEAD>
<TITLE>Select Navigation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function goThere(list) {
    location = list.options[list.selectedIndex].value
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Choose a place to go:
<SELECT NAME="urlList" onChange="goThere(this)">
    <OPTION SELECTED VALUE="index.html">Home Page
    <OPTION VALUE="store.html">Shop Our Store
    <OPTION VALUE="policies.html">Shipping Policies
    <OPTION VALUE="http://www.yahoo.com">Search the Web
</SELECT>
</FORM>
</BODY>
</HTML>
```

2. This requires a bit of surgery. The Submit button is replaced with a standard button whose `VALUE` attribute is set to "Submit." The button's `onClick` event handler calls the `checkForm()` function, which performs the validation. If an empty field exists, the function must return to bail out of the loop. Because the event handler is not expecting any returned value, you can simply issue the `return` statement to stop the function altogether. If all the tests pass, then the form is submitted with the `submit()` method. Functions that have a `return` statement inside an `if` construction must also have a `return` statement outside the construction so that it always returns a value (including the `null` value used here). The other change is that the `onSubmit` event handler has been removed from the `<FORM>` tag, because it is no longer needed (the `submit()` method does not trigger an `onSubmit` event handler).

```
<HTML>
<HEAD>
<TITLE>Validator</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
function checkForm(form) {
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].value == "") {
            alert("Fill out ALL fields.")
            return
        }
    }
    form.submit()
    return
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Please enter all requested information:<BR>
First Name:<INPUT TYPE="text" NAME="firstName"><BR>
Last Name:<INPUT TYPE="text" NAME="lastName"><BR>
Rank:<INPUT TYPE="text" NAME="rank"><BR>
Serial Number:<INPUT TYPE="text" NAME="serialNumber"><BR>

<A HREF="javascript:void checkForm(document.forms[0])">
Submit Form</A>
</FORM>
</BODY>
</HTML>
```

3. The `this` keyword refers to the text field object, so that `this.value` refers to the `value` property of that object.

```
function showText(txt) {
    alert(txt)
}
```

4. `document.accessories.acc1.value = "Leather Carrying Case"`

```
document.forms[1].acc1.value = "Leather Carrying Case"
```

5. The SELECT object invokes a function that does the job.

```
<HTML>
<HEAD>
<TITLE>Color Changer</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setColor(list) {
    var newColor = list.options[list.selectedIndex].value
    document.bgColor = newColor
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Select a background color:
<SELECT onChange="setColor(this)">
<OPTION VALUE="red">Stop
<OPTION VALUE="yellow">Caution
<OPTION VALUE="green">Go
```

```
</SELECT>
</FORM>
</BODY>
</HTML>
```

Chapter 10 Answers

1. Use `string.indexOf()` to see if the field contains the "@" symbol.

```
<HTML>
<HEAD>
<TITLE>E-mail Validator</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkAddress(form) {
    if (form.email.value.indexOf("@") == -1) {
        alert("Check the e-mail address for accuracy.")
        return false
    }
    return true
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="return checkAddress(this)">
Enter your e-mail address:
<INPUT TYPE="text" NAME="email" SIZE=30><BR>
<INPUT TYPE="submit">
</FORM>
</BODY>
</HTML>
```

2. Remember that the substring goes up to, but does not include, the index of the second parameter. Spaces count as characters.

```
myString.substring(0,3)    // result = "Net"
myString.substring(13,18)  // result = "gator"
myString.substring(4,12)   // result = "cape Nav"
```

3. The missing `for` loop is in boldface. You could also use the increment operator on the `count` variable (`++count`) to add 1 to it for each letter "e."

```
function countE(form) {
    var count = 0
    var inputString = form.mainstring.value.toLowerCase()
    for (var i = 0; i < inputString.length; i++) {
        if (inputString.charAt(i) == "e") {
            count += 1
        }
    }
    var msg = "The string has " + count
    msg += " instances of the letter e."
    alert(msg)
}
```

4. The formula for the random throw of one die is in the chapter.

```
<HTML>
<HEAD>
<TITLE>E-mail Validator</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function roll(form) {
    form.die1.value = Math.floor(Math.random() * 6) + 1
    form.die2.value = Math.floor(Math.random() * 6) + 1
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="text" NAME="die1" SIZE=2>
<INPUT TYPE="text" NAME="die2" SIZE=2><BR>
<INPUT TYPE="button" VALUE="Roll the Dice"
onClick="roll(this.form)">
</FORM>
</BODY>
</HTML>
```

5. If you used the `Math.round()` method in your calculations, that is fine for your current exposure to the `Math` object. Another method, `Math.ceil()`, may be more valuable because it rounds up any fractional value.

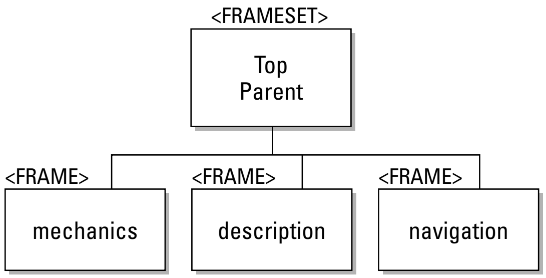
```
<HTML>
<HEAD>
<TITLE>Waiting for Santa</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function daysToXMAS() {
    var oneDay = 1000 * 60 * 60 * 24
    var today = new Date()
    var XMAS = new Date("December 25, 2001")
    var diff = XMAS.getTime() - today.getTime()
    return Math.ceil(diff/oneDay)
}
</SCRIPT>
</HEAD>

<BODY>
<SCRIPT LANGUAGE="JavaScript">
document.write(daysToXMAS() + " days until Christmas.")
</SCRIPT>
</BODY>
</HTML>
```

Chapter 11 Answers

1. `onLoad="parent.currCourse = 'history101'"`

2.



3. All three frames are siblings, so references include the parent.

```
parent.mechanics.location.href = "french201M.html"
parent.description.location.href = "french201D.html"
```

4. A script in one of the documents is attempting to reference the `selector` object in one of the frames but the document has not fully loaded, causing the object to not yet be in the browser's object model. Rearrange the script so that it fires in response to the `onLoad` event handler of the framesetting document.

5. From the subwindow, the `opener` property refers back to the frame containing the `window.open()` method. To extend the reference to the frame's parent, the reference includes both pieces: `opener.parent.ObjVarFuncName`.

Chapter 12 Answers

1. As the document loads, the `<IMG>` tag creates a document image object. A memory image object is created with the new `Image()` constructor. Both objects have the same properties, and assigning a URL to the `src` property of a memory object loads the image into the browser's image cache.

2. `var janeImg = new Image(100,120)`

   `janeImg.src = "jane.jpg"`

3. `document.images["people"].src = janeImg.src`

4. Surround `<IMG>` tags with link (A element) tags, and use the link's `onClick`, `onMouseOver`, and `onMouseOut` event handlers. Set the image's `BORDER` attribute to zero if you don't want the link highlight to appear around the image.

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APPENDIX D

JavaScript and DOM Internet Resources

As an online technology, JavaScript has plenty of support online for scripters. Items recommended here were taken as a snapshot of Internet offerings in early 2001. But beware! Sites change. URLs change. Be prepared to hunt around for these items if the information provided here becomes out-of-date by the time you read this.

Support and Updates for this Book

The most up-to-date list of errata and other notes of interest pertaining to this edition of the *JavaScript Bible* can be found at the official Support Center, located at:

`http://www.dannyg.com/update.html`

If you are experiencing difficulty with the example listings in this book, first check with the Support Center to see if your question has been answered. As mentioned earlier, you are encouraged to enter the tutorial listings yourself to get used to typing JavaScript (and HTML) code. If, after copying the examples from Part II, you can't make something work (and a fix hasn't already been posted to the Support Center), send the file you've typed to me via e-mail, along with a description of what's not working for you. Also tell me the browser version and operating system that you're using. My e-mail address is `dannyg@dannyg.com`. Regretfully, I am unable to answer general questions about JavaScript or how to apply examples from the book to your own projects.

Newsgroups

The best places to get quick answers to your pressing questions are online newsgroups. Here are the top JavaScript-related newsgroups:

On most news servers:

```
comp.lang.javascript
```

On `news://msnews.microsoft.com`

```
microsoft.public.scripting.jscript
microsoft.public.windows.inetexplorer.ie5.programming.dhtml
microsoft.public.windows.inetexplorer.ie5.programming.dhtml.scripting
microsoft.public.inetsdk.programming.scripting.jscript
```

On `news://secnews.netscape.com`

```
netscape.public.mozilla.dom
netscape.public.mozilla.jseng
```

Before you post a question to a newsgroup, however, read about FAQs in the following section and also use the extremely valuable Deja.com newsgroup archive, which is now owned by Google. Look for links to "Usenet Advanced Search" at:

```
http://groups.google.com
```

Enter the keyword or phrase into the top text box, but then also try to narrow your search by limiting the newsgroup(s) to search. For example, if you have a question about weird behavior you are experiencing with the `borderCollapse` style property in IE, enter `borderCollapse` into the keyword field, and then first try narrowing the search to the newsgroup `comp.lang.javascript`. If you don't find the answer there, try again with all the Microsoft newsgroups by specifying `microsoft.public.*` in the Newsgroups field.

If you post a question to a newsgroup, you will most likely get a quick and intelligent response if you also provide either some sample code that's giving you a problem, or a link to a temporary file on your server that others can check out. Visualizing a problem you've spent days on is very hard for others. Be as specific as possible, including the browser(s) on which the code must run and the nature of the problem.

FAQs

One situation that arises with a popular and accessible technology, such as JavaScript and DHTML authoring, is that the same questions get asked over and over, as newcomers arrive on the scene daily. Rather than invoke the ire of newsgroup users, look through existing FAQ files to see if your concern has already been raised and answered. Here are some of the best JavaScript FAQ sites:

```
javascript.faqts.com
developer.irt.org/script/script.htm
```

For less-frequently asked questions — but previously asked and answered in a public form — use the `dejanews.com` archive search, described earlier in this appendix.

Online Documentation

Locations of Web sites that dispense official documentation for one browser or another are extremely fluid. Therefore, the following information contains links only to top-level areas of appropriate Web sites, along with tips on what to look for after you are at the site.

For Netscape browser technologies, start at:

```
http://developer.netscape.com/library/
```

You can also find some interesting future-oriented developer documentation at:

```
http://www.mozilla.org/docs
```

Microsoft has condensed its developer documentation into a massive site called MSDN (Microsoft Developer Network). The place to begin is:

```
http://msdn.microsoft.com/workshop/
```

This page is the portal to many technologies, but the one most applicable to JavaScript and client-side scripting is one labeled "DHTML, HTML & CSS". Look for subject headers covering Document Object Model and DHTML References. The core JScript language is detailed in a separate section:

```
http://msdn.microsoft.com/scripting/jscript/techinfo/jsdocs.htm
```

Finally, you can read the industry standards for HTML, CSS, and ECMAScript technologies online. Be aware that these documents are primarily intended for developers of tools that we use — browsers, WYSIWYG editors,and so forth — to direct them on how their products should respond to tags, style sheets, scripts, and so on. Reading these documents has frequently been cited as a cure for insomnia.

```
http://www.ecma.ch/ecma1/STAND/ECMA-262.HTM
http://www.w3.org/TR/html4
http://www.w3.org/TR/REC-CSS2
```

Please note that just because a particular item is described in an industry standard doesn't mean that it is implemented in any or all browsers. In the real world, we must develop for the way the technologies are actually implemented in browsers.

World Wide Web

The number of Web sites devoted to JavaScript tips and tricks is mind-boggling. Many sites come and go in the middle of the night, leaving no trace of their former existence. If you are looking for more example code for applications not covered in this book, perhaps the best place to begin your journey is through the traditional search engines. Narrowing your search through careful keyword choice is vital. In addition to the Netscape and (heavily Windows-oriented) Microsoft developer Web sites (plus numerous online articles of mine listed at `http://www.dannyg.com/recentwriting.html`), a couple other venerable sites are:

```
http://builder.com
http://www.webreference.com
```

These sites are by no means the only worthwhile JavaScript and DHTML destinations on the Web. Sometimes having too many sources is as terrifying as having not enough. The links and newsgroups described in this appendix should take you a long way.

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APPENDIX E

What's on the CD-ROM

The accompanying Windows–Macintosh CD-ROM contains nearly 300 HTML Document listings from the book, substantial supplemental book material, electronic versions of the Quick Reference shown in Appendix A, a complete, searchable version of the book, trial software, and the Adobe Acrobat Reader.

System Requirements

To derive the most benefit from the example Listings, you should have both Netscape Navigator 6 (or later) and Internet Explorer 5 (or later) installed on your computer. While many scripts run in both browsers, several scripts demonstrate features that are available on only one browser or the other. To write scripts, you can use a simple text editor, word processor, or dedicated HTML editor.

To use the Adobe Acrobat Reader, you need the following:

✦ For Windows 95, Windows 98, or Windows NT4.0 (with SP3 or later), you should be using a 486 or Pentium computer with 16MB of RAM and 10MB of hard disk space.

✦ Macintosh users require a PowerPC, System 7.1,2 or later, at least 8MB of RAM, and 8MB of disk space.

Disc Contents

Platform-specific software is located in the appropriate Windows and Macintosh directories on the CD-ROM. The contents include the following items.

JavaScript listings for Windows and Macintosh text editors

Starting with Part III of the book, almost all example listings are on the CD-ROM in the form of complete HTML files, which you can load into a browser to see the language item in operation. A directory called Listings contains the HTML and related files, with nested folders named for each chapter. Each HTML file's name is keyed to the Listing number in the book. For example, the file for Listing 15-1 is named `lst15-01.htm`. Note that no listings are provided for the tutorial chapters of Part II, because you are encouraged to enter HTML and scripting code manually.

For your convenience, an `index.html` file in the Listings folder provides a front-end table of contents to the HTML files for the book's program listings. Open that file from your browser whenever you want to access the program listing files. If you intend to access that index page frequently, you can bookmark it in your browser(s). Using the index file to access the listing files can be very important in some cases, because several individual files must be opened within their associated framesets to work properly. Accessing the files through the `index.html` file assures that you open the frameset. The `index.html` file also shows browser compatibility ratings for all the listings. This saves you time from opening listings that are not intended to run on your browser. To examine and modify the HTML source files, open them from your favorite text editor program (for Windows editors, be sure to specify the `.htm` file extension in the Open File dialog box).

You can open all listing files directly from the CD-ROM, but if you copy them to your hard drive, access is faster and you will be able to experiment with modifying the files more readily. Copy the folder named Listings from the CD-ROM to any location on your hard drive.

JavaScript and Browser Object Quick Reference from Appendix A (Adobe Acrobat format)

If you like the Quick Reference in Appendix A, you can print it out in your choice of format with the help of the Adobe Acrobat Reader, included with the CD-ROM. The files are located on the CD-ROM in the `:Author_Files:JS Object Reference:` folder in PDF format. To decide on the format that is best for you, read the file named `Choose a Version.txt`. The `.pdf` file for each version is contained in its own subdirectory, where you also find full assembly and collating instructions in a companion text file. Start Acrobat Reader on your computer and open the desired file from either the CD-ROM or from a copy made to your hard drive. Before printing out the document, be sure to choose Landscape orientation in the Page Setup dialog box of Acrobat Reader.

Adobe Acrobat Reader

The Adobe Acrobat Reader is a helpful program that enables you to view the reference example sections for Parts III and IV of the book, the Quick Reference from Appendix A, and the searchable version of this book, all of which are in `.pdf` format on the CD-ROM. To install and run Adobe Acrobat Reader, follow these steps:

For Windows

1. Start Windows Explorer or Windows NT Explorer and then open the Acrobat folder on the CD-ROM.
2. In the Acrobat folder, double-click `rs405eng.exe` and follow the instructions presented on-screen for installing Adobe Acrobat Reader.

For Macintosh

1. Open the Acrobat folder on the CD-ROM.
2. In the Acrobat folder, double-click the Adobe Acrobat Installer icon and follow the instructions presented on-screen for installing Adobe Acrobat Reader.

Reference example sections from Parts III and IV

In many places throughout the reference chapters of Parts III and IV, you see an icon that directs you to the CD-ROM for an example of the language term being discussed. All of these example sections are collected into Appendix F, which is located on the CD-ROM and is part ot the book's `.pdf` file. For the fastest access to these example sections, copy the Examples directory and its contents to your hard disk.

An example may consist of a detailed description of a listing or directions on how to experiment with the term through a handy learning utility on the CD-ROM, called The Evaluator, which is located among the listings for Chapter 15. While many of these example sections contain listings, the Acrobat files are distinct from the HTML listing files that you run in your browser and edit with your text editor.

Searchable version of the book

This is a complete, searchable version of the book, provided in Adobe Acrobat `.pdf` format. Access it from the JSB4 folder after installing Adobe Acrobat Reader. To take advantage of the full-text search, you must add the book's index file (`.pdx` file) to the list of indexes available to your copy of Acrobat Reader. Here are the steps to add the index:

1. Choose Search from the Edit menu.
2. Choose Select Indexes from the submenu.
3. Click the Add button.
4. Locate the `.pdx` file on the CD-ROM in the directory containing the book's `.pdf` files and open the `.pdx` file. The *JavaScript Bible* index should be listed in the Index Selection window. If the checkbox next to the name is not yet checked, check it now.
5. Click OK.

To begin an actual search, click the Search icon (binoculars in front of a sheet of paper). Enter the text for which you're searching. The search also covers the text of example listings. To access the index and search facilities in future sessions, the CD-ROM must be in your CD-ROM drive.

Commercial software products

Included on the CD-ROM are licensed versions of Microsoft Internet Explorer 5.5 for Windows and both the Windows and Macintosh versions of Netscape Navigator 6.0. These products are included on the CD-ROM for your convenience if you have not yet downloaded the installers for the products from Microsoft or Netscape. Prior to installing either product, be sure that you read and understand the installation instructions.

Commercial, trial, and shareware software

We also include the following software for your review:

Index Stock Imagery WebSpice Objects

The CD-ROM contains the full version of WebSpice Objects. The product contains 3,000 high-quality buttons, labels, borders, and other art to give the professional look to your Web pages.

Helios Software Solutions TextPad 4.3.1 (Windows only)

TextPad is a favorite Windows text editor for programmers. TextPad is a significant improvement over the Notepad and WordPad editors that come with Windows, but doesn't have all the overhead that you find in word processors. TextPad is shareware. Registration information is included with the product.

Bare Bones Software BBEdit 5.1.1 (Macintosh only)

BBEdit is the most popular text editor for the Macintosh. The version on the CD-ROM is a demo version.

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APPENDIX F

Examples from Parts III and IV

Chapter 15 Examples

The following section contains examples from Chapter 15, "Generic HTML Element Objects."

Generic Objects

Properties

accessKey

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

When you load the script in Listing 15-1, adjust the height of the browser window so that you can see nothing below the second dividing rule. Enter any character into the Settings portion of the page and press Enter. (The Enter key may cause your computer to beep.) Then hold down the Alt (Windows) or Ctrl (Mac) key while pressing the same keyboard key. The element from below the second divider should come into view.

Listing 15-1: Controlling the accessKey Property

```
<HTML>
<HEAD>
<TITLE>accessKey Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function assignKey(type, elem) {
    if (window.event.keyCode == 13) {
        switch (type) {
            case "button":
                document.forms["output"].access1.accessKey = elem.value
                break
            case "text":
                document.forms["output"].access2.accessKey = elem.value
                break
            case "table":
                document.all.myTable.accessKey = elem.value
        }
        return false
    }
}
</SCRIPT>
</HEAD>
<BODY>
```

```
<H1>accessKey Property Lab</H1>
<HR>
Settings:<BR>
<FORM NAME="input">
Assign an accessKey value to the Button below and press Return:
<INPUT TYPE="text" SIZE=2 MAXLENGTH=1
onKeyPress="return assignKey('button', this)">
<BR>
Assign an accessKey value to the Text Box below and press Return:
<INPUT TYPE="text" SIZE=2 MAXLENGTH=1
onKeyPress="return assignKey('text', this)">
<BR>
Assign an accessKey value to the Table below (IE5.5 only) and press Return:
<INPUT TYPE="text" SIZE=2 MAXLENGTH=1
onKeyPress="return assignKey('table', this)">
</FORM>
<BR>
Then press Alt (Windows) or Control (Mac) + the key.
<BR>
<I>Size the browser window to view nothing lower than this line.</I>
<HR>

<FORM NAME="output" onSubmit="return false">
<INPUT TYPE="button" NAME="access1" VALUE="Standard Button">
<P></P>
<INPUT TYPE="text" NAME="access2">
<P></P>
</FORM>
<TABLE ID="myTable" CELLPADDING="10" BORDER=2>
<TR>
<TH>Quantity<TH>Description<TH>Price
</TR>
<TBODY BGCOLOR="red">
<TR>
    <TD WIDTH=100>4<TD>Primary Widget<TD>$14.96
</TR>
<TR>
    <TD>10<TD>Secondary Widget<TD>$114.96
</TR>
</TBODY>
</TABLE>

</BODY>
</HTML>
```

Note

In IE5, the keyboard combination may bring focus to the input field. This anomalous behavior does not affect the normal script setting of the `accessKey` property.

all

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `all` collection. Enter the following statements one at a time into the lower text box, and review the results in the textarea for each.

```
document.all
myTable.all
myP.all
```

If you encounter a numbered element within a collection, you can explore that element to see which tag is associated with it. For example, if one of the results for the `document.all` collection says `document.all.8=[object]`, enter the following statement into the topmost text box:

```
document.all[8].tagName
```

attributes

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to examine the values of the `attributes` array for some of the elements in that document. Enter each of the following expressions into the lower text field, and see the array contents in the Results textarea for each:

```
document.body.attributes
document.getElementById("myP").attributes
document.getElementById("myTable").attributes
```

If you have both NN6 and IE5, compare the results you get for each of these expressions. To view the properties of a single attribute in IE5/Windows, enter the following statement into the bottom text field:

```
document.getElementById("myP").attributes["class"]
```

For NN6 and IE5/Mac, use the W3C DOM syntax:

```
document.getElementById("myP").attributes.getNamedItem("class")
```

behaviorUrns

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

The following function is embedded within a more complete example of IE/Windows HTML behaviors (Listing 15-19 in this chapter). It reports the length of the `behaviorUrns` array and shows — if the values are returned — the URL of the attached behavior.

```
function showBehaviors() {
    var num = document.all.myP.behaviorUrns.length
    var msg = "The myP element has " + num + " behavior(s). "
    if (num > 0) {
        msg += "Name(s): \r\n"
        for (var i = 0; i < num; i++) {
            msg += document.all.myP.behaviorUrns[i] + "\r\n"
        }
    }
    alert(msg)
}
```

canHaveChildren

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-2 uses color to demonstrate the difference between an element that can have children and one that cannot. The first button sets the `color` style property of every visible element on the page to red. Thus, elements (including the normally non-childbearing ones such as HR and INPUT) are affected by the color change. But if you reset the page and click the largest button, only those elements that can contain nested elements receive the color change.

Listing 15-2: **Reading the canHaveChildren Property**

```
<HTML>
<HEAD>
<TITLE>canHaveChildren Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function colorAll() {
    for (var i = 0; i < document.all.length; i++) {
        document.all[i].style.color = "red"
    }
}

function colorChildBearing() {
    for (var i = 0; i < document.all.length; i++) {
        if (document.all[i].canHaveChildren) {
            document.all[i].style.color = "red"
        }
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>canHaveChildren Property Lab</H1>
<HR>
<FORM NAME="input">
<INPUT TYPE="button" VALUE="Color All Elements" onClick="colorAll()">
<BR>
<INPUT TYPE="button" VALUE="Reset" onClick="history.go(0)">
<BR>
<INPUT TYPE="button" VALUE="Color Only Elements That Can Have Children"
onClick="colorChildBearing()">
</FORM>
<BR>
<HR>

<FORM NAME="output">
<INPUT TYPE="checkbox" CHECKED>Your basic checkbox
<P></P>
<INPUT TYPE="text" NAME="access2" VALUE="Some textbox text.">
<P></P>
</FORM>
<TABLE ID="myTable" CELLPADDING="10" BORDER=2>
<TR>
<TH>Quantity<TH>Description<TH>Price
</TR>
```

```
<TBODY>
<TR>
    <TD WIDTH=100>4<TD>Primary Widget<TD>$14.96
</TR>
<TR>
    <TD>10<TD>Secondary Widget<TD>$114.96
</TR>
</TBODY>
</TABLE>

</BODY>
</HTML>
```

canHaveHTML

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with the `canHaveHTML` property. Enter the following statements into the top text field and observe the results:

```
document.all.input.canHaveHTML
document.all.myP.canHaveHTML
```

The first statement returns `false` because an INPUT element (the top text field in this case) cannot have nested HTML. But the `myP` element is a P element that gladly accepts HTML content.

childNodes

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	

Example

The `walkChildNodes()` function shown in Listing 15-3 accumulates and returns a hierarchical list of child nodes from the point of view of the document's HTML element (the default) or any element whose ID you pass as a string parameter. This function is embedded in The Evaluator so that you can inspect the child node hierarchy of that page or (when using `evaluator.js` for debugging as described in Chapter 45) the node hierarchy within any page you have under construction. Try it out in The Evaluator by entering the following statements into the top text field:

```
walkChildNodes()
walkChildNodes(getElementById("myP"))
```

The results of this function show the nesting relationships among all child nodes within the scope of the initial object. It also shows the act of drilling down to further `childNodes` collections until all child nodes are exposed and catalogued. Text nodes are labeled accordingly. The first 15 characters of the actual text are placed in the results to help you identify the nodes when you compare the results against your HTML source code. The early NN6 phantom text nodes that contain carriage returns display `<cr>` in the results for each return character.

Listing 15-3: **Collecting Child Nodes**

```
function walkChildNodes(objRef, n) {
    var obj
    if (objRef) {
        if (typeof objRef == "string") {
            obj = document.getElementById(objRef)
        } else {
            obj = objRef
        }
    } else {
        obj = (document.body.parentElement) ?
            document.body.parentElement : document.body.parentNode
    }
    var output = ""
    var indent = ""
    var i, group, txt
    if (n) {
        for (i = 0; i < n; i++) {
            indent += "+---"
        }
    } else {
        n = 0
        output += "Child Nodes of <" + obj.tagName
        output += ">\n=====================\n"
    }
    group = obj.childNodes
    for (i = 0; i < group.length; i++) {
        output += indent
        switch (group[i].nodeType) {
```

```
                case 1:
                    output += "<" + group[i].tagName
                    output += (group[i].id) ? " ID=" + group[i].id : ""
                    output += (group[i].name) ? " NAME=" + group[i].name : ""
                    output += ">\n"
                    break
                case 3:
                    txt = group[i].nodeValue.substr(0,15)
                    output += "[Text:\"" + txt.replace(/[\r\n]/g,"<cr>")
                    if (group[i].nodeValue.length > 15) {
                        output += "..."
                    }
                    output += "\"]\n"
                    break
                case 8:
                    output += "[!COMMENT!]\n"
                    break
                default:
                    output += "[Node Type = " + group[i].nodeType + "]\n"
            }
            if (group[i].childNodes.length > 0) {
                output += walkChildNodes(group[i], n+1)
            }
        }
        return output
}
```

children

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The `walkChildren()` function shown in Listing 15-4 accumulates and returns a hierarchical list of child elements from the point of view of the document's HTML element (the default) or any element whose ID you pass as a string parameter. This function is embedded in The Evaluator so that you can inspect the parent–child hierarchy of that page or (when using `evaluator.js` for debugging as described in Chapter 45) the element hierarchy within any page you have under construction. Try it out in The Evaluator in IE5+ by entering the following statements into the top text field:

```
walkChildren()
walkChildren("myP")
```

The results of this function show the nesting relationships among all parent and child elements within the scope of the initial object. It also shows the act of drilling down to further `children` collections until all child elements are exposed and catalogued. The element tags also display their `ID` and/or `NAME` attribute values if any are assigned to the elements in the HTML source code.

Listing 15-4: **Collecting Child Elements**

```
function walkChildren(objRef, n) {
    var obj
    if (objRef) {
        if (typeof objRef == "string") {
            obj = document.getElementById(objRef)
        } else {
            obj = objRef
        }
    } else {
        obj = document.body.parentElement
    }
    var output = ""
    var indent = ""
    var i, group
    if (n) {
        for (i = 0; i < n; i++) {
            indent += "+---"
        }
    } else {
        n = 0
        output += "Children of <" + obj.tagName
        output += ">\n=====================\n"
    }
    group = obj.children
    for (i = 0; i < group.length; i++) {
        output += indent + "<" + group[i].tagName
        output += (group[i].id) ? " ID=" + group[i].id : ""
        output += (group[i].name) ? " NAME=" + group[i].name : ""
        output += ">\n"
        if (group[i].children.length > 0) {
            output += walkChildren(group[i], n+1)
        }
    }
    return output
}
```

className

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The style of an element toggles between "on" and "off" in Listing 15-5 by virtue of setting the element's `className` property alternatively to an existing style sheet class selector name and an empty string. When you set the `className` to an empty string, the default behavior of the H1 element governs the display of the first header. A click of the button forces the style sheet rule to override the default behavior in the first H1 element.

Listing 15-5: **Working with the className Property**

```
<HTML>
<HEAD>
<TITLE>className Property</TITLE>
<STYLE TYPE="text/css">
.special {font-size:16pt; color:red}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function toggleSpecialStyle(elemID) {
    var elem = (document.all) ? document.all(elemID) :
document.getElementById(elemID)
    if (elem.className == "") {
        elem.className = "special"
    } else {
        elem.className = ""
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>className Property Lab</H1>
<HR>
<FORM NAME="input">
<INPUT TYPE="button" VALUE="Toggle Class Name"
onClick="toggleSpecialStyle('head1')">
</FORM>
<BR>
<H1 ID="head1">ARTICLE I</H1>
```

Continued

Listing 15-5 *(continued)*

```
<P>Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.</P>

<H1>ARTICLE II</H1>
<P>A well regulated militia, being necessary to the security of a free state,
the right of the people to keep and bear arms, shall not be infringed.</P>
</BODY>
</HTML>
```

You can also create multiple versions of a style rule with different class selector identifiers and apply them at will to a given element.

clientHeight
clientWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 15-6 calls upon the `clientHeight` and `clientWidth` properties of a DIV element that contains a paragraph element. Only the width of the DIV element is specified in its style sheet rule, which means that the paragraph's text wraps inside that width and extends as deeply as necessary to show the entire paragraph. The `clientHeight` property describes that depth. The `clientHeight` property then calculates where a logo image should be positioned immediately after DIV, regardless of the length of the text. As a bonus, the `clientWidth` property helps the script center the image horizontally with respect to the paragraph's text.

Listing 15-6: **Using clientHeight and clientWidth Properties**

```
<HTML>
<HEAD>
<TITLE>clientHeight and clientWidth Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
function showLogo() {
    var paragraphW = document.all.myDIV.clientWidth
    var paragraphH = document.all.myDIV.clientHeight
    // correct for Windows/Mac discrepancies
    var paragraphTop = (document.all.myDIV.clientTop) ?
        document.all.myDIV.clientTop : document.all.myDIV.offsetTop
    var logoW = document.all.logo.style.pixelWidth
    // center logo horizontally against paragraph
    document.all.logo.style.pixelLeft = (paragraphW-logoW)/2
    // position image immediately below end of paragraph
    document.all.logo.style.pixelTop = paragraphTop + paragraphH
    document.all.logo.style.visibility = "visible"
}
</SCRIPT>
</HEAD>
<BODY>
<BUTTON onClick="showLogo()">Position and Show Logo Art</BUTTON>
<DIV ID="logo" STYLE="position:absolute; width:120px; visibility:hidden"><IMG
SRC="logo.gif"></DIV>
<DIV ID="myDIV" STYLE="width:200px">
<P>Lorem ipsum dolor sit amet, consectetaur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua. Ut enim adminim veniam, quis
nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
Duis aute irure dolor in reprehenderit involuptate velit esse cillum dolore eu
fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident.</P>
</DIV>
</BODY>
</HTML>
```

To assist in the vertical positioning of the logo, the `offsetTop` property of the DIV object provides the position of the start of the DIV with respect to its outer container (the BODY). Unfortunately, IE/Mac uses the `clientTop` property to obtain the desired dimension. That measure (assigned to the `paragraphTop` variable), plus the `clientHeight` of the DIV, provides the top coordinate of the image.

If you use only IE5, you can eliminate the DIV wrapper around the P element and assign the `STYLE` attribute directly to the P element. The script can then read the `clientHeight` and `clientWidth` of the P object.

contentEditable

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Listing 15-7 is a simplified demonstration of how to turn some text inside a document into an editable element. When you click the button of a freshly loaded page, the `toggleEdit()` function captures the opposite of the current editable state via the `isContentEditable` property of the DIV that is subject to edit. You switch on editing for that element in the next statement by assigning the new value to the `contentEditable` property of the DIV. For added impact, turn the text of the DIV to red to provide additional user feedback about what is editable on the page. You can also switch the button label to one that indicates the action invoked by the next click on it.

Listing 15-7: **Using the contentEditable Property**

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
.normal {color: black}
.editing {color: red}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function toggleEdit() {
    var newState = !editableText.isContentEditable
    editableText.contentEditable = newState
    editableText.className = (newState) ? "editing" : "normal"
    editBtn.innerText = (newState) ? "Disable Editing" : "Enable Editing"
}
</SCRIPT>
<BODY>
<H1>Editing Contents</H1>
<HR>
<P>Turn on editing to modify the following text:</P>
<DIV ID="editableText">Edit this text on the fly....</DIV>
<P><BUTTON ID="editBtn" onClick="toggleEdit()" onFocus="this.blur()">
Enable Editing
</BUTTON></P>
</BODY>
</HTML>
```

The BUTTON element has an `onFocus` event handler that immediately invokes the `blur()` method on the button. This prevents a press of the spacebar (during editing) from accidentally triggering the button.

currentStyle

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to compare the properties of the `currentStyle` and `style` objects of an element. For example, an unmodified copy of The Evaluator contains an EM element whose ID is `"myEM"`. Enter `document.all.myEM.style` into the bottom property listing text box and press Enter. Notice how most of the property values are empty. Now enter `document.all.myEM.currentStyle` into the property listing text box and press Enter. Every property has a value associated with it.

dataFld
dataFormatAs
dataSrc

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 15-8 is a simple document that has two TDC objects associated with it. The external files are different formats of the U.S. Bill of Rights document. One file is a traditional, tab-delimited data file consisting of only two records. The first record is a tab-delimited sequence of field names (named `"Article1"`, `"Article2"`, and so on); the second record is a tab-delimited sequence of article content defined in HTML:

```
<H1>ARTICLE I</H1><P>Congress shall make...</P>
```

The second file is a raw text file consisting of the full Bill of Rights with no HTML formatting attached.

When you load Listing 15-8, only the first article of the Bill of Rights appears in a blue-bordered box. Buttons enable you to navigate to the previous and next articles in the series. Because the data source is a traditional, tab-delimited file, the `nextField()` and `prevField()` functions calculate the name of the next source field and assign the new value to the `dataFld` property. All of the data is already in the browser after the page loads, so cycling through the records is as fast as the browser can reflow the page to accommodate the new content.

Listing 15-8: **Changing dataFld and dataSrc Properties**

```
<HTML>
<HEAD>
<TITLE>Data Binding</TITLE>
<STYLE TYPE="text/css">
#display {width:500px; border:10px ridge blue; padding:20px}
.hiddenControl {display:none}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function nextField() {
    var elem = document.all.display
    var fieldName = elem.dataFld
    var currFieldNum = parseInt(fieldName.substring(7, fieldName.length),10)
    currFieldNum = (currFieldNum == 10) ? 1 : ++currFieldNum
    elem.dataFld = "Article" + currFieldNum
}
function prevField() {
    var elem = document.all.display
    var fieldName = elem.dataFld
    var currFieldNum = parseInt(fieldName.substring(7, fieldName.length),10)
    currFieldNum = (currFieldNum == 1) ? 10 : --currFieldNum
    elem.dataFld = "Article" + currFieldNum
}

function toggleComplete() {
    if (document.all.buttonWrapper.className == "") {
        document.all.display.dataSrc = "#rights_raw"
        document.all.display.dataFld = "column1"
        document.all.display.dataFormatAs = "text"
        document.all.buttonWrapper.className = "hiddenControl"
    } else {
        document.all.display.dataSrc = "#rights_html"
        document.all.display.dataFld = "Article1"
        document.all.display.dataFormatAs = "HTML"
        document.all.buttonWrapper.className = ""
    }
}
</SCRIPT>
</HEAD>
```

```
<BODY>
<P><B>U.S. Bill of Rights</B></P>
<FORM>
<INPUT TYPE="button" VALUE="Toggle Complete/Individual"
onClick="toggleComplete()">
<SPAN ID="buttonWrapper" CLASS="">
<INPUT TYPE="button" VALUE="Prev" onClick="prevField()">
<INPUT TYPE="button" VALUE="Next" onClick="nextField()">
</SPAN>
</FORM>


<DIV ID="display" DATASRC="#rights_html" DATAFLD="Article1"
DATAFORMATAS="HTML"></DIV>

<OBJECT ID="rights_html" CLASSID="clsid:333C7BC4-460F-11D0-BC04-0080C7055A83">
    <PARAM NAME="DataURL" VALUE="Bill of Rights.txt">
    <PARAM NAME="UseHeader" VALUE="True">
    <PARAM NAME="FieldDelim" VALUE="&#09;">
</OBJECT>
<OBJECT ID="rights_raw" CLASSID="clsid:333C7BC4-460F-11D0-BC04-0080C7055A83">
    <PARAM NAME="DataURL" VALUE="Bill of Rights (no format).txt">
    <PARAM NAME="FieldDelim" VALUE="\">
    <PARAM NAME="RowDelim" VALUE="\">
</OBJECT>
</BODY>
</HTML>
```

Another button on the page enables you to switch between the initial piecemeal version of the document and the unformatted version in its entirety. To load the entire document as a single record, the `FieldDelim` and `RowDelim` parameters of the second OBJECT element eliminate their default values by replacing them with characters that don't appear in the document at all. And because the external file does not have a field name in the file, the default value (`column1` for the lone column in this document) is the data field. Thus, in the `toggleComplete()` function, the `dataSrc` property is changed to the desired OBJECT element ID, the `dataFld` property is set to the correct value for the data source, and the `dataFormatAs` property is changed to reflect the different intention of the source content (to be rendered as HTML or as plain text). When the display shows the entire document, you can hide the two radio buttons by assigning a `className` value to the SPAN element that surrounds the buttons. The `className` value is the identifier of the class selector in the document's style sheet. When the `toggleComplete()` function resets the `className` property to empty, the default properties (normal inline display style) take hold.

One further example demonstrates the kind of power available to the TDC under script control. Listing 15-9 displays table data from a tab-delimited file of Academy

Award information. The data file has eight columns of data, and each column heading is treated as a field name: Year, Best Picture, Best Director, Best Director Film, Best Actress, Best Actress Film, Best Actor, and Best Actor Film. For the design of the page, only five fields from each record appear: Year, Film, Director, Actress, and Actor. Notice in the listing how the HTML for the table and its content is bound to the data source object and the fields within the data.

The "dynamic" part of this example is apparent in how you can sort and filter the data, once loaded into the browser, without further access to the original source data. The TDC object features `Sort` and `Filter` properties that enable you to act on the data currently loaded in the browser. The simplest kind of sorting indicates on which field (or fields via a semicolon delimited list of field names) the entire data set should be sorted. Leading the name of the sort field is either a plus (to indicate ascending) or minus (descending) symbol. After setting the `data` object's `Sort` property, invoke its `Reset()` method to tell the object to apply the new property. The data in the bound table is immediately redrawn to reflect any changes.

Similarly, you can tell a data collection to display records that meet specific criteria. In Listing 15-9, two select lists and a pair of radio buttons provide the interface to the `Filter` property's settings. For example, you can filter the output to display only those records in which the Best Picture was the same picture of the winning Best Actress's performance. Simple filter expressions are based on field names:

```
dataObj.Filter = "Best Picture" = "Best Actress Film"
```

Listing 15-9: **Sorting and Filtering Bound Data**

```
<HTML>
<HEAD>
<TITLE>Data Binding—Sorting</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function sortByYear(type) {
    oscars.Sort = (type == "normal") ? "-Year" : "+Year"
    oscars.Reset()
}
function filterInCommon(form) {
    var filterExpr1 = form.filter1.options[form.filter1.selectedIndex].value
    var filterExpr2 = form.filter2.options[form.filter2.selectedIndex].value
    var operator = (form.operator[0].checked) ? "=" : "<>"
    var filterExpr = filterExpr1 + operator + filterExpr2
    oscars.Filter = filterExpr
    oscars.Reset()
}
</SCRIPT>

</HEAD>
<BODY>
```

```
<P><B>Academy Awards 1978-1997</B></P>
<FORM>
<P>Sort list by year <A HREF="javascript:sortByYear('normal')">from newest to
oldest</A> or <A HREF="javascript:sortByYear('reverse')">from oldest to
newest</A>.</P>
<P>Filter listings for records whose
<SELECT NAME="filter1" onChange="filterInCommon(this.form)">
    <OPTION VALUE="">
    <OPTION VALUE="Best Picture">Best Picture
    <OPTION VALUE="Best Director Film">Best Director's Film
    <OPTION VALUE="Best Actress Film">Best Actress's Film
    <OPTION VALUE="Best Actor Film">Best Actor's Film
</SELECT>
<INPUT TYPE="radio" NAME="operator" CHECKED
onClick="filterInCommon(this.form)">is
<INPUT TYPE="radio" NAME="operator" onClick="filterInCommon(this.form)">is not
<SELECT NAME="filter2" onChange="filterInCommon(this.form)">
    <OPTION VALUE="">
    <OPTION VALUE="Best Picture">Best Picture
    <OPTION VALUE="Best Director Film">Best Director's Film
    <OPTION VALUE="Best Actress Film">Best Actress's Film
    <OPTION VALUE="Best Actor Film">Best Actor's Film
</SELECT>
</P>
</FORM>
<TABLE DATASRC="#oscars" BORDER=1 ALIGN="center">
<THEAD STYLE="background-color:yellow; text-align:center">
<TR><TD>Year</TD>
    <TD>Film</TD>
    <TD>Director</TD>
    <TD>Actress</TD>
    <TD>Actor</TD>
</TR>
</THEAD>
<TR>
    <TD><DIV ID="col1" DATAFLD="Year" ></DIV></TD>
    <TD><DIV ID="col2" DATAFLD="Best Picture"></DIV></TD>
    <TD><DIV ID="col3" DATAFLD="Best Director"></DIV></TD>
    <TD><DIV ID="col4" DATAFLD="Best Actress"></DIV></TD>
    <TD><DIV ID="col5" DATAFLD="Best Actor"></DIV></TD>
</TR>
</TABLE>

<OBJECT ID="oscars" CLASSID="clsid:333C7BC4-460F-11D0-BC04-0080C7055A83">
    <PARAM NAME="DataURL" VALUE="Academy Awards.txt">
    <PARAM NAME="UseHeader" VALUE="True">
    <PARAM NAME="FieldDelim" VALUE="&#09;">
</OBJECT>
</BODY>
</HTML>
```

For more detailed information on Data Source Objects and their properties, visit `http://msdn.microsoft.com` and search for "Data Binding".

dir

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Changing this property value in a standard U.S. version of the browser only makes the right margin the starting point for each new line of text (in other words, the characters are not rendered in reverse order). You can experiment with this in The Evaluator by entering the following statements into the expression evaluation field:

```
document.getElementById("myP").dir = "rtl"
```

disabled

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `disabled` property on both form elements (IE4+) and regular HTML elements (IE5.5). For IE4+ and NN6, see what happens when you disable the output textarea by entering the following statement into the top text box:

```
document.forms[0].output.disabled = true
```

The textarea is disabled for user entry, although you can still set the field's `value` property via script (which is how the `true` returned value got there).

If you have IE5.5+, disable the `myP` element by entering the following statement into the top text box:

```
document.all.myP.disabled = true
```

The sample paragraph's text turns gray.

document

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The following simplified function accepts a parameter that can be any object in a document hierarchy. The script finds out the reference of the object's containing document for further reference to other objects:

```
function getCompanionFormCount(obj) {
    var ownerDoc = obj.document
    return ownerDoc.forms.length
}
```

Because the `ownerDoc` variable contains a valid reference to a `document` object, the `return` statement uses that reference to return a typical property of the document object hierarchy.

firstChild
lastChild

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

These two properties come in handy for Listing 15-10, whose job it is to either add or replace `LI` elements to an existing `OL` element. You can enter any text you want to appear at the beginning or end of the list. Using the `firstChild` and `lastChild` properties simplifies access to the ends of the list. For the functions that replace child nodes, the example uses the `replaceChild()` method. Alternatively for IE4+, you can modify the `innerText` property of the objects returned by the `firstChild` or `lastChild` property. This example is especially interesting to watch when you add items to the list: The browser automatically renumbers items to fit the current state of the list.

Listing 15-10: **Using firstChild and lastChild Properties**

```
<HTML>
<HEAD>
<TITLE>firstChild and lastChild Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// helper function for prepend() and append()
function makeNewLI(txt) {
    var newItem = document.createElement("LI")
    newItem.innerHTML = txt
    return newItem
}
function prepend(form) {
    var newItem = makeNewLI(form.input.value)
    var firstLI = document.getElementById("myList").firstChild
    document.getElementById("myList").insertBefore(newItem, firstLI)
}
function append(form) {
    var newItem = makeNewLI(form.input.value)
    var lastLI = document.getElementById("myList").lastChild
    document.getElementById("myList").appendChild(newItem)
}
function replaceFirst(form) {
    var newItem = makeNewLI(form.input.value)
    var firstLI = document.getElementById("myList").firstChild
    document.getElementById("myList").replaceChild(newItem, firstLI)
}
function replaceLast(form) {
    var newItem = makeNewLI(form.input.value)
    var lastLI = document.getElementById("myList").lastChild
    document.getElementById("myList").replaceChild(newItem, lastLI)
}
</SCRIPT>

</HEAD>
<BODY>
<H1>firstChild and lastChild Property Lab</H1>
<HR>
<FORM>
<LABEL>Enter some text to add to or replace in the OL element:</LABEL><BR>
<INPUT TYPE="text" NAME="input" SIZE=50><BR>
<INPUT TYPE="button" VALUE="Insert at Top" onClick="prepend(this.form)">
<INPUT TYPE="button" VALUE="Append to Bottom" onClick="append(this.form)">
<BR>
<INPUT TYPE="button" VALUE="Replace First Item"
onClick="replaceFirst(this.form)">
<INPUT TYPE="button" VALUE="Replace Last Item" onClick="replaceLast(this.form)">
</FORM>
<P></P>
<OL ID="myList"><LI>Initial Item 1
```

```
<LI>Initial Item 2
<LI>Initial Item 3
<LI>Initial Item 4
<OL>
</BODY>
</HTML>
```

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

The following example increases the width of a table by 10 percent.

```
var tableW = parseInt(document.all.myTable.width)
document.all.myTable.width = (tableW * 1.1) + "%"
```

Because the initial setting for the `WIDTH` attribute of the TABLE element is set as a percentage value, the script calculation extracts the number from the percentage width string value. In the second statement, the old number is increased by 10 percent and turned into a percentage string by appending the percentage symbol to the value. The resulting string value is assigned to the `width` property of the table.

hideFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with the `hideFocus` property in IE5.5. Enter the following statement into the top text field to assign a `tabIndex` value to the `myP` element so that, by default, the element receives focus and the dotted rectangle:

```
document.all.myP.tabIndex = 1
```

Press the Tab key several times until the paragraph receives focus. Now, disable the focus rectangle:

```
document.all.myP.hideFocus = true
```

If you now press the Tab key several times, the dotted rectangle does not appear around the paragraph. To prove that the element still receives focus, scroll the page down to the bottom so that the paragraph is not visible (you may have to resize the window). Click one of the focusable elements at the bottom of the page, and then press the Tab key slowly until the Address field toolbar has focus. Press the Tab key once. The page scrolls to bring the paragraph into view, but there is no focus rectangle around the element.

id

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Rarely do you need to access this property in a script — unless you write an authoring tool that iterates through all elements of a page to extract the IDs assigned by the author. You can retrieve an object reference once you know the object's `id` property (via the `document.getElementById(elemID)` method). But if for some reason your script doesn't know the ID of, say, the second paragraph of a document, you can extract that ID as follows:

```
var elemID = document.all.tags("P")[1].id
```

innerHTML
innerText

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				(✓)			✓	✓	✓

Example

The IE4+ page generated by Listing 15-11 contains an H1 element label and a paragraph of text. The purpose is to demonstrate how the innerHTML and innerText properties differ in their intent. Two text boxes contain the same combination of text and HTML tags that replaces the inner content of the paragraph's label.

If you apply the default content of the first text box to the innerHTML property of the label1 object, the italic style is rendered as such for the first word. In addition, the text in parentheses is rendered with the help of the small style sheet rule assigned by virtue of the surrounding <SPAN> tags. But if you apply that same content to the innerText property of the label object, the tags are rendered as is.

Use this as a laboratory to experiment with some other content in both text boxes. See what happens when you insert a
 tag within some text of both text boxes.

Listing 15-11: **Using innerHTML and innerText Properties**

```
<HTML>
<HEAD>
<TITLE>innerHTML and innerText Properties</TITLE>
<STYLE TYPE="text/css">
H1 {font-size:18pt; font-weight:bold; font-family:"Comic Sans MS", Arial, sans-serif}
.small {font-size:12pt; font-weight:400; color:gray}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">

function setGroupLabelAsText(form) {
    var content = form.textInput.value
    if (content) {
        document.all.label1.innerText = content
    }
}
function setGroupLabelAsHTML(form) {
    var content = form.HTMLInput.value
    if (content) {
        document.all.label1.innerHTML = content
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P>
```

Continued

Listing 15-11 *(continued)*

```
    <INPUT TYPE="text" NAME="HTMLInput"
    VALUE="<I>First</I> Article <SPAN CLASS='small'>(of ten)</SPAN>"
    SIZE=50>
    <INPUT TYPE="button" VALUE="Change Heading HTML"
    onClick="setGroupLabelAsHTML(this.form)">
</P>
<P>
    <INPUT TYPE="text" NAME="textInput"
    VALUE="<I>First</I> Article <SPAN CLASS='small'>(of ten)</SPAN>"
    SIZE=50>
    <INPUT TYPE="button" VALUE="Change Heading Text"
    onClick="setGroupLabelAsText(this.form)">
</P>
</FORM>
<H1 ID="label1">ARTICLE I</H1>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</BODY>
</HTML>
```

isContentEditable

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with both the `contentEditable` and `isContentEditable` properties on the `myP` and nested `myEM` elements (reload the page to start with a known version). Check the current setting for the `myEM` element by typing the following statement into the top text field:

```
myEM.isContentEditable
```

This value is `false` because no element upward in the element containment hierarchy is set to be editable yet. Next, turn on editing for the surrounding `myP` element:

```
myP.contentEditable = true
```

At this point, the entire `myP` element is editable because its child element is set, by default, to inherit the edit state of its parent. Prove it by entering the following statement into the top text box:

```
myEM.isContentEditable
```

While the `myEM` element is shown to be editable, no change has accrued to its `contentEditable` property:

```
myEM.contentEditable
```

This property value remains the default `inherit`.

You can see an additional example of these two properties in use in Listing 15-7.

isDisabled

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with both the `disabled` and `isDisabled` properties on the `myP` and nested `myEM` elements (reload the page to start with a known version). Check the current setting for the `myEM` element by typing the following statement into the top text field:

```
myEM.isDisabled
```

This value is `false` because no element upward in the element containment hierarchy is set for disabling yet. Next, disable the surrounding `myP` element:

```
myP.disabled = true
```

At this point, the entire `myP` element (including its children) is disabled. Prove it by entering the following statement into the top text box:

```
myEM.isDisabled
```

While the `myEM` element is shown as disabled, no change has accrued to its `disabled` property:

```
myEM.disabled
```

This property value remains the default `false`.

isMultiLine

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to read the `isMultiLine` property for elements on that page. Try the following statements in the top text box:

```
document.body.isMultiLine
document.forms[0].input.isMultiLine
myP.isMultiLine
myEM.isMultiLine
```

All but the text field form control report that they are capable of occupying multiple lines.

isTextEdit

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Good coding practice dictates that your script check for this property before invoking the `createTextRange()` method on any object. A typical implementation is as follows:

```
if (document.all.myObject.isTextEdit) {
    var myRange = document.all.myObject.createTextRange()
    [more statements that act on myRange]
}
```

lang

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Values for the `lang` property consist of strings containing valid ISO language codes. Such codes have, at the minimum, a primary language code (for example, `"fr"` for French) plus an optional region specifier (for example, `"fr-ch"` for Swiss French). The code to assign a Swiss German value to an element looks like the following:

```
document.all.specialSpan.lang = "de-ch"
```

language

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Although it is unlikely that you will modify this property, the following example shows you how to do it for a table cell object:

```
document.all.cellA3.language = "vbs"
```

lastChild

See `firstchild`.

length

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

You can try the following sequence of statements in the top text box of The Evaluator to see how the `length` property returns values (and sets them for some objects). Note that some statements work in only some browser versions.

```
(All browsers)     document.forms.length
(All browsers)     document.forms[0].elements.length
(NN3+, IE4+)       document.images.length
(NN4+)             document.layers.length
(IE4+)             document.all.length
(IE5+,             NN6) document.getElementById("myTable").childNodes.length
```

nextSibling
previousSibling

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

The following function assigns the same class name to all child nodes of an element:

```
function setAllChildClasses(parentElem, className) {
    var childElem = parentElem.firstChild
    while (childElem.nextSibling) {
        childElem.className = className
        childElem = childElem.nextSibling
    }
}
```

This example is certainly not the only way to achieve the same results. Using a `for` loop to iterate through the `childNodes` collection of the parent element is an equally valid approach.

nodeName

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

The following function demonstrates one (not very efficient) way to assign a new class name to every P element in an IE5+ document:

```
function setAllPClasses(className) {
    for (var i = 0; i < document.all.length; i++) {
        if (document.all[i].nodeName == "P") {
            document.all[i].className = className
        }
    }
}
```

A more efficient approach uses the `getElementsByTagName()` method to retrieve a collection of all P elements and then iterate through them directly.

nodeType

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

You can experiment with viewing `nodeType` property values in The Evaluator. The P element whose ID is `myP` is a good place to start. The P element itself is a `nodeType` of `1`:

```
document.getElementById("myP").nodeType
```

This element has three child nodes: a string of text (`nodeName #text`); an EM element (`nodeName EM`); and the rest of the text of the element content (`nodeName #text`). If you view the `nodeType` of either of the text portions, the value comes back as `3`:

```
document.getElementById("myP").childNodes[0].nodeType
```

In NN6 and IE5/Mac, you can inspect the `nodeType` of the one attribute of this element (the `ID` attribute):

```
document.getElementById("myP").attributes[0].nodeType
```

With NN6 and IE5/Mac, you can see how the `document` object returns a `nodeType` of `9`:

```
document.nodeType
```

When IE5 does not support a nodeType constant for a node, its value is sometimes reported as 1. However, more likely the value is undefined.

nodeValue

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

The first example increases the width of a TEXTAREA object by 10 percent. The nodeValue is converted to an integer (for NN6's string values) before performing the math and reassignment:

```
function widenCols(textareaElem) {
    var colWidth = parseInt(textareaElem.attributes["cols"].nodeValue, 10)
    textareaElem.attributes["cols"].nodeValue = (colWidth * 1.1)
}
```

The second example replaces the text of an element, assuming that the element contains no further nested elements:

```
function replaceText(elem, newText) {
    if (elem.childNodes.length == 1 && elem.firstChild.nodeType == 3) {
        elem.firstChild.nodeValue = newText
    }
}
```

The function builds in one final verification that the element contains just one child node and that it is a text type. An alternative version of the assignment statement of the second example uses the innerText property in IE with identical results:

```
elem.innerText = newText
```

offsetHeight
offsetWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

With IE4+, you can substitute the `offsetHeight` and `offsetWidth` properties for `clientHeight` and `clientWidth` in Listing 15-6. The reason is that the two elements in question have their widths hard-wired in style sheets. Thus, the `offsetWidth` property follows that lead rather than observing the default width of the parent (BODY) element.

With IE5+ and NN6, you can use The Evaluator to inspect the `offsetHeight` and `offsetWidth` property values of various objects on the page. Enter the following statements into the top text box:

```
document.getElementById("myP").offsetWidth
document.getElementById("myEM").offsetWidth
document.getElementById("myP").offsetHeight
document.getElementById("myTable").offsetWidth
```

offsetLeft
offsetTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following IE script statements utilize all four "offset" dimensional properties to size and position a DIV element so that it completely covers a SPAN element located within a P element. This can be for a fill-in-the-blank quiz that provides text entry fields elsewhere on the page. As the user gets an answer correct, the blocking `DIV` element is hidden to reveal the correct answer.

```
document.all.blocker.style.pixelLeft = document.all.span2.offsetLeft
document.all.blocker.style.pixelTop = document.all.span2.offsetTop
document.all.blockImg.height = document.all.span2.offsetHeight
document.all.blockImg.width = document.all.span2.offsetWidth
```

Because the `offsetParent` property for the SPAN element is the BODY element, the positioned DIV element can use the same positioning context (it's the default context, anyway) for setting the `pixelLeft` and `pixelTop` style properties. (Remember that positioning properties belong to an element's `style` object.) The `offsetHeight` and `offsetWidth` properties can read the dimensions of the SPAN element (the example has no borders, margins, or padding to worry about) and assign them to the dimensions of the image contained by the blocker `DIV` element.

This example is also a bit hazardous in some implementations. If the text of `span2` wraps to a new line, the new `offsetHeight` value has enough pixels to accommodate both lines. But the `blockImg` and `blocker` DIV elements are block-level elements that render as a simple rectangle. In other words, the `blocker` element doesn't turn into two separate strips to cover the pieces of `span2` that spread across two lines.

offsetParent

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

You can use the `offsetParent` property to help you locate the position of a nested element on the page. Listing 15-12 demonstrates how a script can "walk" up the hierarchy of `offsetParent` objects in IE for Windows to assemble the location of a nested element on a page. The goal of the exercise in Listing 15-12 is to position an image at the upper-left corner of the second table cell. The entire table is centered on the page.

The `onLoad` event handler invokes the `setImagePosition()` function. The function first sets a Boolean flag that determines whether the calculations should be based on the client or offset sets of properties. IE4/Windows and IE5/Mac rely on client properties, while IE5+/Windows works with the offset properties. The discrepancies even out, however, with the `while` loop. This loop traverses the `offsetParent` hierarchy starting with the `offsetParent` of the cell out to, but not including, the `document.body` object. The `body` object is not included because that is the positioning context for the image. In IE5, the `while` loop executes only once because just the `TABLE` element exists between the cell and the body; in IE4, the loop executes twice to account for the TR and TABLE elements up the hierarchy. Finally, the cumulative values of left and top measures are applied to the positioning properties of the DIV object's style and the image is made visible.

Listing 15-12: Using the offsetParent Property

```
<HTML>
<HEAD>
<TITLE>offsetParent Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setImagePosition(){
    var cElement = document.all.myCell
```

```
    // Set flag for whether calculations should use
    // client- or offset- property measures. Use
    // client- for IE5/Mac and IE4/Windows; otherwise
    // use offset- properties. An ugly, but necessary
    // workaround.
    var useClient = (cElement.offsetTop == 0) ?
        ((cElement.offsetParent.tagName == "TR") ? false : true) : false
    if (useClient) {
        var x = cElement.clientLeft
        var y = cElement.clientTop
    } else {
        var x = cElement.offsetLeft
        var y = cElement.offsetTop
    }
    var pElement = document.all.myCell.offsetParent
    while (pElement != document.body) {
        if (useClient) {
            x += pElement.clientLeft
            y += pElement.clientTop
        } else {
            x += pElement.offsetLeft
            y += pElement.offsetTop
        }
        pElement = pElement.offsetParent
    }
    document.all.myDIV.style.pixelLeft = x
    document.all.myDIV.style.pixelTop = y
    document.all.myDIV.style.visibility = "visible"
}
</SCRIPT>
</HEAD>
<BODY onload="setImagePosition()">
<SCRIPT LANGUAGE="JavaScript">
</SCRIPT>
<H1>The offsetParent Property</H1>
<HR>
<P>After the document loads, the script positions a small image in the upper
left corner of the second table cell.</P>
<TABLE BORDER=1 ALIGN="center">
<TR>
    <TD>This is the first cell</TD>
    <TD ID="myCell">This is the second cell.</TD>
</TR>
</TABLE>
<DIV ID="myDIV" STYLE="position:absolute; visibility:hidden; height:12;
width:12">
<IMG SRC="end.gif" HEIGHT=12 WIDTH=12></DIV>
</BODY>
</HTML>
```

outerHTML
outerText

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The page generated by Listing 15-13 (IE4+/Windows only) contains an `H1` element label and a paragraph of text. The purpose is to demonstrate how the `outerHTML` and `outerText` properties differ in their intent. Two text boxes contain the same combination of text and HTML tags that replaces the element that creates the paragraph's label.

If you apply the default content of the first text box to the `outerHTML` property of the `label1` object, the H1 element is replaced by a SPAN element whose `CLASS` attribute acquires a different style sheet rule defined earlier in the document. Notice that the ID of the new SPAN element is the same as the original H1 element. This allows the script attached to the second button to address the object. But this second script replaces the element with the raw text (including tags). The element is now gone, and any attempt to change the `outerHTML` or `outerText` properties of the `label1` object causes an error because there is no longer a `label1` object in the document.

Use this laboratory to experiment with some other content in both text boxes.

Listing 15-13: **Using outerHTML and outerText Properties**

```
<HTML>
<HEAD>
<TITLE>outerHTML and outerText Properties</TITLE>
<STYLE TYPE="text/css">
H1 {font-size:18pt; font-weight:bold; font-family:"Comic Sans MS", Arial, sans-
serif}
.heading {font-size:20pt; font-weight:bold; font-family:"Arial Black", Arial,
sans-serif}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">

function setGroupLabelAsText(form) {
    var content = form.textInput.value
    if (content) {
```

```
        document.all.label1.outerText = content
    }
}
function setGroupLabelAsHTML(form) {
    var content = form.HTMLInput.value
    if (content) {
        document.all.label1.outerHTML = content
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P>
    <INPUT TYPE="text" NAME="HTMLInput"
    VALUE="<SPAN ID='label1' CLASS='heading'>Article the First</SPAN>" SIZE=55>
    <INPUT TYPE="button" VALUE="Change Heading HTML"
    onClick="setGroupLabelAsHTML(this.form)">
</P>
<P>
    <INPUT TYPE="text" NAME="textInput"
    VALUE="<SPAN ID='label1' CLASS='heading'>Article the First</SPAN>" SIZE=55>
    <INPUT TYPE="button" VALUE="Change Heading Text"
    onClick="setGroupLabelAsText(this.form)">
</P>
</FORM>
<H1 ID="label1">ARTICLE I</H1>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</BODY>
</HTML>
```

ownerDocument

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to explore the `ownerDocument` property in NN6. Enter the following statement into the top text box:

```
document.body.childNodes[5].ownerDocument
```

The result is a reference to the `document` object. You can use that to inspect a property of the document, as shown in the following statement you should enter into the top text box:

```
document.body.childNodes[5].ownerDocument.URL
```

This returns the `document.URL` property for the document that owns the child node.

parentElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can experiment with the `parentElement` property in The Evaluator. The document contains a P element named myP. Type each of the following statements from the left column into the upper expression evaluation text box and press Enter to see the results.

Expression	***Result***
`document.all.myP.tagName`	`P`
`document.all.myP.parentElement`	`[object]`
`document.all.myP.parentElement.tagName`	`BODY`
`document.all.myP.parentElement.parentElement`	`[object]`
`document.all.myP.parentElement.parentElement.tagName`	`HTML`
`document.all.myP.parentElement.parentElement.parentElement`	`null`

parentNode

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator to examine the `parentNode` property values of both an element and a non-element node. Begin with the following two statements and watch the results of each:

```
document.getElementById("myP").parentNode.tagName
document.getElementById("myP").parentElement.tagName    (IE only)
```

Now examine the properties from the point of view of the first text fragment node of the `myP` paragraph element:

```
document.getElementById("myP").childNodes[0].nodeValue
document.getElementById("myP").childNodes[0].parentNode.tagName
document.getElementById("myP").childNodes[0].parentElement    (IE only)
```

Notice (in IE) that the text node does not have a `parentElement` property.

parentTextEdit

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The page resulting from Listing 15-14 contains a paragraph of Greek text and three radio buttons that select the size of a paragraph chunk: one character, one word, or one sentence. If you click anywhere within the large paragraph, the `onClick` event handler invokes the `selectChunk()` function. The function first examines which of the radio buttons is selected to determine how much of the paragraph to highlight (select) around the point at which the user clicks.

After the script employs the `parentTextEdit` property to test whether the clicked element has a valid parent capable of creating a text range, it calls upon the property again to help create the text range. From there, `TextRange` object methods shrink the range to a single insertion point, move that point to the spot nearest the cursor location at click time, expand the selection to encompass the desired chunk, and select that bit of text.

Notice one workaround for the `TextRange` object's `expand()` method anomaly: If you specify a sentence, IE doesn't treat the beginning of a P element as the starting end of a sentence automatically. A camouflaged (white text color) period is appended to the end of the previous element to force the `TextRange` object to expand only to the beginning of the first sentence of the targeted P element.

Listing 15-14: **Using the parentTextEdit Property**

```
<HTML>
<HEAD>
<TITLE>parentTextEdit Property</TITLE>
<STYLE TYPE="text/css">
P {cursor:hand}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function selectChunk() {
    var chunk, range
    for (var i = 0; i < document.forms[0].chunk.length; i++) {
        if (document.forms[0].chunk[i].checked) {
            chunk = document.forms[0].chunk[i].value
            break
        }
    }
    var x = window.event.clientX
    var y = window.event.clientY
    if (window.event.srcElement.parentTextEdit) {
        range = window.event.srcElement.parentTextEdit.createTextRange()
        range.collapse()
        range.moveToPoint(x, y)
        range.expand(chunk)
        range.select()
    }
}
</SCRIPT>
</HEAD>

<BODY BGCOLOR="white">
<FORM>
<P>Choose how much of the paragraph is to be selected when you click anywhere in
it:<BR>
<INPUT TYPE="radio" NAME="chunk" VALUE="character" CHECKED>Character
<INPUT TYPE="radio" NAME="chunk" VALUE="word">Word
<INPUT TYPE="radio" NAME="chunk" VALUE="sentence">Sentence
```

```
<FONT COLOR="white">.</FONT></P>
</FORM>

<P onClick="selectChunk()">
Lorem ipsum dolor sit amet, consectetaur adipisicing elit, sed do eiusmod tempor
incididunt ut labore et dolore magna aliqua. Ut enim adminim veniam, quis
nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
Duis aute irure dolor in reprehenderit involuptate velit esse cillum dolore eu
fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in
culpa qui officia deserunt mollit anim id est laborum.
</P>
</BODY>
</HTML>
```

previousSibling

See `nextSibling`.

readyState

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To witness a `readyState` property other than `complete` for standard HTML, you can try examining the property in a script that immediately follows an `<IMG>` tag:

```
...
<IMG ID="myImg" SRC="someImage.gif">
<SCRIPT LANGUAGE="JavaScript">
alert(document.all.myImg.readyState)
</SCRIPT>
...
```

Putting this fragment into a document that is accessible across a slow network helps. If the image is not in the browser's cache, you might get the `uninitialized` or `loading` result. The former means that the IMG object exists, but it has not started receiving the image data from the server yet. If you reload the page, chances are that the image will load instantaneously from the cache and the `readyState` property will report `complete`.

recordNumber

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can see the `recordNumber` property in action in Listing 15-15. The data source is a small, tab-delimited file consisting of 20 records of Academy Award data. Thus, the table that displays a subset of the fields is bound to the data source object. Also bound to the data source object are three SPAN objects embedded within a paragraph near the top of the page. As the user clicks a row of data, three fields from that clicked record are placed into the bound SPAN objects.

The script part of this page is a mere single statement. When the user triggers the `onClick` event handler of the repeated TR object, the function receives as a parameter a reference to the TR object. The data store object maintains an internal copy of the data in a `recordset` object. One of the properties of this `recordset` object is the `AbsolutePosition` property, which is the integer value of the current record that the data object points to (it can point to only one row at a time, and the default row is the first row). The statement sets the `AbsolutePosition` property of the `recordset` object to the `recordNumber` property for the row that the user clicks. Because the three SPAN elements are bound to the same data source, they are immediately updated to reflect the change to the data object's internal pointer to the current record. Notice, too, that the third SPAN object is bound to one of the data source fields not shown in the table. You can reach any field of a record because the Data Source Object holds the entire data source content.

Listing 15-15: Using the Data Binding recordNumber Property

```
<HTML>
<HEAD>
<TITLE>Data Binding (recordNumber)</TITLE>
<STYLE TYPE="text/css">
.filmTitle {font-style:italic}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// set recordset pointer to the record clicked on in the table.
function setRecNum(row) {
    document.oscars.recordset.AbsolutePosition = row.recordNumber
}
</SCRIPT>
```

```
</HEAD>
<BODY>
<P><B>Academy Awards 1978-1997</B> (Click on a table row to extract data from
one record.)</P>
<P>The award for Best Actor of <SPAN DATASRC="#oscars" DATAFLD="Year"></SPAN>
 went to <SPAN DATASRC="#oscars" DATAFLD="Best Actor"></SPAN>
 for his outstanding achievement in the film
<SPAN CLASS="filmTitle" DATASRC="#oscars" DATAFLD="Best Actor Film"></SPAN>.</P>
<TABLE BORDER=1 DATASRC="#oscars" ALIGN="center">
<THEAD STYLE="background-color:yellow; text-align:center">
<TR><TD>Year</TD>
    <TD>Film</TD>
    <TD>Director</TD>
    <TD>Actress</TD>
    <TD>Actor</TD>
</TR>
</THEAD>
<TR ID=repeatableRow onClick="setRecNum(this)">
    <TD><DIV ID="col1" DATAFLD="Year"></DIV></TD>
    <TD><DIV CLASS="filmTitle" ID="col2" DATAFLD="Best Picture"></DIV></TD>
    <TD><DIV ID="col3" DATAFLD="Best Director"></DIV></TD>
    <TD><DIV ID="col4" DATAFLD="Best Actress"></DIV></TD>
    <TD><DIV ID="col5" DATAFLD="Best Actor"></DIV></TD>
</TR>
</TABLE>

<OBJECT ID="oscars" CLASSID="clsid:333C7BC4-460F-11D0-BC04-0080C7055A83">
    <PARAM NAME="DataURL" VALUE="Academy Awards.txt">
    <PARAM NAME="UseHeader" VALUE="True">
    <PARAM NAME="FieldDelim" VALUE="&#09;">
</OBJECT>
</BODY>
</HTML>
```

runtimeStyle

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to compare the properties of the `runtimeStyle` and `style` objects of an element. For example, an unmodified copy of The Evaluator contains an EM element whose ID is “myEM”. Enter both

```
document.all.myEM.style.color
```

and

```
document.all.myEM.runtimeStyle.color
```

into the top text field in turn. Initially, both values are empty. Now assign a color to the `style` property via the upper text box:

```
document.all.myEM.style.color = "red"
```

If you now type the two earlier statements into the upper box, you can see that the `style` object reflects the change, while the `runtimeStyle` object still holds onto its original (empty) value.

scopeName

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

If you have a sample document that contains XML and a namespace spec, you can use `document.write()` or `alert()` methods to view the value of the `scopeName` property. The syntax is

```
document.all.elementID.scopeName
```

scrollHeight
scrollWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with these two properties of the TEXTAREA object, which displays the output of evaluations and property listings.

To begin, enter the following into the bottom one-line text field to list the properties of the `body` object:

```
document.body
```

This displays a long list of properties for the `body` object. Now enter the following property expression in the top one-line text field to see the `scrollHeight` property of the output TEXTAREA when it holds the dozens of lines of property listings:

```
document.all.output.scrollHeight
```

The result, some number probably in the hundreds, is now displayed in the output TEXTAREA. This means that you can scroll the content of the `output` element vertically to reveal that number of pixels. Click the Evaluate button once more. The result, 13 or 14, is a measure of the `scrollHeight` property of the TEXTAREA that had only the previous result in it. The scrollable height of that content was only 13 or 14 pixels, the height of the font in the TEXTAREA. The `scrollWidth` property of the output TEXTAREA is fixed by the width assigned to the element's `COLS` attribute (as calculated by the browser to determine how wide to make the textarea on the page).

scrollLeft
scrollTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with these two properties of the TEXTAREA object, which displays the output of evaluations and property listings. To begin, enter the following into the bottom one-line text field to list the properties of the `body` object:

```
document.body
```

This displays a long list of properties for the `body` object. Use the TEXTAREA's scrollbar to page down a couple of times. Now enter the following property expression in the top one-line text field to see the `scrollTop` property of the output TEXTAREA after you scroll:

```
document.all.output.scrollTop
```

The result, some number, is now displayed in the output TEXTAREA. This means that the content of the `output` element was scrolled vertically. Click the Evaluate button once more. The result, `0`, is a measure of the `scrollTop` property of the TEXTAREA that had only the previous result in it. There wasn't enough content in the TEXTAREA to scroll, so the content was not scrolled at all. The `scrollTop` property, therefore, is zero. The `scrollLeft` property of the output is always zero because the TEXTAREA element is set to wrap any text that overflows the width of the element. No horizontal scrollbar appears in this case, and the `scrollLeft` property never changes.

sourceIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

While the operation of this property is straightforward, the sequence of elements exposed by the `document.all` property may not be. To that end, you can use The Evaluator (Chapter 13) to experiment in IE4+ with the values that the `sourceIndex` property returns to see how the index values of the `document.all` collection follow the source code.

To begin, reload The Evaluator. Enter the following statement in the top text box to set a preinitialized global variable:

```
a = 0
```

When you evaluate this expression, a zero should appear in the Results box. Next, enter the following statement into the top text box:

```
document.all[a].tagName + " [" + a++ + "]"
```

There are a lot of plus signs in this statement, so be sure you enter it correctly. As you successively evaluate this statement (repeatedly click the Evaluate button), the global variable (`a`) is incremented, thus enabling you to "walk through" the elements in source code order. The `sourceIndex` value for each HTML tag appears in square brackets in the Results box. You generally begin with the following sequence:

```
HTML [0]
HEAD [1]
TITLE [2]
```

You can continue until there are no more elements, at which point an error message appears because the value of `a` exceeds the number of elements in the `document.all` array. Compare your findings against the HTML source code view of The Evaluator.

style

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Most of the action with the `style` property has to do with the `style` object's properties, so you can use The Evaluator here to simply explore the lists of `style` object properties available on as many DHTML-compatible browsers as you have running. To begin, enter the following statement into the lower, one-line text box to inspect the `style` property for the `document.body` object:

```
document.body.style
```

Now inspect the `style` property of the table element that is part of the original version of The Evaluator. Enter the following statement into the lower text box:

```
document.getElementById("myTable").style
```

In both cases, the values assigned to the `style` object's properties are quite limited by default.

tabIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The HTML and scripting in Listing 15-16 demonstrate not only the way you can modify the tabbing behavior of a form on the fly, but also how to force form elements out of the tabbing sequence entirely in IE. In this page, the upper form (named lab) contains four elements. Scripts invoked by buttons in the lower form control the tabbing sequence. Notice that the TABINDEX attributes of all lower form elements are set to -1, which means that these control buttons are not part of the tabbing sequence in IE.

When you load the page, the default tabbing order for the lab form control elements (default setting of zero) takes charge. If you start pressing the Tab key, the precise results at first depend on the browser you use. In IE, the Address field is first selected; next the Tab sequence gives focus to the window (or frame, if this page were in a frameset); finally the tabbing reaches the lab form. Continue pressing the Tab key and watch how the browser assigns focus to each of the element types. In NN6, however, you must click anywhere on the content to get the Tab key to start working on form controls.

The sample script inverts the tabbing sequence with the help of a for loop that initializes two variables that work in opposite directions as the looping progresses. This gives the last element the lowest tabIndex value. The skip2() function simply sets the tabIndex property of the second text box to -1, removing it from the tabbing entirely (IE only). Notice, however, that you can click in the field and still enter text. (See the disabled property earlier in this chapter to see how to prevent field editing.) NN6 does not provide a tabIndex property setting that forces the browser to skip over a form control. You should disable the control instead.

Listing 15-16: **Controlling the tabIndex Property**

```
<HTML>
<HEAD>
<TITLE>tabIndex Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function invert() {
    var form = document.lab
    for (var i = 0, j = form.elements.length; i < form.elements.length;
i++, j--) {
        form.elements[i].tabIndex = j
    }
}

function skip2() {
    document.lab.text2.tabIndex = -1
}

function resetTab() {
    var form = document.lab
    for (var i = 0; i < form.elements.length; i++) {
        form.elements[i].tabIndex = 0
    }
```

```
}
</SCRIPT>
</HEAD>

<BODY>
<H1>tabIndex Property Lab</H1>
<HR>
<FORM NAME="lab">
Text box no. 1: <INPUT TYPE="text" NAME="text1"><BR>
Text box no. 2: <INPUT TYPE="text" NAME="text2"><BR>
<INPUT TYPE="button" VALUE="A Button"><BR>
<INPUT TYPE="checkbox">And a checkbox
</FORM>
<HR>
<FORM NAME="control">
<INPUT TYPE="button" VALUE="Invert Tabbing Order" TABINDEX=-1
onClick="invert()"><BR>
<INPUT TYPE="button" VALUE="Skip Text box no. 2 (IE Only)" TABINDEX=-1
onClick="skip2()"><BR>
<INPUT TYPE="button" VALUE="Reset to Normal Order" TABINDEX=-1
onClick="resetTab()">
</FORM>
</BODY>
</HTML>
```

The final function, `resetTab()`, sets the `tabIndex` property value to zero for all `lab` form elements. This restores the default order; but in IE5.5/Windows, you may experience buggy behavior that prevents you from tabbing to items after you reset them. Only the reloading of the page provides a complete restoration of default behavior.

tagName

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

You can see the `tagName` property in action for the example associated with the `sourceIndex` property discussed earlier. In that example, the `tagName` property is read from a sequence of objects in source code order.

tagUrn

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

If you have a sample document that contains XML and a Namespace spec, you can use `document.write()` or `alert()` methods to view the value of the `tagUrn` property. The syntax is

```
document.all.elementID.tagUrn
```

title

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

You can see how dynamic a tooltip is in Listing 15-17. A simple paragraph element has its `TITLE` attribute set to `"First Time!"`, which is what the tooltip displays if you roll the pointer atop the paragraph and pause after the page loads. But an `onMouseOver` event handler for that element increments a global variable counter in the script, and the `title` property of the paragraph object is modified with each mouseover action. The `count` value is made part of a string assigned to the `title` property. Notice that there is not a live connection between the `title` property and the variable; instead, the new value explicitly sets the `title` property.

Listing 15-17: Controlling the title Property

```
<HTML>
<HEAD>
<TITLE>title Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// global counting variable
```

```
var count = 0

function setToolTip(elem) {
    elem.title = "You have previously rolled atop this paragraph " +
        count + " time(s)."
}

function incrementCount(elem) {
    count++
    setToolTip(elem)
}
</SCRIPT>

</HEAD>
<BODY>
<H1>title Property Lab</H1>
<HR>
<P ID="myP" TITLE="First Time!" onMouseOver="incrementCount(this)">
Roll the mouse over this paragraph a few times.<BR>
Then pause atop it to view the tooltip.</P>
</BODY>
</HTML>
```

uniqueID

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-18 demonstrates the recommended syntax for obtaining and applying a browser-generated identifier for an object. After you enter some text into the text box and click the button, the `addRow()` function appends a row to the table. The left column displays the identifier generated via the table row object's `uniqueID` property. IE5+ generates identifiers in the format `"ms__id`*n*`"`, where *n* is an integer starting with zero for the current browser session. Because the `addRow()` function assigns `uniqueID` values to the row and the cells in each row, the integer for each row is three greater than the previous one. There is no guarantee that future generations of the browser will follow this format, so do not rely on the format or sequence in your scripts.

Listing 15-18: Using the uniqueID Property

```
<HTML>
<HEAD>
<TITLE>Inserting an IE5+/Windows Table Row</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function addRow(item1) {
    if (item1) {
        // assign long reference to shorter var name
        var theTable = document.all.myTable
        // append new row to the end of the table
        var newRow = theTable.insertRow(theTable.rows.length)
        // give the row its own ID
        newRow.id = newRow.uniqueID

        // declare cell variable
        var newCell

        // an inserted row has no cells, so insert the cells
        newCell = newRow.insertCell(0)
        // give this cell its own id
        newCell.id = newCell.uniqueID
        // display the row's id as the cell text
        newCell.innerText = newRow.id
        newCell.bgColor = "yellow"
        // reuse cell var for second cell insertion
        newCell = newRow.insertCell(1)
        newCell.id = newCell.uniqueID
        newCell.innerText = item1
    }
}
</SCRIPT>
</HEAD>

<BODY>
<TABLE ID="myTable" BORDER=1>
<TR>
<TH>Row ID</TH>
<TH>Data</TH>
</TR>

<TR ID="firstDataRow">
<TD>firstDataRow
<TD>Fred
</TR>
<TR ID="secondDataRow">
<TD>secondDataRow
<TD>Jane
</TR>
</TABLE>
<HR>
```

```
<FORM>
Enter text to be added to the table:<BR>
<INPUT TYPE="text" NAME="input" SIZE=25><BR>
<INPUT TYPE='button' VALUE='Insert Row' onClick='addRow(this.form.input.value)'>
</FORM>
</BODY>
</HTML>
```

Methods

addBehavior("*URL*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-19a is the JavaScript code for an external component named `makeHot.htc`. Its purpose is to turn the `color` style property of an object to either a default color (`"red"`) or any other color that is passed to the component. For details on the syntax of the `<PUBLIC>` tags, see Chapter 48. The code presented here helps you see how the page and scripts in Listing 15-19b work.

Listing 15-19a: The makeHot.htc Behavior Component

```
<PUBLIC:ATTACH EVENT="onmousedown" ONEVENT="makeHot()" />
<PUBLIC:ATTACH EVENT="onmouseup" ONEVENT="makeNormal()" />
<PUBLIC:PROPERTY NAME="hotColor" />
<PUBLIC:METHOD NAME="setHotColor" />
<SCRIPT LANGUAGE="JScript">
var oldColor
var hotColor = "red"

function setHotColor(color) {
    hotColor = color
}

function makeHot() {
    if (event.srcElement == element) {
```

Continued

Listing 15-19a *(continued)*

```
        oldColor = style.color
        runtimeStyle.color = hotColor
    }
}

function makeNormal() {
    if (event.srcElement == element) {
        runtimeStyle.color = oldColor
    }
}
</SCRIPT>
```

The object to which the component is attached is a simple paragraph object, shown in Listing 15-19b. When the page loads, the behavior is not attached so clicking the paragraph text has no effect.

When you turn on the behavior by invoking the `turnOn()` function, the `addBehavior()` method attaches the code of the `makeHot.htc` component to the `myP` object. At this point, the `myP` object has one more property, one more method, and two more event handlers that are written to be made public by the component's code. If you want the behavior to apply to more than one paragraph in the document, you have to invoke the `addBehavior()` method for each paragraph object.

After the behavior file is instructed to start loading, the `setInitialColor()` function is called to set the new color property of the paragraph to the user's choice from the SELECT list. But this can happen only if the component is fully loaded. Therefore, the function checks the `readyState` property of `myP` for completeness before invoking the component's function. If IE is still loading the component, the function is invoked again in 500 milliseconds.

As long as the behavior is loaded, you can change the color used to turn the paragraph "hot." The function first ensures that the component is loaded by checking that the object has the new color property. If it does, then (as a demonstration of how to expose and invoke a component method) the method of the component is invoked. You can also simply set the property value.

Listing 15-19b: **Using addBehavior() and removeBehavior()**

```
<HTML>
<HEAD>
<TITLE>addBehavior() and removeBehavior() Methods</TITLE>
```

```
<SCRIPT LANGUAGE="JavaScript">
var myPBehaviorID

function turnOn() {
    myPBehaviorID = document.all.myP.addBehavior("makeHot.htc")
    setInitialColor()
}

function setInitialColor() {
    if (document.all.myP.readyState == "complete") {
        var select = document.forms[0].colorChoice
        var color = select.options[select.selectedIndex].value
        document.all.myP.setHotColor(color)
    } else {
        setTimeout("setInitialColor()", 500)
    }
}

function turnOff() {
    document.all.myP.removeBehavior(myPBehaviorID)
}

function setColor(select, color) {
    if (document.all.myP.hotColor) {
        document.all.myP.setHotColor(color)
    } else {
        alert("This feature is not available. Turn on the Behavior first.")
        select.selectedIndex = 0
    }
}
function showBehaviorCount() {
    var num = document.all.myP.behaviorUrns.length
    var msg = "The myP element has " + num + " behavior(s). "
    if (num > 0) {
        msg += "Name(s): \r\n"
        for (var i = 0; i < num; i++) {
            msg += document.all.myP.behaviorUrns[i] + "\r\n"
        }
    }
    alert(msg)
}
</SCRIPT>
</HEAD>
<BODY>
<H1>addBehavior() and removeBehavior() Method Lab</H1>
<HR>
<P ID="myP">This is a sample paragraph. After turning on the behavior,
it will turn your selected color when you mouse down anywhere in this
paragraph.</P>
<FORM>
```

Continued

Listing 15-19b *(continued)*

```
<INPUT TYPE="button" VALUE="Switch On Behavior" onClick="turnOn()">
Choose a 'hot' color:
<SELECT NAME="colorChoice" onChange="setColor(this, this.value)">
<OPTION VALUE="red">red
<OPTION VALUE="blue">blue
<OPTION VALUE="cyan">cyan
</SELECT><BR>
<INPUT TYPE="button" VALUE="Switch Off Behavior" onClick="turnOff()">
<P><INPUT TYPE="button" VALUE="Count the URNs"
onClick="showBehaviorCount()"></P>
</BODY>
</HTML>
```

To turn off the behavior, the `removeBehavior()` method is invoked. Notice that the `removeBehavior()` method is associated with the `myP` object, and the parameter is the ID of the behavior added earlier. If you associate multiple behaviors with an object, you can remove one without disturbing the others because each has its own unique ID.

addEventListener("*eventType*", *listenerFunc*, *useCapture*)
removeEventListener("*eventType*", *listenerFunc*, *useCapture*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 15-20 provides a compact workbench to explore and experiment with the basic W3C DOM event model. When the page loads, no event listeners are registered with the browser (except for the control buttons, of course). But you can add an event listener for a `click` event in bubble and/or capture mode to the BODY element or the P element that surrounds the SPAN holding the line of text. If you add an event listener and click the text, you see a readout of the element processing the event and information indicating whether the event phase is bubbling (3) or capture (1). With all event listeners engaged, notice the sequence of events being processed. Remove listeners one at a time to see the effect on event processing.

Note

Listing 15-20 includes code for event capture that does not operate in NN6. Event capture facilities should work in a future version of the browser.

Listing 15-20: **W3C Event Lab**

```
<HTML>
<HEAD>
<TITLE>W3C Event Model Lab</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// add event listeners
function addBubbleListener(elemID) {
    document.getElementById(elemID).addEventListener("click", reportEvent, false)
}
function addCaptureListener(elemID) {
    document.getElementById(elemID).addEventListener("click", reportEvent, true)
}
// remove event listeners
function removeBubbleListener(elemID)  {
    document.getElementById(elemID).removeEventListener("click", reportEvent, false)
}
function removeCaptureListener(elemID) {
    document.getElementById(elemID).removeEventListener("click", reportEvent, true)
}
// display details about any event heard
function reportEvent(evt) {
    if (evt.target.parentNode.id == "mySPAN") {
        var msg = "Event processed at " + evt.currentTarget.tagName +
            " element (event phase = " + evt.eventPhase + ").\n"
        document.controls.output.value += msg
    }
}
// clear the details textarea
function clearTextArea() {
    document.controls.output.value = ""
}
</SCRIPT>
</HEAD>
<BODY ID="myBODY">
<H1>W3C Event Model Lab</H1>
<HR>
<P ID="myP"><SPAN ID="mySPAN">This paragraph (a SPAN element nested inside a P
element) can be set to listen for "click" events.</SPAN></P>
<HR>
<TABLE CELLPADDING=5 BORDER=1>
<CAPTION STYLE="font-weight:bold">Control Panel</CAPTION>
```

Continued

Listing 15-20 *(continued)*

```
<FORM NAME="controls">
<TR STYLE="background-color:#ffff99"><TD ROWSPAN=2>"Bubble"-type click listener:
    <TD><INPUT TYPE="button" VALUE="Add to BODY"
onClick="addBubbleListener('myBODY')">
    <TD><INPUT TYPE="button" VALUE="Remove from BODY"
onClick="removeBubbleListener('myBODY')">
</TR>
<TR STYLE="background-color:#ffff99">
    <TD><INPUT TYPE="button" VALUE="Add to P"
onClick="addBubbleListener('myP')">
    <TD><INPUT TYPE="button" VALUE="Remove from P"
onClick="removeBubbleListener('myP')">
</TR>
<TR STYLE="background-color:#ff9999"><TD ROWSPAN=2>"Capture"-type click
listener:
    <TD><INPUT TYPE="button" VALUE="Add to BODY"
onClick="addCaptureListener('myBODY')">
    <TD><INPUT TYPE="button" VALUE="Remove from BODY"
onClick="removeCaptureListener('myBODY')">
</TR>
<TR STYLE="background-color:#ff9999">
    <TD><INPUT TYPE="button" VALUE="Add to P"
onClick="addCaptureListener('myP')">
    <TD><INPUT TYPE="button" VALUE="Remove from P"
onClick="removeCaptureListener('myP')">
</TR>
<P>Examine click event characteristics: <INPUT TYPE="button" VALUE="Clear"
onClick="clearTextArea()"><BR>
<TEXTAREA NAME="output" COLS="80" ROWS="6" WRAP="virtual"></TEXTAREA>
</FORM>
</TABLE>
</BODY>
</HTML>
```

appendChild(*elementObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Scripts in Listing 15-21 demonstrate how the three major child-related methods work in IE5+ and NN6. The page includes a simple, two-item list. A form enables you to add items to the end of the list or replace the last item with a different entry.

The `append()` function creates a new LI element and then uses the `appendChild()` method to attach the text box text as the displayed text for the item. The nested expression, `document.createTextNode(form.input.value)`, evaluates to a legitimate node that is appended to the new LI item. All of this occurs before the new LI item is added to the document. In the final statement of the function, `appendChild()` is invoked from the vantage point of the UL element — thus adding the LI element as a child node of the UL element.

Invoking the `replaceChild()` method in the `replace()` function utilizes some of the same code. The main difference is that the `replaceChild()` method requires a second parameter: a reference to the child element to be replaced. This demonstration replaces the final child node of the UL list, so the function takes advantage of the `lastChild` property of all elements to get a reference to that final nested child. That reference becomes the second parameter to `replaceChild()`.

Listing 15-21: **Various Child Methods**

```
<HTML>
<HEAD>
<TITLE>appendChild(), removeChild(), and replaceChild() Methods</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function append(form) {
    if (form.input.value) {
        var newItem = document.createElement("LI")
        newItem.appendChild(document.createTextNode(form.input.value))
        document.getElementById("myUL").appendChild(newItem)
    }
}

function replace(form) {
    if (form.input.value) {
        var newItem = document.createElement("LI")
        var lastChild = document.getElementById("myUL").lastChild
        newItem.appendChild(document.createTextNode(form.input.value))
        document.getElementById("myUL").replaceChild(newItem, lastChild)
    }
}

function restore() {
    var oneChild
    var mainObj = document.getElementById("myUL")
```

Continued

Listing 15-21 *(continued)*

```
    while (mainObj.childNodes.length > 2) {
        oneChild = mainObj.lastChild
        mainObj.removeChild(oneChild)
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Child Methods</H1>
<HR>
Here is a list of items:
<UL ID="myUL"><LI>First Item
<LI>Second Item
</UL>
<FORM>
Enter some text to add/replace in the list:
<INPUT TYPE="text" NAME="input" SIZE=30><BR>
<INPUT TYPE="button" VALUE="Append to List" onClick="append(this.form)">
<INPUT TYPE="button" VALUE="Replace Final Item" onClick="replace(this.form)">
<INPUT TYPE="button" VALUE="Restore List" onClick="restore()">
</BODY>
</HTML>
```

The final part of the demonstration uses the `removeChild()` method to peel away all children of the UL element until just the two original items are left standing. Again, the `lastChild` property comes in handy as the `restore()` function keeps removing the last child until only two remain. Upon restoring the list, IE5/Mac fails to render the list bullets; but in the browser's object model, the UL element still exists.

applyElement(*elementObject*[, *type*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

To help you visualize the impact of the `applyElement()` method with its different parameter settings, Listing 15-22 enables you to apply a new element (an EM element) to a SPAN element inside a paragraph. At any time, you can view the HTML of the entire P element to see where the EM element is applied as well as its impact on the element containment hierarchy for the paragraph.

After you load the page, inspect the HTML for the paragraph before doing anything else. Notice the SPAN element and its nested FONT element, both of which surround the one-word content. If you apply the EM element inside the SPAN element (click the middle button), the SPAN element's first (and only) child element becomes the EM element; the FONT element is now a child of the new EM element.

Listing 15-22: **Using the applyElement() Method**

```
<HTML>
<HEAD>
<TITLE>applyElement() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function applyOutside() {
    var newItem = document.createElement("EM")
    newItem.id = newItem.uniqueID
    document.all.mySpan.applyElement(newItem)
}

function applyInside() {
    var newItem = document.createElement("EM")
    newItem.id = newItem.uniqueID
    document.all.mySpan.applyElement(newItem, "inside")
}

function showHTML() {
    alert(document.all.myP.outerHTML)
}
</SCRIPT>
</HEAD>
<BODY>
<H1>applyElement() Method</H1>
<HR>
<P ID="myP">A simple paragraph with a <SPAN ID="mySpan">
<FONT SIZE=+1>special</FONT></SPAN> word in it.</P>
<FORM>
<INPUT TYPE="button" VALUE="Apply <EM> Outside" onClick="applyOutside()">
<INPUT TYPE="button" VALUE="Apply <EM> Inside" onClick="applyInside()">
<INPUT TYPE="button" VALUE="Show <P> HTML..." onClick="showHTML()"><BR>
<INPUT TYPE="button" VALUE="Restore Paragraph" onClick="location.reload()">
</BODY>
</HTML>
```

The visible results of applying the EM element inside and outside the SPAN element in this case are the same. But you can see from the HTML results that each element impacts the element hierarchy quite differently.

attachEvent("*eventName*", *functionRef*)
detachEvent("*eventName*", *functionRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to create an anonymous function that is called in response to an `onmousedown` event of the first paragraph on the page. Begin by assigning the anonymous function to global variable `a` (already initialized in The Evaluator) in the upper text box:

```
a = new Function("alert('Function created at " + (new Date()) + "')")
```

The quote marks and parentheses can get jumbled easily, so enter this expression carefully. When you enter the expression successfully, the Results box shows the function's text. Now assign this function to the `onmousedown` event of the myP element by entering the following statement into the upper text box:

```
document.all.myP.attachEvent("onmousedown", a)
```

The Results box displays `true` when successful. If you mouse down on the first paragraph, an alert box displays the date and time that the anonymous function was created (when the `new Date()` expression was evaluated).

Now, disconnect the event relationship from the object by entering the following statement into the upper text box:

```
document.all.myP.detachEvent("onmousedown", a)
```

blur()
focus()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

To show how both the `window.focus()` method and its opposite (`window.blur()`) operate, Listing 15-23 for NN3+ and IE4+ creates a two-window environment. From each window, you can bring the other window to the front. The main window uses the object returned by `window.open()` to assemble the reference to the new window. In the subwindow (whose content is created entirely on the fly by JavaScript), `self.opener` is summoned to refer to the original window, while `self.blur()` operates on the subwindow itself (except for the buggy behavior of NN6 noted earlier). Blurring one window and focusing on another window yields the same result of sending the window to the back of the pile.

Listing 15-23: The window.focus() and window.blur() Methods

```
<HTML>
<HEAD>
<TITLE>Window Focus() and Blur()</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
// declare global variable name
var newWindow = null
function makeNewWindow() {
    // check if window already exists
    if (!newWindow || newWindow.closed) {
        // store new window object in global variable
        newWindow = window.open("","","width=250,height=250")
        // pause briefly to let IE3 window finish opening
        setTimeout("fillWindow()",100)
    } else {
        // window already exists, so bring it forward
        newWindow.focus()
    }
}
// assemble new content and write to subwindow
function fillWindow() {
    var newContent = "<HTML><HEAD><TITLE>Another Subwindow</TITLE></HEAD>"
    newContent += "<BODY bgColor='salmon'>"
    newContent += "<H1>A Salmon-Colored Subwindow.</H1>"
    newContent += "<FORM><INPUT TYPE='button' VALUE='Bring Main to Front'
onClick='self.opener.focus()'>"
    // the following button doesn't work in NN6
    newContent += "<FORM><INPUT TYPE='button' VALUE='Put Me in Back'
onClick='self.blur()'>"
    newContent += "</FORM></BODY></HTML>"
    // write HTML to new window document
```

Continued

Listing 15-23 *(continued)*

```
    newWindow.document.write(newContent)
    newWindow.document.close()
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Window focus() and blur() Methods</H1>
<HR>
<FORM>
<INPUT TYPE="button" NAME="newOne" VALUE="Show New Window"
onClick="makeNewWindow()">
</FORM>
</BODY>
</HTML>
```

A key ingredient to the success of the `makeNewWindow()` function in Listing 15-23 is the first conditional expression. Because `newWind` is initialized as a `null` value when the page loads, that is its value the first time through the function. But after you open the subwindow the first time, `newWind` is assigned a value (the subwindow object) that remains intact even if the user closes the window. Thus, the value doesn't revert to `null` by itself. To catch the possibility that the user has closed the window, the conditional expression also sees if the window is closed. If it is, a new subwindow is generated, and that new window's reference value is reassigned to the `newWind` variable. On the other hand, if the window reference exists and the window is not closed, the `focus()` method brings that subwindow to the front.

You can see the `focus()` method for a text object in action in Chapter 25's description of the `select()` method for text objects.

clearAttributes()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to examine the attributes of an element before and after you apply `clearAttributes()`. To begin, display the HTML for the table element on the page by entering the following statement into the upper text field:

```
myTable.outerHTML
```

Notice the attributes associated with the `<TABLE>` tag. Look at the rendered table to see how attributes such as `BORDER` and `WIDTH` affect the display of the table. Now, enter the following statement in the top text box to remove all removable attributes from this element:

```
myTable.clearAttributes()
```

First, look at the table. The border is gone, and the table is rendered only as wide as is necessary to display the content with no cell padding. Lastly, view the results of the `clearAttributes()` method in the `outerHTML` of the table again:

```
myTable.outerHTML
```

The source code file has not changed, but the object model in the browser's memory reflects the changes you made.

click()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `click()` method. The page includes various types of buttons at the bottom. You can "click" the checkbox, for example, by entering the following statement in the topmost text field:

```
document.myForm2.myCheckbox.click()
```

If you use a recent browser version, you most likely can see the checkbox change states between checked and unchecked each time you execute the statement.

cloneNode(*deepBoolean*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to clone, rename, and append an element found in The Evaluator's source code. Begin by cloning the paragraph element named `myP` along with all of its content. Enter the following statement into the topmost text field:

```
a = document.getElementById("myP").cloneNode(true)
```

The variable `a` now holds the clone of the original node, so you can change its `ID` attribute at this point by entering the following statement:

```
a.setAttribute("ID", "Dolly")
```

If you want to see the properties of the cloned node, enter `a` into the lower text field. The precise listing of properties you see depends on whether you use NN or IE; in either case, you should be able to locate the `id` property, whose value is now `Dolly`.

As a final step, append this newly named node to the end of the `body` element by entering the following statement into the topmost text field:

```
document.body.appendChild(a)
```

You can now scroll down to the bottom of the page and see a duplicate of the content. But because the two nodes have different `ID` attributes, they cannot confuse scripts that need to address one or the other.

componentFromPoint(*x*,*y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can experiment with this method in the code supplied with Listing 15-24. As presented, the method is associated with a TEXTAREA object that is specifically sized to display both vertical and horizontal scrollbars. As you click various areas of the TEXTAREA and the rest of the page, the status bar displays information about the location of the event with the help of the `componentFromPoint()` method.

The script utilizes a combination of the `event.srcElement` property and the `componentFromPoint()` method to help you distinguish how you can use each one for different types of event processing. The `srcElement` property is used initially as a filter to decide whether the status bar will reveal further processing about the TEXTAREA element's event details.

The `onMouseDown` event handler in the BODY element triggers all event processing. IE events bubble up the hierarchy (and no events are cancelled in this page), so all `mouseDown` events eventually reach the BODY element. Then, the `whereInWorld()` function can compare each `mouseDown` event from any element against the textarea's geography.

Listing 15-24: **Using the componentFromPoint() Method**

```
<HTML>
<HEAD>
<TITLE>componentFromPoint() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function whereInWorld(elem) {
    var x = event.clientX
    var y = event.clientY
    var component = document.all.myTextarea.componentFromPoint(x,y)
    if (window.event.srcElement == document.all.myTextarea) {
        if (component == "") {
            status = "mouseDown event occurred inside the element"
        } else {
            status = "mouseDown occurred on the element\'s " + component
        }
    } else {
        status = "mouseDown occurred " + component + " of the element"
    }
}
</SCRIPT>
</HEAD>
<BODY onMouseDown="whereInWorld()">
<H1>componentFromPoint() Method</H1>
<HR>
<P>Tracking the mouseDown event relative to the textarea object. View results in
status bar.</P>
<FORM>
<TEXTAREA NAME="myTextarea" WRAP="off" COLS=12 ROWS=4>
This is Line 1
This is Line 2
This is Line 3
This is Line 4
This is Line 5
This is Line 6
</TEXTAREA>
</FORM>
</BODY>
</HTML>
```

contains(*elementObjectReference*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Using The Evaluator (Chapter 13), see how the `contains()` method responds to the object combinations in each of the following statements as you enter them into the upper text box:

```
document.body.contains(document.all.myP)
document.all.myP.contains(document.all.item("myEM"))
document.all.myEM.contains(document.all.myEM)
document.all.myEM.contains(document.all.myP)
```

Feel free to test other object combinations within this page.

detachEvent()

See `attachEvent()`.

dispatchEvent(*eventObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 15-25 demonstrates the `dispatchEvent()` method as defined in the W3C DOM Level 2. The behavior is identical to that of Listing 15-26, which demonstrates the IE5.5 equivalent: `fireEvent()`. This example does not perform all intended actions in the first release of NN6 because the browser does not fully implement the `document.createEvent()` method. The example is designed to operate more completely in a future version that supports event generation.

Listing 15-25: Using the dispatchEvent() Method

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
#mySPAN {font-style:italic}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// assemble a couple event object properties
function getEventProps(evt) {
    var msg = ""
    var elem = evt.target
    msg += "event.target.nodeName: " + elem.nodeName + "\n"
    msg += "event.target.parentNode: " + elem.parentNode.id + "\n"
    msg += "event button: " + evt.button
    return msg
}

// onClick event handlers for body, myP, and mySPAN
function bodyClick(evt) {
    var msg = "Click event processed in BODY\n\n"
    msg += getEventProps(evt)
    alert(msg)
    checkCancelBubble(evt)
}
function pClick(evt) {
    var msg = "Click event processed in P\n\n"
    msg += getEventProps(evt)
    alert(msg)
    checkCancelBubble(evt)
}
function spanClick(evt) {
    var msg = "Click event processed in SPAN\n\n"
    msg += getEventProps(evt)
    alert(msg)
    checkCancelBubble(evt)
}

// cancel event bubbling if check box is checked
function checkCancelBubble(evt) {
    if (document.controls.bubbleOn.checked) {
        evt.stopPropagation()
    }
}

// assign onClick event handlers to three elements
function init() {
    document.body.onclick = bodyClick
    document.getElementById("myP").onclick = pClick
```

Continued

Listing 15-25 *(continued)*

```
    document.getElementById("mySPAN").onclick = spanClick
}

// invoke fireEvent() on object whose ID is passed as parameter
function doDispatch(objID, evt) {
    // don't let button clicks bubble
    evt.stopPropagation()
    var newEvt = document.createEvent("MouseEvent")
    if (newEvt) {
        newEvt.button = 3
        document.getElementById(objID).dispatchEvent(newEvt)
    } else {
        alert("This browser version does not support the feature.")
    }
}
</SCRIPT>
</HEAD>
<BODY ID="myBODY" onLoad="init()">
<H1>fireEvent() Method</H1>
<HR>
<P ID="myP">This is a paragraph <SPAN ID="mySPAN">(with a nested SPAN)</SPAN>
that receives click events.</SPAN></P>
<HR>
<P><B>Control Panel</B></P>
<FORM NAME="controls">
<P><INPUT TYPE="checkbox" NAME="bubbleOn"
onClick="event.stopPropagation()">Cancel event bubbling.</P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on BODY"
onClick="doDispatch('myBODY', event)"></P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on myP"
onClick="doDispatch('myP', event)"></P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on mySPAN"
onClick="doDispatch('mySPAN', event)"></P>
</FORM>
</BODY>
</HTML>
```

fireEvent("*eventType*"[, *eventObjectRef*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

The small laboratory of Listing 15-26 enables you to explore the possibilities of the IE5.5 `fireEvent()` method while reinforcing event bubbling concepts in IE. Three nested element objects are assigned separate `onClick` event handlers (via the `init()` function invoked after the page loads—although you can also set these event handlers via `onClick` attributes in the tags). Each handler displays an alert whose content reveals which object's event handler was triggered and the tag name and ID of the object that received the event. The default behavior of the page is to allow event bubbling, but a checkbox enables you to turn off bubbling.

After you load the page, click the italic segment (a nested SPAN element) to receive a series of three alert boxes. The first advises you that the SPAN element's `onClick` event handler is processing the event and that the SPAN element (whose ID is `mySPAN`) is, indeed, the source element of the event. Because event bubbling is enabled by default, the event bubbles upward to the SPAN element's next outermost container: the `myP` paragraph element. (However, `mySPAN` is still the source element.) Finally, the event reaches the BODY element. If you click in the H1 element at the top of the page, the event is not processed until it reaches the BODY element—although the H1 element is the source element because that's what you clicked. In all cases, when you explicitly click something to generate the `onclick` event, the event's `button` property shows zero to signify the primary mouse button in IE.

Now onto the real purpose of this example: the `fireEvent()` method. Three buttons enable you to direct a click event to each of the three elements that have event handlers defined for them. The events fired this way are artificial, generated via the `createEventObject()` method. For demonstration purposes, the `button` property of these scripted events is set to `3`. This property value is assigned to the `event` object that eventually gets directed to an element. With event bubbling left on, the events sent via `fireEvent()` behave just like the physical clicks on the elements. Similarly, if you disable event bubbling, the first event handler to process the event cancels bubbling, and no further processing of that event occurs. Notice that event bubbling is cancelled within the event handlers that process the event. To prevent the clicks of the checkbox and action buttons from triggering the BODY element's `onClick` event handlers, event bubbling is turned off for the buttons right away.

Listing 15-26: **Using the fireEvent() Method**

```
<HTML>
<HEAD>
<STYLE TYPE="text/css">
#mySPAN {font-style:italic}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// assemble a couple event object properties
```

Continued

Listing 15-26 *(continued)*

```
function getEventProps() {
    var msg = ""
    var elem = event.srcElement
    msg += "event.srcElement.tagName: " + elem.tagName + "\n"
    msg += "event.srcElement.id: " + elem.id + "\n"
    msg += "event button: " + event.button
    return msg
}

// onClick event handlers for body, myP, and mySPAN
function bodyClick() {
    var msg = "Click event processed in BODY\n\n"
    msg += getEventProps()
    alert(msg)
    checkCancelBubble()
}
function pClick() {
    var msg = "Click event processed in P\n\n"
    msg += getEventProps()
    alert(msg)
    checkCancelBubble()
}
function spanClick() {
    var msg = "Click event processed in SPAN\n\n"
    msg += getEventProps()
    alert(msg)
    checkCancelBubble()
}

// cancel event bubbling if check box is checked
function checkCancelBubble() {
    event.cancelBubble = document.controls.bubbleOn.checked
}

// assign onClick event handlers to three elements
function init() {
    document.body.onclick = bodyClick
    document.all.myP.onclick = pClick
    document.all.mySPAN.onclick = spanClick
}

// invoke fireEvent() on object whose ID is passed as parameter
function doFire(objID) {
    var newEvt = document.createEventObject()
    newEvt.button = 3
    document.all(objID).fireEvent("onclick", newEvt)
    // don't let button clicks bubble
    event.cancelBubble = true
}
```

```
</SCRIPT>
</HEAD>
<BODY ID="myBODY" onLoad="init()">
<H1>fireEvent() Method</H1>
<HR>
<P ID="myP">This is a paragraph <SPAN ID="mySPAN">(with a nested SPAN)</SPAN>
that receives click events.</SPAN></P>
<HR>
<P><B>Control Panel</B></P>
<FORM NAME="controls">
<P><INPUT TYPE="checkbox" NAME="bubbleOn"
onClick="event.cancelBubble=true">Cancel event bubbling.</P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on BODY"
onClick="doFire('myBODY')"></P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on myP"
onClick="doFire('myP')"></P>
<P><INPUT TYPE="button" VALUE="Fire Click Event on mySPAN"
onClick="doFire('mySPAN')"></P>
</FORM>
</BODY>
</HTML>
```

focus()

See `blur()`.

getAdjacentText("*position*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to examine all four adjacent text possibilities for the `myP` and nested `myEM` elements in that document. Enter each of the following statements into the upper text box, and view the results:

```
document.all.myP.getAdjacentText("beforeBegin")
document.all.myP.getAdjacentText("afterBegin")
document.all.myP.getAdjacentText("beforeEnd")
document.all.myP.getAdjacentText("afterEnd")
```

The first and last statements return empty strings because the myP element has no text fragments surrounding it. The afterBegin version returns the text fragment of the myP element up to, but not including, the EM element nested inside. The beforeEnd string picks up after the end of the nested EM element and returns all text to the end of myP.

Now, see what happens with the nested myEM element:

```
document.all.myEM.getAdjacentText("beforeBegin")
document.all.myEM.getAdjacentText("afterBegin")
document.all.myEM.getAdjacentText("beforeEnd")
document.all.myEM.getAdjacentText("afterEnd")
```

Because this element has no nested elements, the afterBegin and beforeEnd strings are identical: the same value as the innerText property of the element.

getAttribute("*attributeName*"[, *caseSensitivity*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the getAttribute() method for the elements in the page. For IE4, use the document.all notation. IE5 and NN6 understand the W3C standard getElementById() method of addressing an element. You can enter the following sample statements into the top text box to view attribute values.

IE4:

```
document.all.myTable.getAttribute("width")
document.all.myTable.getAttribute("border")
```

IE5/NN6:

```
document.getElementById("myTable").getAttribute("width")
document.getElementById("myTable").getAttribute("border")
```

getAttributeNode("*attributeName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to explore the `getAttributeNode()` method in NN6. The Results TEXTAREA element provides several attributes to check out. Because the method returns an object, enter the following statements into the bottom text field so you can view the properties of the attribute node object returned by the method:

```
document.getElementById("output").getAttributeNode("COLS")
document.getElementById("output").getAttributeNode("ROWS")
document.getElementById("output").getAttributeNode("wrap")
document.getElementById("output").getAttributeNode("style")
```

All (except the last) statements display a list of properties for each attribute node object. The last statement, however, returns nothing because the `STYLE` attribute is not specified for the element.

getBoundingClientRect()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-27 employs both the `getBoundingClientRect()` and `getClientRects()` methods in a demonstration of how they differ. A set of elements are grouped within a SPAN element named `main`. The group consists of two paragraphs and an unordered list.

Two controls enable you to set the position of an underlying highlight rectangle to any line of your choice. A checkbox enables you to set whether the highlight rectangle should be only as wide as the line or the full width of the bounding rectangle for the entire SPAN element.

All the code is located in the `hilite()` function. The SELECT and checkbox elements invoke this function. Early in the function, the `getClientRects()` method is invoked for the `main` element to capture a snapshot of all `TextRectangle`s for the entire element. This array comes in handy when the script needs to get the coordinates of a rectangle for a single line, as chosen in the SELECT element.

Whenever the user chooses a number from the SELECT list and the value is less than the total number of `TextRectangle` objects in `clientRects`, the function begins calculating the size and location of the underlying yellow highlighter. When the Full Width checkbox is checked, the left and right coordinates are obtained from the `getBoundingClientRect()` method because the entire SPAN element's rectangle is the space you're interested in; otherwise, you pull the `left` and `right` properties from the chosen rectangle in the `clientRects` array.

Next comes the assignment of location and dimension values to the `hiliter` object's `style` property. The top and bottom are always pegged to whatever line is selected, so the `clientRects` array is polled for the chosen entry's `top` and `bottom` properties. The previously calculated `left` value is assigned to the `hiliter` object's `pixelLeft` property, while the width is calculated by subtracting the `left` from the `right` coordinates. Notice that the `top` and `left` coordinates also take into account any vertical or horizontal scrolling of the entire body of the document. If you resize the window to a smaller size, line wrapping throws off the original line count. However, an invocation of `hilite()` from the `onResize` event handler applies the currently chosen line number to whatever content falls in that line after resizing.

Listing 15-27: **Using getBoundingClientRect()**

```
<HTML>
<HEAD>
<TITLE>getClientRects() and getBoundClientRect() Methods</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function hilite() {
    var hTop, hLeft, hRight, hBottom, hWidth
    var select = document.forms[0].choice
    var n = parseInt(select.options[select.selectedIndex].value) - 1
    var clientRects = document.all.main.getClientRects()
    var mainElem = document.all.main
    if (n >= 0 && n < clientRects.length) {
        if (document.forms[0].fullWidth.checked) {
            hLeft = mainElem.getBoundingClientRect().left
            hRight = mainElem.getBoundingClientRect().right
        } else {
            hLeft = clientRects[n].left
            hRight = clientRects[n].right
        }
        document.all.hiliter.style.pixelTop = clientRects[n].top + 
            document.body.scrollTop
        document.all.hiliter.style.pixelBottom = clientRects[n].bottom
        document.all.hiliter.style.pixelLeft = hLeft + document.body.scrollLeft
```

```
        document.all.hiliter.style.pixelWidth = hRight - hLeft
        document.all.hiliter.style.visibility = "visible"
    } else if (n > 0) {
        alert("The content does not have that many lines.")
        document.all.hiliter.style.visibility = "hidden"
    }
}
</SCRIPT>
</HEAD>
<BODY onResize="hilite()">
<H1>getClientRects() and getBoundClientRect() Methods</H1>
<HR>
<FORM>
Choose a line to highlight:
<SELECT NAME="choice" onChange="hilite()">
<OPTION VALUE=0>
<OPTION VALUE=1>1
<OPTION VALUE=2>2
<OPTION VALUE=3>3
<OPTION VALUE=4>4
<OPTION VALUE=5>5
<OPTION VALUE=6>6
<OPTION VALUE=7>7
<OPTION VALUE=8>8
<OPTION VALUE=9>9
<OPTION VALUE=10>10
<OPTION VALUE=11>11
<OPTION VALUE=12>12
<OPTION VALUE=13>13
<OPTION VALUE=14>14
<OPTION VALUE=15>15
</SELECT><BR>

<INPUT NAME="fullWidth" TYPE="checkbox" onClick="hilite()">
Full Width (bounding rectangle)
</FORM>
<SPAN ID="main">
<P>Lorem ipsum dolor sit amet, consectetaur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim adminim veniam, quis nostrud exercitation ullamco:</P>
<UL>
<LI>laboris
<LI>nisi
<LI>aliquip ex ea commodo
</UL>
<P>Duis aute irure dolor in reprehenderit involuptate velit esse
cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat
cupidatat non proident, sunt in culpa qui officia deseruntmollit
anim id est laborum Et harumd und lookum like Greek to me, dereud
facilis est er expedit distinct.</P>
```

Continued

Listing 15-27 *(continued)*

```
</SPAN>
<DIV ID="hiliter"
STYLE="position:absolute; background-color:yellow; z-index:-1;
visibility:hidden">
</DIV>
</BODY>
</HTML>
```

Because the `z-index` style property of the `hiliter` element is set to `-1`, the element always appears beneath the primary content on the page. If the user selects a line number beyond the current number of lines in the main element, the `hiliter` element is hidden.

getClientRects()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-27, which demonstrates the differences between `getClientRects()` and `getBoundingClientRect()` and shows how you can use the two together.

getElementsByTagName("*tagName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `getElementsByTagName()` method. Enter the following statements one at a time into the upper text box and study the results:

```
document.body.getElementsByTagName("DIV")
```

```
document.body.getElementsByTagName("DIV").length
document.getElementById("myTable").getElementsByTagName("TD").length
```

Because the `getElementsByTagName()` method returns an array of objects, you can use one of those returned values as a valid element reference:

```
document.getElementsByTagName("FORM")[0].getElementsByTagName("INPUT").length
```

getExpression("*attributeName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-32 for the `setExpression()` method. This listing demonstrates the kinds of values returned by `getExpression()`.

hasChildNodes()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `hasChildNodes()` method. If you enter the following statement into the topmost text box:

```
document.getElementById("myP").hasChildNodes()
```

the returned value is `true`. You can find out how many nodes there are by getting the `length` of the `childNodes` array:

```
document.getElementById("myP").childNodes.length
```

This expression reveals a total of three nodes: the two text nodes and the EM element between them. Check out whether the first text node has any children:

```
document.getElementById("myP").childNodes[0].hasChildNodes()
```

The response is `false` because text fragments do not have any nested nodes. But check out the EM element, which is the second child node of the `myP` element:

```
document.getElementById("myP").childNodes[1].hasChildNodes()
```

The answer is `true` because the EM element has a text fragment node nested within it. Sure enough, the statement

```
document.getElementById("myP").childNodes[1].childNodes.length
```

yields a node count of `1`. You can also go directly to the EM element in your references:

```
document.getElementById("myEM").hasChildNodes()
document.getElementById("myEM").childNodes.length
```

If you want to see the properties of the text fragment node inside the EM element, enter the following into the lower text box:

```
document.getElementById("myEM").childNodes[0]
```

You can see that the `data` and `nodeValue` properties for the text fragment return the text `"all"`.

insertAdjacentElement("*location*", *elementObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `insertAdjacentElement()` method. The goal of the experiment is to insert a new H1 element above the `myP` element.

All actions require you to enter a sequence of statements in the topmost text box. Begin by storing a new element in the global variable `a`:

```
a = document.createElement("H1")
```

Give the new object some text:

```
a.innerText = "New Header"
```

Now, insert this element before the start of the myP object:

```
myP.insertAdjacentElement("beforeBegin", a)
```

Notice that you have not assigned an id property value to the new element. But because the element was inserted by reference, you can modify the inserted object by changing the object stored in the a variable:

```
a.style.color = "red"
```

The inserted element is also part of the document hierarchy, so you can access it through hierarchy references such as myP.previousSibling.

The parent element of the newly inserted element is the BODY. Thus, you can inspect the current state of the HTML for the rendered page by entering the following statement into the topmost text box:

```
document.body.innerHTML
```

If you scroll down past the first form, you can find the <H1> element that you added along with the STYLE attribute.

insertAdjacentHTML("*location*", "*HTMLtext*")
insertAdjacentText("*location*", "*text*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with these two methods. The example here demonstrates the result of employing both methods in an attempt to add some HTML to the beginning of the myP element.

Begin by assigning a string of HTML code to the global variable a:

```
a = "<B ID='myB'>Important News!</B>"
```

Because this HTML is to go on the same line as the start of the myP paragraph, use the afterBegin parameter for the insert method:

```
myP.insertAdjacentHTML("afterBegin", a)
```

Notice that there is no space after the exclamation mark of the inserted HTML. But to prove that the inserted HTML is genuinely part of the document's object model, you can now insert the text of a space after the B element whose ID is `myB`:

```
myB.insertAdjacentText("afterEnd", " ")
```

Each time you evaluate the preceding statement (by repeatedly clicking the Evaluate button or pressing Enter with the cursor in the topmost field), an additional space is added.

You should also see what happens when the string to be inserted with `insertAdjacentText()` contains HTML tags. Reload The Evaluator and enter the following two statements into the topmost field, evaluating each one in turn:

```
a = "<B ID='myB'>Important News!</B>"
myP.insertAdjacentText("afterBegin", a)
```

The HTML is not interpreted but is displayed as plain text. There is no object named `myB` after executing this latest insert method.

insertBefore(*newChildNodeObject*[, *referenceChildNode*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Listing 15-28 demonstrates how the `insertBefore()` method can insert child elements (LI) inside a parent (OL) at different locations, depending on the second parameter. A text box enables you to enter your choice of text and/or HTML for insertion at various locations within the OL element. If you don't specify a position, the second parameter of `insertBefore()` is passed as `null` — meaning that the new child node is added to the end of the existing children. But choose a spot from the select list where you want to insert the new item. The value of each SELECT list option is an index of one of the first three child nodes of the OL element.

Listing 15-28: Using the insertBefore() Method

```
<HTML>
<HEAD>
```

```
<TITLE>insertBefore() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doInsert(form) {
    if (form.newText) {
        var newChild = document.createElement("LI")
        newChild.innerHTML = form.newText.value
        var choice = form.itemIndex.options[form.itemIndex.selectedIndex].value
        var insertPoint = (isNaN(choice)) ?
            null : document.getElementById("myUL").childNodes[choice]
        document.getElementById("myUL").insertBefore(newChild, insertPoint)
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>insertBefore() Method</H1>
<HR>
<FORM onSubmit="return false">
<P>Enter text or HTML for a new list item:
<INPUT TYPE="text" NAME="newText" SIZE=40 VALUE=""></P>
<P>Before which existing item?
<SELECT NAME="itemIndex">
    <OPTION VALUE=null>None specified
    <OPTION VALUE=0>1
    <OPTION VALUE=1>2
    <OPTION VALUE=2>3
</SELECT></P>
<INPUT TYPE="button" VALUE="Insert Item" onClick="doInsert(this.form)">
</FORM>

<OL ID="myUL">
    <LI>Originally the First Item
    <LI>Originally the Second Item
    <LI>Originally the Third Item
</OL>
</BODY>
</HTML>
```

item(*index* | "*index*" [, *subIndex*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `item()` method. Type the following statements into the topmost text box and view the results for each:

NN6 and IE5

```
document.getElementById("myP").childNodes.length
document.getElementById("myP").childNodes.item(0).data
document.getElementById("myP").childNodes.item(1).nodeName
```

NN6, IE4, and IE5

```
document.forms[1].elements.item(0).type
```

IE4 and IE5

```
document.all.item("myP").outerHTML
myP.outerHTML
```

In the last two examples, both statements return the same string. The first example is helpful when your script is working with a string version of an object's name. If your script already knows the object reference, then the second approach is more efficient and compact.

mergeAttributes("*sourceObject*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-29 demonstrates the usage of `mergeAttributes()` in the process of replicating the same form input field while assigning a unique ID to each new field. So you can see the results as you go, I display the HTML for each input field in the field.

The `doMerge()` function begins by generating two new elements: a P and an INPUT element. Because these newly created elements have no properties associated with them, a unique ID is assigned to the INPUT element via the `uniqueID` property. Attributes from the field in the source code (`field1`) are merged into the new INPUT element. Thus, all attributes except `name` and `id` are copied to the new element. The INPUT element is inserted into the P element, and the P element is appended to the document's form element. Finally, the `outerHTML` of the new element is displayed in its field. Notice that except for the `NAME` and `ID` attributes, all others are copied. This includes style sheet attributes and event handlers. To prove that the event handler works in the new elements, you can add a space to any one of them and press Tab to trigger the `onChange` event handler that changes the content to all uppercase characters.

Listing 15-29: **Using the mergeAttributes() Method**

```
<HTML>
<HEAD>
<TITLE>mergeAttributes() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doMerge(form) {
    var newPElem = document.createElement("P")
    var newInputElem = document.createElement("INPUT")
    newInputElem.id = newInputElem.uniqueID
    newInputElem.mergeAttributes(form.field1)
    newPElem.appendChild(newInputElem)
    form.appendChild(newPElem)
    newInputElem.value = newInputElem.outerHTML
}
// called by onChange event handler of fields
function upperMe(field) {
    field.value = field.value.toUpperCase()
}
</SCRIPT>
</HEAD>
<BODY onLoad="document.expandable.field1.value =
document.expandable.field1.outerHTML">
<H1>mergeAttributes() Method</H1>
<HR>
<FORM NAME="expandable" onSubmit="return false">
<P><INPUT TYPE="button" VALUE="Append Field 'Clone'"
onClick="doMerge(this.form)"></P>
<P><INPUT TYPE="text" NAME="field1" ID="FIELD1" SIZE=120 VALUE="" STYLE="font-
size:9pt" onChange="upperMe(this)"></P>
</FORM>
</BODY>
</HTML>
```

normalize()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator to experiment with the `normalize()` method in NN6. The following sequence adds a text node adjacent to one in the `myP` element. A subsequent invocation of the `normalize()` method removes the division between the adjacent text nodes.

Begin by confirming the number of child nodes of the `myP` element:

```
document.getElementById("myP").childNodes.length
```

Three nodes initially inhabit the element. Next, create a text node and append it as the last child of the `myP` element:

```
a = document.createTextNode("This means you!")
document.getElementById("myP").appendChild(a)
```

With the new text now rendered on the page, the number of child nodes increases to four:

```
document.getElementById("myP").childNodes.length
```

You can see that the last child node of `myP` is the text node you just created:

```
document.getElementById("myP").lastChild.nodeValue
```

But by invoking `normalize()` on `myP`, all adjacent text nodes are accumulated into single nodes:

```
document.getElementById("myP").normalize()
```

You can now see that the `myP` element is back to three child nodes, and the last child is a combination of the two previously distinct, but adjacent, text nodes:

```
document.getElementById("myP").childNodes.length
document.getElementById("myP").lastChild.nodeValue
```

releaseCapture()
setCapture(*containerBoolean*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-30 demonstrates the usage of `setCapture()` and `releaseCapture()` in a "quick-and-dirty" context menu for IE5+/Windows. The job of the context menu is to present a list of numbering styles for the ordered list of items on the page. Whenever the user brings up the context menu atop the OL element, the custom context menu appears. Event capture is turned on in the process to prevent mouse actions elsewhere on the page from interrupting the context menu choice. Even a click on the link set up as the title of the list is inhibited while the context menu is visible. A click anywhere outside of the context menu hides the menu. Clicking a choice in the menu changes the `listStyleType` property of the OL object and hides the menu. Whenever the context menu is hidden, event capture is turned off so that clicking on the page (such as the link) works as normal.

For this design, `onClick`, `onMouseOver`, and `onMouseOut` event handlers are assigned to the DIV element that contains the context menu. To trigger the display of the context menu, the OL element has an `onContextMenu` event handler. This handler invokes the `showContextMenu()` function. In this function, event capture is assigned to the context menu DIV object. The DIV is also positioned at the location of the click before it is set to be visible. To prevent the system's regular context menu from also appearing, the `event` object's `returnValue` property is set to `false`.

Now that all mouse events on the page go through the `contextMenu` DIV object, let's examine what happens with different kinds of events triggered by user action. As the user rolls the mouse, a flood of `mouseover` and `mouseout` events fire. The event handlers assigned to the DIV manage these events. But notice that the two event handlers, `highlight()` and `unhighlight()`, perform action only when the `srcElement` property of the event is one of the menu items in the DIV. Because the page has no other `onMouseOver` or `onMouseOut` event handlers defined for elements up the containment hierarchy, you do not have to cancel event bubbling for these events.

When a user clicks the mouse button, different things happen depending on whether event capture is enabled. Without event capture, the `click` event bubbles up from wherever it occurred to the `onClick` event handler in the BODY element. (An alert dialog box displays to let you know when the event reaches the BODY.) But with event capture turned on (the context menu is showing), the `handleClick()` event handler takes over to apply the desired choice whenever the click is atop one of the context menu items. For all `click` events handled by this function, the context menu is hidden and the `click` event is canceled from bubbling up any higher (no alert dialog box appears). This takes place whether the user makes a choice in the context menu or clicks anywhere else on the page. In the latter case, all you need is for the context menu to go away like the real context menu does. For added insurance, the `onLoseCapture` event handler hides the context menu when a user performs any of the actions just listed that cancel capture.

Listing 15-30: **Using setCapture() and releaseCapture()**

```
<HTML>
<STYLE TYPE="text/css">
#contextMenu {position:absolute; background-color:#cfcfcf;
              border-style:solid; border-width:1px;
              border-color:#EFEFEF #505050 #505050 #EFEFEF;
              padding:3px 10px; font-size:8pt; font-family:Arial, Helvetica;
              line-height:150%; visibility:hidden}
.menuItem {color:black}
.menuItemOn {color:white}
OL {list-style-position:inside; font-weight:bold; cursor:nw-resize}
LI {font-weight:normal}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showContextMenu() {
    contextMenu.setCapture()
    contextMenu.style.pixelTop = event.clientY + document.body.scrollTop
    contextMenu.style.pixelLeft = event.clientX + document.body.scrollLeft
    contextMenu.style.visibility = "visible"
    event.returnValue = false
}

function revert() {
    document.releaseCapture()
    hideMenu()
}

function hideMenu() {
    contextMenu.style.visibility = "hidden"
}

function handleClick() {
    var elem = window.event.srcElement
    if (elem.id.indexOf("menuItem") == 0) {
        shapesList.style.listStyleType = elem.LISTTYPE
    }
    revert()
    event.cancelBubble = true
}

function highlight() {
    var elem = event.srcElement
    if (elem.className == "menuItem") {
        elem.className = "menuItemOn"
    }
}
```

```
function unhighlight() {
    var elem = event.srcElement
    if (elem.className == "menuItemOn") {
        elem.className = "menuItem"
    }
}
</SCRIPT>
<BODY onClick="alert('You reached the document object.')" >
<OL ID="shapesList" onContextMenu="showContextMenu()">
<A HREF="javascript:alert('A sample link.')">Three-Dimensional Shapes</A>
<LI>Circular Cylinder</LI>
<LI>Cube</LI>
<LI>Rectangular Prism</LI>
<LI>Regular Right Pyramid</LI>
<LI>Right Circular Cone</LI>
<LI>Sphere</LI>
</OL>

<DIV ID="contextMenu" onLoseCapture="hideMenu()" onClick="handleClick()"
onMouseOver="highlight()" onMouseOut="unhighlight()">
<SPAN ID="menuItem1" CLASS="menuItem" LISTTYPE="upper-
alpha">A,B,C,...</SPAN><BR>
<SPAN ID="menuItem2" CLASS="menuItem" LISTTYPE="lower-
alpha">a,b,c,...</SPAN><BR>
<SPAN ID="menuItem3" CLASS="menuItem" LISTTYPE="upper-
roman">I,II,III,...</SPAN><BR>
<SPAN ID="menuItem4" CLASS="menuItem" LISTTYPE="lower-
roman">i,ii,iii,...</SPAN><BR>
<SPAN ID="menuItem5" CLASS="menuItem" LISTTYPE="decimal">1,2,3,...</SPAN><BR>
</DIV>
</BODY>
</HTML>
```

removeAttribute("*attributeName*"[, *caseSensitivity*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `removeAttribute()` method for the elements in the page. See the examples for the `setAttribute()`

method later in this chapter, and enter the corresponding `removeAttribute()` statements in the top text box. Interlace statements using `getAttribute()` to verify the presence or absence of each attribute.

removeAttributeNode(*attributeNode*)
setAttributeNode(*attributeNode*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `setAttributeNode()` and `removeAttributeNode()` methods for the P element in the page. The task is to create and add a `STYLE` attribute to the P element. Begin by creating a new attribute and storing it temporarily in the global variable `a`:

```
a = document.createAttribute("style")
```

Assign a value to the `attribute` object:

```
a.nodeValue = "color:red"
```

Now insert the new attribute into the P element:

```
document.getElementById("myP").setAttributeNode(a)
```

The paragraph changes color in response to the newly added attribute.

Due to the NN6 bug that won't allow the method to return a reference to the newly inserted attribute node, you can artificially obtain such a reference:

```
b = document.getElementById("myP").getAttributeNode("style")
```

Finally, use the reference to the newly added attribute to remove it from the element:

```
document.getElementById("myP").removeAttribute(b)
```

Upon removing the attribute, the paragraph resumes its initial color. See the example for the `setAttribute()` method later in this chapter to discover how you can perform this same kind of operation with `setAttribute()`.

removeBehavior(*ID*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listings 15-19a and 15-19b earlier in this chapter for examples of how to use `addBehavior()` and `removeBehavior()`.

removeChild(*nodeObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

You can see an example of `removeChild()` as part of Listing 15-21 earlier in this chapter.

removeEventListener()

See `addEventListener()`.

removeExpression("*propertyName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can experiment with all three expression methods in The Evaluator (Chapter 13). The following sequence adds an expression to a style sheet property of the `myP` element on the page and then removes it.

To begin, enter the number 24 in the bottom one-line text box in The Evaluator (but don't press Enter or click the List Properties button). This is the value used in the expression to govern the fontSize property of the myP object. Next, assign an expression to the myP object's style object by entering the following statement into the topmost text box:

```
myP.style.setExpression("fontSize","document.forms[0].inspector.value","JScript")
```

You can now enter different font sizes into the lower text box and have the values immediately applied to the fontSize property. (Keyboard events in the text box automatically trigger the recalculation.) The default unit is px, but you can also append other units (such as pt) to the value in the text field to see how different measurement units influence the same numeric value.

Before proceeding to the next step, enter a value other than 16 (the default fontSize value). Finally, enter the following statement in the topmost text box to disconnect the expression from the property:

```
myP.style.removeExpression("fontSize")
```

Notice that although you can no longer adjust the font size from the lower text box, the most recent value assigned to it still sticks to the element. To prove it, enter the following statement in the topmost text box to see the current value:

```
myP.style.fontSize
```

removeNode(*removeChildrenFlag*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Examine Listing 15-21 for the appendChild() method to understand the difference between removeChild() and removeNode(). In the restore() function, you can replace this statement

```
mainObj.removeChild(oneChild)
```

in IE5+ with

```
oneChild.removeNode(true)
```

The difference is subtle, but it is important to understand. See Listing 15-31 later in this chapter for another example of the `removeNode()` method.

replaceAdjacentText("*location*", "*text*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `replaceAdjacentText()` method. Enter each of the following statements into the top text box and watch the results in the `myP` element (and its nested `myEM` element) below the solid rule:

```
document.all.myEM.replaceAdjacentText("afterBegin", "twenty")
```

Notice that the `myEM` element's new text picks up the behavior of the element. In the meantime, the replaced text (`all`) is returned by the method and displayed in the Results box.

```
document.all.myEM.replaceAdjacentText("beforeBegin", "We need ")
```

All characters of the text fragment, including spaces, are replaced. Therefore, you may need to supply a trailing space, as shown here, if the fragment you replace has a space.

```
document.all.myP.replaceAdjacentText("beforeEnd", " good people.")
```

This is another way to replace the text fragment following the `myEM` element, but it is also relative to the surrounding `myP` element. If you now attempt to replace text after the end of the `myP` block-level element,

```
document.all.myP.replaceAdjacentText("afterEnd", "Hooray!")
```

the text fragment is inserted after the end of the `myP` element's tag set. The fragment is just kind of floating in the document object model as an unlabeled text node.

replaceChild(*newNodeObject*, *oldNodeObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

You can see an example of `replaceChild()` as part of Listing 15-21 earlier in this chapter.

replaceNode("*newNodeObject*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-31 demonstrates three node-related methods: `removeNode()`, `replaceNode()`, and `swapNode()`. These methods work in IE5+ only.

The page rendered from Listing 15-31 begins with a UL type list of four items. Four buttons control various aspects of the node structure of this list element. The first button invokes the `replace()` function, which changes the UL type to OL. To do this, the function must temporarily tuck away all child nodes of the original UL element so that they can be added back into the new OL element. At the same time, the old UL node is stored in a global variable (`oldNode`) for restoration in another function.

To replace the UL node with an OL, the `replace()` function creates a new, empty OL element and assigns the `myOL` ID to it. Next, the children (LI elements) are stored en masse as an array in the variable innards. The child nodes are then inserted into the empty OL element, using the `insertBefore()` method. Notice that as each child element from the `innards` array is inserted into the OL element, the child element is removed from the `innards` array. That's why the loop to insert the child nodes is a `while` loop that constantly inserts the first item of the `innards` array to the new element. Finally, the `replaceNode()` method puts the new node in the old node's place, while the old node (just the UL element) is stored in `oldNode`.

The `restore()` function operates in the inverse direction of the `replace()` function. The same juggling of nested child nodes is required.

The third button invokes the `swap()` function, whose script exchanges the first and last nodes. The `swapNode()` method, like the others in this discussion, operates from the point of view of the node. Therefore, the method is attached to one of the swapped nodes, while the other node is specified as a parameter. Because of the nature of the OL element, the number sequence remains fixed but the text of the LI node swaps.

To demonstrate the `removeNode()` method, the fourth function removes the last child node of the list. Each call to `removeNode()` passes the `true` parameter to guarantee that the text nodes nested inside each LI node are also removed. Experiment with this method by setting the parameter to `false` (the default). Notice how the parent–child relationship changes when you remove the LI node.

Listing 15-31: **Using Node-Related Methods**

```
<HTML>
<HEAD>
<TITLE>removeNode(), replaceNode(), and swapNode() Methods</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// store original node between changes
var oldNode

// replace UL node with OL
function replace() {
    if (document.all.myUL) {
        var newNode = document.createElement("OL")
        newNode.id = "myOL"
        var innards = document.all.myUL.children
        while (innards.length > 0) {
            newNode.insertBefore(innards[0])
        }
        oldNode = document.all.myUL.replaceNode(newNode)
    }
}

// restore OL to UL
function restore() {
    if (document.all.myOL && oldNode) {
        var innards = document.all.myOL.children
        while (innards.length > 0) {
            oldNode.insertBefore(innards[0])
        }
        document.all.myOL.replaceNode(oldNode)

    }
}
```

Continued

Listing 15-31 *(continued)*

```
// swap first and last nodes
function swap() {
    if (document.all.myUL) {
        document.all.myUL.firstChild.swapNode(document.all.myUL.lastChild)
    }
    if (document.all.myOL) {
        document.all.myOL.firstChild.swapNode(document.all.myOL.lastChild)
    }
}

// remove last node
function remove() {
    if (document.all.myUL) {
        document.all.myUL.lastChild.removeNode(true)
    }
    if (document.all.myOL) {
        document.all.myOL.lastChild.removeNode(true)
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Node Methods</H1>
<HR>
Here is a list of items:
<UL ID="myUL">
<LI>First Item
<LI>Second Item
<LI>Third Item
<LI>Fourth Item
</UL>
<FORM>
<INPUT TYPE="button" VALUE="Change to OL List" onClick="replace()">  
<INPUT TYPE="button" VALUE="Restore LI List" onClick="restore()">  
<INPUT TYPE="button" VALUE="Swap First/Last" onClick="swap()">  
<INPUT TYPE="button" VALUE="Remove Last" onClick="remove()">
</BODY>
</HTML>
```

You can accomplish the same functionality shown in Listing 15-31 in a cross-browser fashion using the W3C DOM. In place of the `removeNode()` and `replaceNode()` methods, use `removeChild()` and `replaceChild()` methods to shift the point of view (and object references) to the parent of the UL and OL objects: the `document.body`. Also, you need to change the `document.all` references to `document.getElementById()`.

scrollIntoView(*topAlignFlag*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `scrollIntoView()` method. Resize the browser window height so that you can see only the topmost text box and the Results textarea. Enter each of the following statements into the top text box and see where the `myP` element comes into view:

```
myP.scrollIntoView()
myP.scrollIntoView(false)
```

Expand the height of the browser window until you can see part of the table lower on the page. If you enter

```
myTable.scrollIntoView(false)
```

into the top text box, the page scrolls to bring the bottom of the table to the bottom of the window. But if you use the default parameter (`true` or empty),

```
myTable.scrollIntoView()
```

the page scrolls as far as it can in an effort to align the top of the element as closely as possible to the top of the window. The page cannot scroll beyond its normal scrolling maximum (although if the element is a positioned element, you can use dynamic positioning to place it wherever you want — including “off the page”). Also, if you shrink the window and try to scroll the top of the table to the top of the window, be aware that the TABLE element contains a CAPTION element so the caption is flush with the top of the window.

setActive()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to compare the `setActive()` and `focus()` methods. With the page scrolled to the top and the window sized so that you cannot see the sample check box near the bottom of the page, enter the following statement into the top text box:

```
document.forms[1].myCheckbox.setActive()
```

Scroll down to see that the checkbox has operational focus (press the spacebar to see). Now, scroll back to the top and enter the following:

```
document.forms[1].myCheckbox.focus()
```

This time, the checkbox gets focus and the page automatically scrolls the object into view.

setAttribute("*attributeName*", *value*[, *caseSensitivity*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `setAttribute()` method for the elements in the page. For IE4, use the `document.all` notation; IE5 and NN6 understand the W3C standard `getElementById()` method of addressing an element.

Setting attributes can have immediate impact on the layout of the page (just as setting an object's properties can). Enter these sample statements into the top text box to view attribute values:

IE4+:

```
document.all.myTable.setAttribute("width", "80%")
document.all.myTable.setAttribute("border", "5")
```

IE5+/NN6:

```
document.getElementById("myTable").setAttribute("width", "80%")
document.getElementById("myTable").setAttribute("border", "5")
```

setAttributeNode()

See `removeAttributeNode()`.

setCapture(*containerBoolean*)

See `releaseCapture()`.

setExpression("*propertyName*", "*expression*","*language*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-32 shows the `setExpression()`, `recalc()`, and `getExpression()` methods at work in a DHTML-based clock. Figure 15-1 shows the clock. As time clicks by, the bars for hours, minutes, and seconds adjust their widths to reflect the current time. At the same time, the `innerHTML` of SPAN elements to the right of each bar display the current numeric value for the bar.

The dynamically calculated values in this example are based on the creation of a new date object over and over again to get the current time from the client computer clock. It is from the date object (stored in the variable called `now`) that the hour, minute, and second values are retrieved. Some other calculations are involved so that a value for one of these time components is converted into a pixel value for the width of the bars. The bars are divided into 24 (for the hours) and 60 (for the minutes and seconds) parts, so the scale for the two types differs. For the 60-increment bars in this application, each increment is set to 5 pixels (stored in `shortWidth`); the 24-increment bars are 2.5 times the `shortWidth`.

As the document loads, the three SPAN elements for the colored bars are given no width, which means that they assume the default width of zero. But after the page loads, the `onLoad` event handler invokes the `init()` function, which sets the initial values for each bar's width and the text (`innerHTML`) of the three labeled spans. Once these initial values are set, the `init()` function invokes the `updateClock()` function.

In the `updateClock()` function, a new date object is created for the current instant. The `document.recalc()` method is called, instructing the browser to recalculate the expressions that were set in the `init()` function and assign the new values to the properties. To keep the clock “ticking,” the `setTimeout()` method is set to invoke this same `updateClock()` function in one second.

To see what the `getExpression()` method does, you can click the button on the page. It simply displays the returned value for one of the attributes that you assign using `setExpression()`.

Listing 15-32: **Dynamic Properties**

```
<HTML>
<HEAD>
<TITLE>getExpression(), setExpression(), and recalc() Methods</TITLE>
<STYLE TYPE="text/css">
TH {text-align:right}
SPAN {vertical-align:bottom}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">

var now = new Date()
var shortWidth = 5
var multiple = 2.5

function init() {
    with (document.all) {
        hoursBlock.style.setExpression("width",
            "now.getHours() * shortWidth * multiple","jscript")
        hoursLabel.setExpression("innerHTML",
            "now.getHours()","jscript")
        minutesBlock.style.setExpression("width",
            "now.getMinutes() * shortWidth","jscript")
        minutesLabel.setExpression("innerHTML",
            "now.getMinutes()","jscript")
        secondsBlock.style.setExpression("width",
            "now.getSeconds() * shortWidth","jscript")
        secondsLabel.setExpression("innerHTML",
            "now.getSeconds()","jscript")
    }

    updateClock()
}
```

```
function updateClock() {
    now = new Date()
    document.recalc()
    setTimeout("updateClock()",1000)
}

function showExpr() {
    alert("Expression for the \'Hours\' innerHTML property is:\r\n" +
document.all.hoursLabel.getExpression("innerHTML") + ".")
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>getExpression(), setExpression(), recalc() Methods</H1>
<HR>
<P>This clock uses Dynamic Properties to calculate bar width and time
numbers:</P>
<TABLE BORDER=0>
<TR>
    <TH>Hours:</TH>
    <TD><SPAN ID="hoursBlock" STYLE="background-color:red"></SPAN>
 <SPAN ID="hoursLabel"></SPAN></TD>
</TR>
<TR>
    <TH>Minutes:</TH>
    <TD><SPAN ID="minutesBlock" STYLE="background-color:yellow"></SPAN>
 <SPAN ID="minutesLabel"></SPAN></TD>
</TR>
<TR>
    <TH>Seconds:</TH>
    <TD><SPAN ID="secondsBlock" STYLE="background-color:green"></SPAN>
 <SPAN ID="secondsLabel"></SPAN></TD>
</TR>
</TABLE>
<HR>
<FORM>
<INPUT TYPE="button" VALUE="Show 'Hours' number innerHTML Expression"
onClick="showExpr()"
</FORM>
</BODY>
</HTML>
```

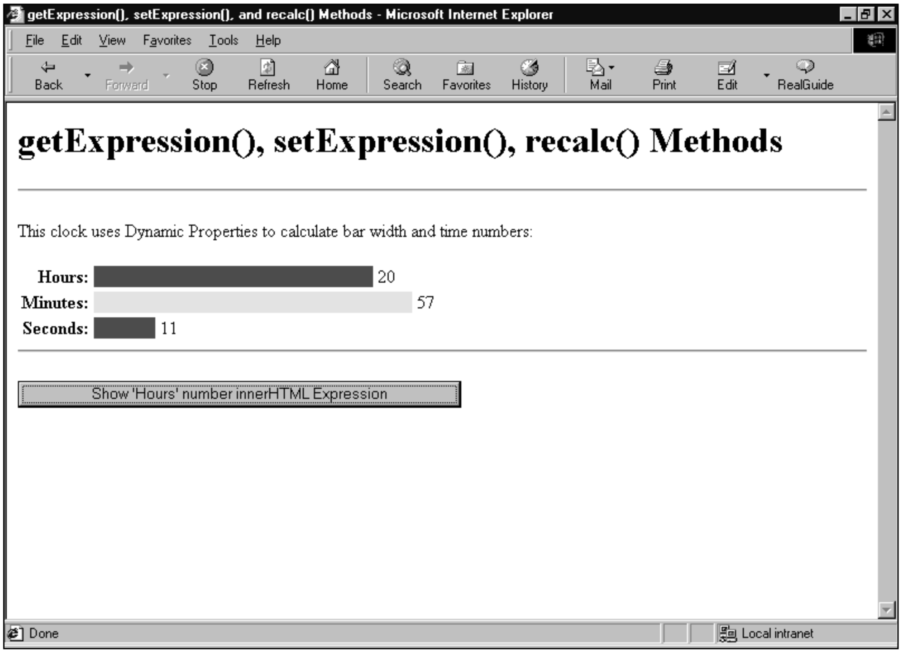

Figure 15-1: A clock controlled by dynamic properties

swapNode(*otherNodeObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-31 (the `replaceNode()` method) for an example of the `swapNode()` method in action.

tags("*tagName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `tags()` method. Enter the following statements one at a time into the upper text box and study the results:

```
document.all.tags("DIV")
document.all.tags("DIV").length
myTable.all.tags("TD").length
```

Because the `tags()` method returns an array of objects, you can use one of those returned values as a valid element reference:

```
document.all.tags("FORM")[1].elements.tags("INPUT").length
```

urns("*behaviorURN*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

In case the `urns()` method is reconnected in the future, you can add a button and function to Listing 15-19b that reveals whether the `makeHot.htc` behavior is attached to the `myP` element. Such a function looks like this:

```
function behaviorAttached() {
    if (document.all.urns("makeHot")) {
        alert("There is at least one element set to \'makeHot\'.")
    }
}
```

Event handlers

onActivate
onBeforeDeactivate
onDeactivate

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

You can modify Listing 15-34 later in this chapter by substituting `onActivate` for `onFocus` and `onDeactivate` for `onBlur`.

Use The Evaluator (Chapter 13) to experiment with the `onBeforeDeactivate` event handler. To begin, set the `myP` element so it can accept focus:

```
myP.tabIndex = 1
```

If you repeatedly press the Tab key, the `myP` paragraph will eventually receive focus — indicated by the dotted rectangle around it. To see how you can prevent the element from losing focus, assign an anonymous function to the `onBeforeDeactivate` event handler, as shown in the following statement:

```
myP.onbeforedeactivate = new Function("event.returnValue=false")
```

Now you can press Tab all you like or click other focusable elements all you like, and the `myP` element will not lose focus until you reload the page (which clears away the event handler). Please do not do this on your pages unless you want to infuriate and alienate your site visitors.

onBeforeCopy

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can use the `onBeforeCopy` event handler to preprocess information prior to an actual copy action. In Listing 15-33, the function invoked by the second paragraph element's `onBeforeCopy` event handler selects the entire paragraph so that the user can select any character(s) in the paragraph to copy the entire paragraph into the clipboard. You can paste the results into the textarea to verify the operation. By assigning the paragraph selection to the `onBeforeCopy` event handler, the page notifies the user about what the copy operation will entail prior to making the menu choice. Had the operation been deferred to the `onCopy` event handler, the selection would have been made after the user chose Copy from the menu.

Listing 15-33: The onBeforeCopy Event Handler

```
<HTML>
<HEAD>
<TITLE>onBeforeCopy Event Handler</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function selectWhole() {
    var obj = window.event.srcElement
    var range = document.body.createTextRange()
    range.moveToElementText(obj)
    range.select()
    event.returnValue = false
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onBeforeCopy Event Handler</H1>
<HR>
<P>Select one or more characters in the following paragraph. Then
execute a Copy command via Edit or context menu.</P>
<P ID="myP" onBeforeCopy="selectWhole()">Lorem ipsum dolor sit amet,
consectetaur adipisicing elit, sed do eiusmod tempor incididunt ut
labore et dolore magna aliqua. Ut enim adminim veniam, quis nostrud
exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.</P>
<FORM>
<P>Paste results here:<BR>
<TEXTAREA NAME="output" COLS="60" ROWS="5"></TEXTAREA>
</P>
</FORM>
</BODY>
</HTML>
```

onBeforeCut

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can use the `onBeforeCut` event handler to preprocess information prior to an actual cut action. You can try this by editing a copy of Listing 15-33, changing the onBeforeCopy event handler to onBeforeCut. Notice that in its original form, the example does not activate the Cut item in either the context or Edit menu when you select some text in the second paragraph. But by assigning a function to the onBeforeCut event handler, the menu item is active, and the entire paragraph is selected from the function that is invoked.

onBeforeDeactivate

See onActivate.

onBeforeEditFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator to explore the onBeforeEditFocus in IE5.5+. In the following sequence, you assign an anonymous function to the onBeforeEditFocus event handler of the myP element. The function turns the text color of the element to red when the event handler fires:

```
myP.onbeforeeditfocus = new Function("myP.style.color='red'")
```

Now turn on content editing for the myP element:

```
myP.contentEditable = true
```

If you now click inside the myP element on the page to edit its content, the text turns to red before you begin editing. In a page scripted for this kind of user interface, you would include some control that turns off editing and changes the color to normal.

If you wish to learn more about HTML content editing via the DHTML Editing ActiveX control, visit http://msdn.microsoft.com/workshop/browser/mshtml/.

onBeforePaste

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-45 for the `onPaste` event handler (later in this chapter) to see how the `onBeforePaste` and `onPaste` event handlers work together.

onBlur

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

More often than not, a page author uses the `onBlur` event handler to exert extreme control over the user, such as preventing a user from exiting out of a text box unless that user types something into the box. This is not a Web-friendly practice, and it is one that I discourage because there are intelligent ways to ensure a field has something typed into it before a form is submitted (see Chapter 43). Listing 15-34 simply demonstrates the impact of the `TABINDEX` attribute in an IE5/Windows element with respect to the `onBlur` and `onFocus` events. Notice that as you press the Tab key, only the second paragraph issues the events even though all three paragraphs have event handlers assigned to them.

Listing 15-34: **onBlur and onFocus Event Handlers**

```
<HTML>
<HEAD>
<TITLE>onBlur and onBlur Event Handlers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function showBlur() {
    var id = event.srcElement.id
    alert("Element \"" + id + "\" has blurred.")
```

Continued

Listing 15-34 *(continued)*

```
}
function showFocus() {
    var id = event.srcElement.id
    alert("Element \"" + id + "\" has received focus.")
}
</SCRIPT>
</HEAD>
<BODY>
<H1 ID="H1" TABINDEX=2>onBlur and onBlur Event Handlers</H1>
<HR>
<P ID="P1" onBlur="showBlur()" onFocus="showFocus()">Lorem ipsum
dolor sit amet, consectetaur adipisicing elit, sed do eiusmod tempor
incididunt ut labore et dolore magna aliqua. Ut enim adminim veniam,
quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea
commodo consequat.</P>

<P ID="P2" TABINDEX=1 onBlur="showBlur()" onFocus="showFocus()">Bis
nostrud exercitation ullam mmodo consequet. Duis aute involuptate
velit esse cillum dolore eu fugiat nulla pariatur. At vver eos et
accusam dignissum qui blandit est praesent luptatum delenit
aigueexcepteur sint occae.</P>

<P ID="P3" onBlur="showBlur()" onFocus="showFocus()">Unte af phen
neigepheings atoot Prexs eis phat eit sakem eit vory gast te Plok
peish ba useing phen roxas. Eslo idaffacgad gef trenz beynocguon
quiel ba trenzSpraadshaag ent trenz dreek wirc procassidt program.</P>

</BODY>
</HTML>
```

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The `onClick` event handler is one of the simplest to grasp and use. Listing 15-35 demonstrates its interaction with the `onDblClick` event handler and shows you how to prevent a link's intrinsic action from activating when combined with `click` events. As you click and/or double-click the link, the status bar displays a message associated with each event. Notice that if you double-click, the `click` event fires first with the first message immediately replaced by the second. For demonstration purposes, I show both backward-compatible ways of cancelling the link's intrinsic action. In practice, decide on one style and stick with it.

Listing 15-35: **Using onClick and onDblClick Event Handlers**

```
<HTML>
<HEAD>
<TITLE>onClick and onDblClick Event Handlers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var msg = ""
function showClick() {
    msg = "The element has been clicked. "
    status = msg
}
function showDblClick() {
    msg = "The element has been double-clicked."
    status = msg
    return false
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onClick and onDblClick Event Handlers</H1>
<HR>
<A HREF="#" onClick="showClick();return false"
onDblClick="return showDblClick()">
A sample link.</A>
</BODY>
</HTML>
```

onContextMenu

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-30 earlier in this chapter for an example of using the `onContextMenu` event handler with a custom context menu.

onCopy
onCut

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-36 shows both the `onBeforeCut` and `onCut` event handlers in action (as well as `onBeforePaste` and `onPaste`). Notice how the `handleCut()` function not only stuffs the selected word into the `clipboardData` object, but it also erases the selected text from the table cell element from where it came. If you replace the `onBeforeCut` and `onCut` event handlers with `onBeforeCopy` and `onCopy` (and change `handleCut()` to not eliminate the inner text of the event source element), the operation works with copy and paste instead of cut and paste. I demonstrate this later in the chapter in Listing 15-45.

Listing 15-36: **Cutting and Pasting under Script Control**

```
<HTML>
<HEAD>
<TITLE>onBeforeCut and onCut Event Handlers</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
TH {text-decoration:underline}
.blanks {text-decoration:underline}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function selectWhole() {
    var obj = window.event.srcElement
    var range = document.body.createTextRange()
    range.moveToElementText(obj)
    range.select()
    event.returnValue = false
}
function handleCut() {
    var rng = document.selection.createRange()
    clipboardData.setData("Text",rng.text)
    var elem = event.srcElement
    elem.innerText = ""
    event.returnValue = false
}
```

```
function handlePaste() {
    var elem = window.event.srcElement
    if (elem.className == "blanks") {
        elem.innerHTML = clipboardData.getData("Text")
    }
    event.returnValue = false
}
function handleBeforePaste() {
    var elem = window.event.srcElement
    if (elem.className == "blanks") {
        event.returnValue = false
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onBeforeCut and onCut Event Handlers</H1>
<HR>
<P>Your goal is to cut and paste one noun and one
adjective from the following table into the blanks
of the sentence. Select a word from the table and
use the Edit or context menu to cut it from the table.
Select one or more spaces of the blanks in the
sentence and choose Paste to replace the blank with
the clipboard contents.</P>

<TABLE CELLPADDING=5 onBeforeCut="selectWhole()" onCut="handleCut()" >
<TR><TH>Nouns</TH><TH>Adjectives</TH></TR>
<TR><TD>truck</TD><TD>round</TD></TR>
<TR><TD>doll</TD><TD>red</TD></TR>
<TR><TD>ball</TD><TD>pretty</TD></TR>
</TABLE>

<P ID="myP" onBeforePaste="handleBeforePaste()" onPaste="handlePaste()">
Pat said, "Oh my, the <SPAN ID="blank1" CLASS="blanks">
     </SPAN>
is so <SPAN ID="blank2" CLASS="blanks">
     </SPAN>!"</P>

<BUTTON onClick="location.reload()">Reset</BUTTON>
</BODY>
</HTML>
```

onDblClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

See Listing 15-35 (for the `onClick` event handler) to see the `onDblClick` event in action.

onDrag

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-37 shows several drag-related event handlers in action. The page resembles the example in Listing 15-36, but the scripting behind the page is quite different. In this example, the user is encouraged to select individual words from the Nouns and Adjectives columns and drag them to the blanks of the sentence. To beef up the demonstration, Listing 15-37 shows you how to pass the equivalent of array data from a drag source to a drag target. At the same time, the user has a fixed amount of time (two seconds) to complete each drag operation.

The `onDragStart` and `onDrag` event handlers are placed in the `<BODY>` tag because those events bubble up from any element that the user tries to drag. The scripts invoked by these event handlers filter the events so that the desired action is triggered only by the "hot" elements inside the table. This approach to event handlers prevents you from having to duplicate event handlers (or IE `<SCRIPT FOR=>` tags) for each table cell.

The `onDragStart` event handler invokes `setupDrag()`. This function cancels the `onDragStart` event except when the target element (in other words, the one about to be dragged) is one of the TD elements inside the table. To make this application smarter about what kind of word is dragged to which blank, it passes not only the word's text, but also some extra information about the word. This lets another event handler verify that a noun has been dragged to the first blank, while an adjective has been dragged to the second blank. To help with this effort, class names are assigned to the TD elements to distinguish the words from the Nouns column from the words of the Adjectives column. The `setupDrag()` function generates an array consisting of the `innerText` of the event's source element plus the element's class name. But the `event.dataTransfer` object cannot store array data types, so the `Array.join()` method converts the array to a string with a colon separating the entries. This string, then, is stuffed into the `event.dataTransfer` object. The object is instructed to render the cursor display during the drag-and-drop operation so that when the cursor is atop a drop target, the cursor is the "copy" style. Finally, the `setupDrag()` function is the first to execute in the drag operation, so a timer is set to the current clock time to time the drag operation.

The `onDrag` event handler (in the BODY) captures the `onDrag` events that are generated by whichever table cell element is the source element for the action. Each time the event fires (which is a lot during the action), the `timeIt()` function is invoked to compare the current time against the reference time (global `timer`) set when the drag starts. If the time exceeds two seconds (2,000 milliseconds), an alert dialog box notifies the user. To close the alert dialog box, the user must unclick the mouse button to end the drag operation.

To turn the blank SPAN elements into drop targets, their `onDragEnter`, `onDragOver`, and `onDrop` event handlers must set `event.returnValue` to `false`; also, the `event.dataTransfer.dropEffect` property should be set to the desired effect (`copy` in this case). These event handlers are placed in the P element that contains the two SPAN elements, again for simplicity. Notice, however, that the `cancelDefault()` functions do their work only if the target element is one of the SPAN elements whose ID begins with "blank."

As the user releases the mouse button, the `onDrop` event handler invokes the `handleDrop()` function. This function retrieves the string data from `event.dataTransfer` and restores it to an array data type (using the `String.split()` method). A little bit of testing makes sure that the word type ("noun" or "adjective") is associated with the desired blank. If so, the source element's text is set to the drop target's `innerText` property; otherwise, an error message is assembled to help the user know what went wrong.

Listing 15-37: **Using Drag-Related Event Handlers**

```
<HTML>
<HEAD>
<TITLE>Dragging Event Handlers</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
TH {text-decoration:underline}
.blanks {text-decoration:underline}
</STYLE>
```

Continued

Listing 15-37 *(continued)*

```
<SCRIPT LANGUAGE="JavaScript">
var timer
function setupDrag() {
    if (event.srcElement.tagName != "TD") {
        // don't allow dragging for any other elements
        event.returnValue = false
    } else {
        // setup array of data to be passed to drop target
        var passedData = [event.srcElement.innerText,
event.srcElement.className]
        // store it as a string
        event.dataTransfer.setData("Text", passedData.join(":"))
        event.dataTransfer.effectAllowed = "copy"
        timer = new Date()
    }
}
function timeIt() {
    if (event.srcElement.tagName == "TD" && timer) {
        if ((new Date()) - timer > 2000) {
            alert("Sorry, time is up. Try again.")
            timer = 0
        }
    }
}
function handleDrop() {
    var elem = event.srcElement
    var passedData = event.dataTransfer.getData("Text")
    var errMsg = ""
    if (passedData) {
        // reconvert passed string to an array
        passedData = passedData.split(":")
        if (elem.id == "blank1") {
            if (passedData[1] == "noun") {
                event.dataTransfer.dropEffect = "copy"
                event.srcElement.innerText = passedData[0]
            } else {
                errMsg = "You can't put an adjective into the noun placeholder."
            }
        } else if (elem.id == "blank2") {
            if (passedData[1] == "adjective") {
                event.dataTransfer.dropEffect = "copy"
                event.srcElement.innerText = passedData[0]
            } else {
                errMsg = "You can't put a noun into the adjective placeholder."
            }
        }
```

```
        if (errMsg) {
            alert(errMsg)
        }
    }
}
function cancelDefault() {
    if (event.srcElement.id.indexOf("blank") == 0) {
        event.dataTransfer.dropEffect = "copy"
        event.returnValue = false
    }
}
</SCRIPT>
</HEAD>
<BODY onDragStart="setupDrag()" onDrag="timeIt()">
<H1>Dragging Event Handlers</H1>
<HR>
<P>Your goal is to drag one noun and one
adjective from the following table into the blanks
of the sentence. Select a word from the table and
drag it to the desired blank. When you release the
mouse, the word will appear in the blank. You have
two seconds to complete each blank.</P>

<TABLE CELLPADDING=5>
<TR><TH>Nouns</TH><TH>Adjectives</TH></TR>
<TR><TD class="noun">truck</TD><TD class="adjective">round</TD></TR>
<TR><TD class="noun">doll</TD><TD class="adjective">red</TD></TR>
<TR><TD class="noun">ball</TD><TD class="adjective">pretty</TD></TR>
</TABLE>

<P ID="myP" onDragEnter="cancelDefault()" onDragOver="cancelDefault()"
onDrop="handleDrop()">
Pat said, "Oh my, the <SPAN ID="blank1" CLASS="blanks">
     </SPAN>
is so <SPAN ID="blank2" CLASS="blanks">
     </SPAN>!"</P>

<BUTTON onClick="location.reload()">Reset</BUTTON>
</BODY>
</HTML>
```

One event handler not shown in Listing 15-37 is `onDragEnd`. You can use this event to display the elapsed time for each successful drag operation. Because the event fires on the drag source element, you can implement it in the `<BODY>` tag and filter events similar to the way the `onDragStart` or `onDrag` event handlers filter events for the TD element.

onDragEnter
onDragLeave

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-38 shows the `onDragEnter` and `onDragLeave` event handlers in use. The simple page displays (via the status bar) the time of entry to one element of the page. When the dragged cursor leaves the element, the `onDragLeave` event handler hides the status bar message. No drop target is defined for this page, so when you drag the item, the cursor remains as the "no drop" cursor.

Listing 15-38: Using onDragEnter and onDragLeave Event Handlers

```
<HTML>
<HEAD>
<TITLE>onDragEnter and onDragLeave Event Handlers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function showEnter() {
    status = "Entered at: " + new Date()
    event.returnValue = false
}
function clearMsg() {
    status = ""
    event.returnValue = false
}
</SCRIPT>
</HEAD>
<BODY>
<H1 onDragEnter="showEnter()" onDragLeave="clearMsg()">
onDragEnter and onDragLeave Event Handlers
</H1>
<HR>
<P>Select any character(s) from this paragraph,
and slowly drag it around the page. When the dragging action enters the
large header above, the status bar displays when the onDragEnter
event handler fires. When you leave the header, the message is cleared
```

```
via the onDragLeave event handler.</P>
</BODY>
</HTML>
```

onDragOver

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-37 of the `onDrag` event handler to see how the `onDragOver` event handler contributes to making an element a drop target.

onDragStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 15-37 of the `onDrag` event handler to see how to apply the `onDragStart` event handler in a typical drag-and-drop scenario.

onDrop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-37 of the `onDrag` event handler to see how to apply the `onDrop` event handler in a typical drag-and-drop scenario.

onFilterChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 15-39 demonstrates how the `onFilterChange` event handler can trigger a second transition effect after another one completes. The `onLoad` event handler triggers the first effect. Although the `onFilterChange` event handler works with most of the same objects in IE4 as IE5, the filter object transition properties are not reflected in a convenient form. The syntax shown in Listing 15-39 uses the new ActiveX filter control found in IE5.5 (described in Chapter 30).

Listing 15-39: Using the onFilterChange Event Handler

```
<HTML>
<HEAD>
<TITLE>onFilterChange Event Handler</TITLE>
<SCRIPT LANGUAGE=JavaScript>
function init() {
    image1.filters[0].apply()
    image2.filters[0].apply()
    start()
}

function start() {
    image1.style.visibility = "hidden"
    image1.filters[0].play()
}

function finish() {
    // verify that first transition is done (optional)
    if (image1.filters[0].status == 0) {
        image2.style.visibility = "visible"
        image2.filters[0].play()
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>onFilterChange Event Handler</H1>
<HR>
<P>The completion of the first transition ("circle-in")
```

```
triggers the second ("circle-out").
<BUTTON onClick="location.reload()">Play It Again</BUTTON></P>
<DIV ID="image1" STYLE="visibility:visible;
    position:absolute; top:150px; left:150px;
    filter:progID:DXImageTransform.Microsoft.Iris(irisstyle='CIRCLE',
    motion='in')"
    onFilterChange="finish()"><IMG SRC="desk1.gif" HEIGHT=90
    WIDTH=120></DIV>
<DIV ID="image2" STYLE="visibility:hidden;
    position:absolute; top:150px; left:150px;
    filter:progID:DXImageTransform.Microsoft.Iris(irisstyle='CIRCLE',
    motion='out')">
    <IMG SRC="desk3.gif" HEIGHT=90 WIDTH=120></DIV>
</BODY>
</HTML>
```

onFocus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listing 15-34 earlier in this chapter for an example of the `onFocus` and `onBlur` event handlers.

onHelp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 15-40 is a rudimentary example of a context-sensitive help system that displays help messages tailored to the kind of text input required by different text fields. When the user gives focus to either of the text fields, a small legend appears to remind the user that help is available by a press of the F1 help key. IE5/Mac provides only generic help.

Listing 15-40: **Creating Context-Sensitive Help**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function showNameHelp() {
    alert("Enter your first and last names.")
    event.cancelBubble = true
    return false
}
function showYOBHelp() {
    alert("Enter the four-digit year of your birth. For example: 1972")
    event.cancelBubble = true
    return false
}
function showGenericHelp() {
    alert("All fields are required.")
    event.cancelBubble = true
    return false
}
function showLegend() {
    document.all.legend.style.visibility = "visible"
}
function hideLegend() {
    document.all.legend.style.visibility = "hidden"
}
function init() {
    var msg = ""
    if (navigator.userAgent.indexOf("Mac") != -1) {
        msg = "Press \'help\' key for help."
    } else if (navigator.userAgent.indexOf("Win") != -1) {
        msg = "Press F1 for help."
    }
    document.all.legend.style.visibility = "hidden"
    document.all.legend.innerHTML = msg
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()" onHelp="return showGenericHelp()">
<H1>onHelp Event Handler</H1>
<HR>
<P ID="legend" STYLE="visibility:hidden; font-size:10px"> </P>
<FORM>
Name: <INPUT TYPE="text" NAME="name" SIZE=30
    onFocus="showLegend()" onBlur="hideLegend()"
    onHelp="return showNameHelp()">
<BR>
Year of Birth: <INPUT TYPE="text" NAME="YOB" SIZE=30
    onFocus="showLegend()" onBlur="hideLegend()"
```

```
    onHelp="return showYOBHelp()">
</FORM>
</BODY>
</HTML>
```

onKeyDown
onKeyPress
onKeyUp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Listing 15-41 is a working laboratory that you can use to better understand the way keyboard event codes and modifier keys work in IE5+ and NN6. The actual code of the listing is less important than watching the page while you use it. For every key or key combination that you press, the page shows the `keyCode` value for the `onKeyDown`, `onKeyPress`, and `onKeyUp` events. If you hold down one or more modifier keys while performing the key press, the modifier key name is highlighted for each of the three events. Note that when run in NN6, the `keyCode` value is not the character code (which doesn't show up in this example for NN6). Also, you may need to click the NN6 page for the `document` object to recognize the keyboard events.

The best way to watch what goes on during keyboard events is to press and hold a key to see the key codes for the `onKeyDown` and `onKeyPress` events. Then release the key to see the code for the `onKeyUp` event. Notice, for instance, that if you press the A key without any modifier key, the `onKeyDown` event key code is 65 (A) but the `onKeyPress` key code in IE (and the `charCode` property in NN6 if it were displayed here) is 97 (a). If you then repeat the exercise but hold the Shift key down, all three events generate the 65 (A) key code (and the Shift modifier labels are highlighted). Releasing the Shift key causes the `onKeyUp` event to show the key code for the Shift key.

In another experiment, press any of the four arrow keys. No key code is passed for the `onKeyPress` event because those keys don't generate those events. They do, however, generate `onKeyDown` and `onKeyUp` events.

Listing 15-41: **Keyboard Event Handler Laboratory**

```
<HTML>
<HEAD>
<TITLE>Keyboard Event Handler Lab</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function init() {
    document.onkeydown = showKeyDown
    document.onkeyup = showKeyUp
    document.onkeypress = showKeyPress
}

function showKeyDown(evt) {
    evt = (evt) ? evt : window.event
    document.getElementById("pressKeyCode").innerHTML = 0
    document.getElementById("upKeyCode").innerHTML = 0
    document.getElementById("pressCharCode").innerHTML = 0
    document.getElementById("upCharCode").innerHTML = 0
    restoreModifiers("")
    restoreModifiers("Down")
    restoreModifiers("Up")
    document.getElementById("downKeyCode").innerHTML = evt.keyCode
    if (evt.charCode) {
        document.getElementById("downCharCode").innerHTML = evt.charCode
    }
    showModifiers("Down", evt)
}
function showKeyUp(evt) {
    evt = (evt) ? evt : window.event
    document.getElementById("upKeyCode").innerHTML = evt.keyCode
    if (evt.charCode) {
        document.getElementById("upCharCode").innerHTML = evt.charCode
    }
    showModifiers("Up", evt)
    return false
}
function showKeyPress(evt) {
    evt = (evt) ? evt : window.event
    document.getElementById("pressKeyCode").innerHTML = evt.keyCode
    if (evt.charCode) {
        document.getElementById("pressCharCode").innerHTML = evt.charCode
    }
    showModifiers("", evt)
    return false
}
```

```
function showModifiers(ext, evt) {
    restoreModifiers(ext)
    if (evt.shiftKey) {
        document.getElementById("shift" + ext).style.backgroundColor = "#ff0000"
    }
    if (evt.ctrlKey) {
        document.getElementById("ctrl" + ext).style.backgroundColor = "#00ff00"
    }
    if (evt.altKey) {
        document.getElementById("alt" + ext).style.backgroundColor = "#0000ff"
    }
}
function restoreModifiers(ext) {
    document.getElementById("shift" + ext).style.backgroundColor = "#ffffff"
    document.getElementById("ctrl" + ext).style.backgroundColor = "#ffffff"
    document.getElementById("alt" + ext).style.backgroundColor = "#ffffff"
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()">
<H1>Keyboard Event Handler Lab</H1>
<HR>
<FORM>
<TABLE BORDER=2 CELLPADDING=2>
<TR><TH></TH><TH>onKeyDown</TH><TH>onKeyPress</TH><TH>onKeyUp</TH></TR>
<TR><TH>Key Codes</TH>
    <TD ID="downKeyCode">0</TD>
    <TD ID="pressKeyCode">0</TD>
    <TD ID="upKeyCode">0</TD>
</TR>
<TR><TH>Char Codes (IE5/Mac; NN6)</TH>
    <TD ID="downCharCode">0</TD>
    <TD ID="pressCharCode">0</TD>
    <TD ID="upCharCode">0</TD>
</TR>
<TR><TH ROWSPAN=3>Modifier Keys</TH>
    <TD><SPAN ID="shiftDown">Shift</SPAN></TD>
    <TD><SPAN ID="shift">Shift</SPAN></TD>
    <TD><SPAN ID="shiftUp">Shift</SPAN></TD>
</TR>
<TR>
    <TD><SPAN ID="ctrlDown">Ctrl</SPAN></TD>
    <TD><SPAN ID="ctrl">Ctrl</SPAN></TD>
    <TD><SPAN ID="ctrlUp">Ctrl</SPAN></TD>
</TR>
<TR>
    <TD><SPAN ID="altDown">Alt</SPAN></TD>
    <TD><SPAN ID="alt">Alt</SPAN></TD>
    <TD><SPAN ID="altUp">Alt</SPAN></TD>
```

Continued

Listing 15-41 *(continued)*

```
</TR>
</TABLE>
</FORM>
</BODY>
</HTML>
```

Spend some time with this lab, and try all kinds of keys and key combinations until you understand the way the events and key codes work.

onLoseCapture

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listing 15-30 earlier in this chapter for an example of how to use `onLoseCapture` with an event-capturing scenario for displaying a context menu. The `onLoseCapture` event handler hides the context menu when the user performs any action that causes the menu to lose mouse capture.

onMouseDown
onMouseUp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

To demonstrate a likely scenario of changing button images in response to rolling atop an image, pressing down on it, releasing the mouse button, and rolling away from the image, Listing 15-42 presents a pair of small navigation buttons (left- and right-arrow buttons). Because the image object is not part of the document object model for NN2 or IE3 (which reports itself as Navigator version 2), the page is designed to accept all browsers. Only those browsers that support precached images and image swapping (and thus pass the test for the presence of the `document.images` array) can execute those statements. For a browser with an image object, images are preloaded into the browser cache as the page loads so that response to the user is instantaneous the first time the user calls upon new versions of the images.

Listing 15-42: Using onMouseDown and onMouseUp Event Handlers

```
<HTML>
<HEAD>
<TITLE>onMouseDown and onMouseUp Event Handlers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
if (document.images) {
    var RightNormImg = new Image(16,16)
    var RightUpImg = new Image(16,16)
    var RightDownImg = new Image(16,16)
    var LeftNormImg = new Image(16,16)
    var LeftUpImg = new Image(16,16)
    var LeftDownImg = new Image(16,16)

    RightNormImg.src = "RightNorm.gif"
    RightUpImg.src = "RightUp.gif"
    RightDownImg.src = "RightDown.gif"
    LeftNormImg.src = "LeftNorm.gif"
    LeftUpImg.src = "LeftUp.gif"
    LeftDownImg.src = "LeftDown.gif"
}
function setImage(imgName, type) {
    if (document.images) {
        var imgFile = eval(imgName + type + "Img.src")
        document.images[imgName].src = imgFile
        return false
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onMouseDown and onMouseUp Event Handlers</H1>
<HR>
<P>Roll atop and click on the buttons to see how the link event handlers swap
images:</P>
<CENTER>
<A HREF="javascript:void(0)"
    onMouseOver="return setImage('Left','Up')"
    onMouseDown="return setImage('Left','Down')"
```

Continued

Listing 15-42 *(continued)*

```
    onMouseUp="return setImage('Left','Up')"
    onMouseOut="return setImage('Left','Norm')"
>
<IMG NAME="Left" SRC="LeftNorm.gif" HEIGHT=16 WIDTH=16 BORDER=0></A>
  
<A HREF="javascript:void(0)"
    onMouseOver="return setImage('Right','Up')"
    onMouseDown="return setImage('Right','Down')"
    onMouseUp="return setImage('Right','Up')"
    onMouseOut="return setImage('Right','Norm')"
>
<IMG NAME="Right" SRC="RightNorm.gif" HEIGHT=16 WIDTH=16 BORDER=0></A>
</CENTER>
</BODY>
</HTML>
```

IE4+ and NN6+ simplify the implementation of this kind of three-state image button by allowing you to assign the event handlers directly to IMG element objects. Wrapping images inside links is a backward compatibility approach that allows older browsers to respond to clicks on images for navigation or other scripting tasks.

onMouseEnter
onMouseLeave

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

You can modify Listing 15-43 with the IE5.5 syntax by substituting `onMouseEnter` for `onMouseOver` and `onMouseLeave` for `onMouseOut`. The effect is the same.

onMouseMove

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			(✓)	✓			✓	✓	✓

Example

Listing 15-43 is a simplified example of dragging elements in IE4+. (See Chapter 31 for more dragging examples.) Three images are individually positioned on the page. Most of the scripting code concerns itself with the geography of click locations, the stacking order of the images, and the management of the `onMouseMove` event handler so that it is active only when an item is dragged.

Scripts assign the `onMouseDown` and `onMouseUp` event handlers to the `document` object, invoking the `engage()` and `release()` functions, respectively. When a user mouses down anywhere in the document, the `engage()` function starts by invoking `setSelectedObj()`. This function examines the target of the `mouseDown` event. If it is one of the map images, the `selectedObj` global variable is set to the `image` object and the element is brought to the front of the stacking order of images (any previously stacked image is returned to its normal position in the stack). `MouseDown` events on any other element simply make sure that the `selectedObj` variable is `null`. The presence of a value assigned to `selectedObj` serves as a kind of switch for other functions: When the variable contains a value, it means that the user is doing something associated with dragging an element.

Back at the `engage()` function—provided the user mouses down on one of the draggable images—the `onMouseMove` event handler is assigned to the `document` object, setting it to invoke the `dragIt()` function. For the sake of users, the offset of the mouse down event from the top-left corner of the image is preserved in the `offsetX` and `offsetY` variables (minus any scrolling that the body is subject to at that instant). These offset values are necessary to let the scripts set the location of the image during dragging (the location is set for the top-left corner of the image) while keeping the cursor in the same location within the image as when the user first presses the mouse.

As the user drags the image, the `onMouseDown` event handler fires repeatedly, allowing the `dragIt()` function to continually update the location of the element relative to the current cursor position (the `event.clientX` and `event.clientY` properties). The global offset variables are subtracted from the cursor position to preserve the relation of the image's top-left corner to the initial cursor position at mouse down.

Upon the user releasing the mouse button, the `release()` function turns off the `onMouseMove` event handler (setting it to `null`). This prevents the event from being processed at all during normal usage of the page. The `selectedObj` global variable is also set to `null`, turning off the "switch" that indicates dragging is in session.

Listing 15-43: **Dragging Elements with onMouseMove**

```
<HTML>
<HEAD><TITLE>onMouseMove Event Handler</TITLE>
```

Continued

Listing 15-43 *(continued)*

```
<STYLE TYPE="text/css">
    #camap {position:absolute; left:20; top:120}
    #ormap {position:absolute; left:80; top:120}
    #wamap {position:absolute; left:140; top:120}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// global variables used while dragging
var offsetX = 0
var offsetY = 0
var selectedObj
var frontObj

// set document-level event handlers
document.onmousedown = engage
document.onmouseup = release

// positioning an object at a specific pixel coordinate
function shiftTo(obj, x, y) {
    obj.style.pixelLeft = x
    obj.style.pixelTop = y
}

// setting the z-order of an object
function bringToFront(obj) {
    if (frontObj) {
        frontObj.style.zIndex = 0
    }
    frontObj = obj
    frontObj.style.zIndex = 1
}

// set global var to a reference to dragged element
function setSelectedObj() {
    var imgObj = window.event.srcElement
    if (imgObj.id.indexOf("map") == 2) {
        selectedObj = imgObj
        bringToFront(selectedObj)
        return
    }
    selectedObj = null
    return
}

// do the dragging (called repeatedly by onMouseMove)
function dragIt() {
    if (selectedObj) {
```

```
        shiftTo(selectedObj, (event.clientX - offsetX), (event.clientY - 
offsetY))
        return false
    }
}

// set global vars and turn on mousemove trapping (called by onMouseDown)
function engage() {
    setSelectedObj()
    if (selectedObj) {
        document.onmousemove = dragIt
        offsetX = window.event.offsetX - document.body.scrollLeft
        offsetY = window.event.offsetY - document.body.scrollTop
    }
}

// restore everything as before (called by onMouseUp)
function release() {
    if (selectedObj) {
        document.onmousemove = null
        selectedObj = null
    }
}

</SCRIPT>
</HEAD>
<BODY>
<H1>onMouseMove Event Handler</H1>
<HR>
Click and drag the images:
<IMG ID="camap" SRC="camap.gif" WIDTH="47" HEIGHT="82" BORDER="0">
<IMG ID="ormap" SRC="ormap.gif" WIDTH="57" HEIGHT="45" BORDER="0">
<IMG ID="wamap" SRC="wamap.gif" WIDTH="38" HEIGHT="29" BORDER="0">
</SCRIPT>
</BODY>
</HTML>
```

onMouseOut
onMouseOver

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 15-44 uses the U.S. Pledge of Allegiance with four links to demonstrate how to use the `onMouseOver` and `onMouseOut` event handlers. Notice that for each link, the handler runs a general-purpose function that sets the window's status message. The function returns a `true` value, which the event handler call evaluates to replicate the required `return true` statement needed for setting the status bar. In one status message, I supply a URL in parentheses to let you evaluate how helpful you think it is for users.

Listing 15-44: Using onMouseOver and onMouseOut Event Handlers

```
<HTML>
<HEAD>
<TITLE>onMouseOver and onMouseOut Event Handlers</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setStatus(msg) {
    status = msg
    return true
}
// destination of all link HREFs
function emulate() {
    alert("Not going there in this demo.")
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onMouseOver and onMouseOut Event Handlers
</H1>
<HR>
<H1>Pledge of Allegiance</H1>
<HR>
I pledge <A HREF="javascript:emulate()" onMouseOver="return setStatus('View
dictionary definition')" onMouseOut="return setStatus('')">allegiance</A> to the
<A HREF="javascript:emulate()" onMouseOver="return setStatus('Learn about the
U.S. flag (http://lcweb.loc.gov)')" onMouseOut="return setStatus('')">flag</A>
of the <A HREF="javascript:emulate()" onMouseOver="return setStatus('View info
about the U.S. government')" onMouseOut="return setStatus('')">United States of
America</A>, and to the Republic for which it stands, one nation <A
HREF="javascript:emulate()" onMouseOver="return setStatus('Read about the
history of this phrase in the Pledge')" onMouseOut="return setStatus('')">under
God</A>, indivisible, with liberty and justice for all.
</BODY>
</HTML>
```

onPaste

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 15-45 demonstrates how to use the `onBeforePaste` and `onPaste` event handlers (in conjunction with `onBeforeCopy` and `onCopy`) to let scripts control the data transfer process during a copy-and-paste user operation. A table contains words to be copied (one column of nouns, one column of adjectives) and then pasted into blanks in a paragraph. The `onBeforeCopy` and `onCopy` event handlers are assigned to the TABLE element because the events from the TD elements bubble up to the TABLE container and there is less HTML code to contend with.

Inside the paragraph, two SPAN elements contain underscored blanks. To paste text into the blanks, the user must first select at least one character of the blanks. (See Listing 15-37, which gives a drag-and-drop version of this application.) The `onBeforePaste` event handler in the paragraph (which gets the event as it bubbles up from either SPAN) sets the `event.returnValue` property to `false`, thus allowing the Paste item to appear in the context and Edit menus (not a normal occurrence in HTML body content).

At paste time, the `innerHTML` property of the target SPAN is set to the text data stored in the clipboard. The `event.returnValue` property is set to `false` here, as well, to prevent normal system pasting from interfering with the controlled version.

Listing 15-45: **Using onBeforePaste and onPaste Event Handlers**

```
<HTML>
<HEAD>
<TITLE>onBeforePaste and onPaste Event Handlers</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
TH {text-decoration:underline}
.blanks {text-decoration:underline}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
```

Continued

Listing 15-45 *(continued)*

```
function selectWhole() {
    var obj = window.event.srcElement
    var range = document.body.createTextRange()
    range.moveToElementText(obj)
    range.select()
    event.returnValue = false
}
function handleCopy() {
    var rng = document.selection.createRange()
    clipboardData.setData("Text",rng.text)
    event.returnValue = false
}
function handlePaste() {
    var elem = window.event.srcElement
    if (elem.className == "blanks") {
        elem.innerHTML = clipboardData.getData("Text")
    }
    event.returnValue = false
}
function handleBeforePaste() {
    var elem = window.event.srcElement
    if (elem.className == "blanks") {
        event.returnValue = false
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onBeforePaste and onPaste Event Handlers</H1>
<HR>
<P>Your goal is to copy and paste one noun and one
adjective from the following table into the blanks
of the sentence. Select a word from the table and
copy it to the clipboard. Select one or more spaces
of the blanks in the sentence and choose Paste to
replace the blank with the clipboard contents.</P>

<TABLE CELLPADDING=5 onBeforeCopy="selectWhole()" onCopy="handleCopy()" >
<TR><TH>Nouns</TH><TH>Adjectives</TH></TR>
<TR><TD>truck</TD><TD>round</TD></TR>
<TR><TD>doll</TD><TD>red</TD></TR>
<TR><TD>ball</TD><TD>pretty</TD></TR>
</TABLE>

<P ID="myP" onBeforePaste="handleBeforePaste()" onPaste="handlePaste()">
Pat said, "Oh my, the <SPAN ID="blank1" CLASS="blanks">
     </SPAN>
```

```
is so <SPAN ID="blank2" CLASS="blanks">
     </SPAN>!"</P>

<BUTTON onClick="location.reload()">Reset</BUTTON>
</BODY>
</HTML>
```

onPropertyChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

The page generated by Listing 15-46 contains four radio buttons that alter the `innerHTML` and `style.color` properties of a paragraph. The paragraph's `onPropertyChange` event handler invokes the `showChange()` function, which extracts information about the event and displays the data in the status bar of the window. Notice how the property name includes `style.` when you modify the style sheet property.

Listing 15-46: Using the onPropertyChange Property

```
<HTML>
<HEAD>
<TITLE>onPropertyChange Event Handler</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function normalText() {
    myP.innerText = "This is a sample paragraph."
}
function shortText() {
    myP.innerText = "Short stuff."
}
function normalColor() {
    myP.style.color = "black"
}
function hotColor() {
    myP.style.color = "red"
}
```

Continued

Listing 15-46 *(continued)*

```
function showChange() {
    var objID = event.srcElement.id
    var propName = event.propertyName
    var newValue = eval(objID + "." + propName)
    status = "The " + propName + " property of the " + objID
    status += " object has changed to \"" + newValue + "\"."
}
</SCRIPT>
</HEAD>
<BODY>
<H1>onPropertyChange Event Handler</H1>
<HR>
<P ID="myP" onPropertyChange = "showChange()">This is a sample paragraph.</P>
<FORM>
Text: <INPUT TYPE="radio" NAME="btn1" CHECKED onClick="normalText()">Normal
      <INPUT TYPE="radio" NAME="btn1" onClick="shortText()">Short
<BR>
Color: <INPUT TYPE="radio" NAME="btn2" CHECKED onClick="normalColor()">Black
       <INPUT TYPE="radio" NAME="btn2" onClick="hotColor()">Red
</FORM>
</BODY>
</HTML>
```

onReadyStateChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can use the `onReadyStateChange` event handler to assist with a status display while a long external file, such as a Java applet, loads. For example, you might have a small image on a page that changes with the state change of an applet. The `<APPLET>` tag assigns a function to the `onReadyStateChange` event handler:

```
<APPLET ... onReadyStateChange="showState(this)">
```

Then the function changes the image for each state type:

```
function showState(obj) {
    var img = document.all.statusImage
    switch (obj.readyState) {
        case "uninitialized" :
            img.src = uninit.src
            break
        case "loading" :
            img.src = loading.src
            break
        case "complete" :
            img.src = ready.src
    }
}
```

The preceding function assumes that the state images are precached as the page loads.

onResize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

If you want to capture the user's resizing of the browser window (or frame), you can assign a function to the `onResize` event handler either via script

```
window.onresize = handleResize
```

or by an HTML attribute of the BODY element:

```
<BODY onResize="handleResize()">
```

onSelectStart

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use the page from Listing 15-47 to see how the `onSelectStart` event handler works when a user selects across multiple elements on a page. As the user begins a selection anywhere on the page, the ID of the object receiving the event appears in the status bar. Notice that the event doesn't fire until you actually make a selection. When no other element is under the cursor, the BODY element fires the event.

Listing 15-47: **Using the onSelectStart Event Handler**

```
<HTML>
<HEAD>
<TITLE>onSelectStart Event Handler</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showObj() {
    var objID = event.srcElement.id
    status = "Selection started with object: " + objID
}
</SCRIPT>
</HEAD>
<BODY ID="myBody" onSelectStart="showObj()">
<H1 ID="myH1">onSelectStart Event Handler</H1>
<HR ID="myHR">
<P ID="myP">This is a sample paragraph.</P>
<TABLE BORDER="1">
<TR ID="row1">
    <TH ID="header1">Column A</TH>
    <TH ID="header2">Column B</TH>
    <TH ID="header3">Column C</TH>
</TR>
<TR ID="row2">
    <TD ID="cellA2">text</TD>
    <TD ID="cellB2">text</TD>
    <TD ID="cellC2">text</TD>
</TR>
<TR ID="row3">
    <TD ID="cellA3">text</TD>
    <TD ID="cellB3">text</TD>
    <TD ID="cellC3">text</TD>
</TR>
</TABLE>
</BODY>
</HTML>
```

Chapter 16 Examples

The following sections contain examples from Chapter 16, “Window and Frame Objects.”

Window Object

Properties

clipboardData

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

See Listings 15-30 and 15-39 to see how the `clipboardData` object is used with a variety of edit-related event handlers.

closed

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

In Listing 16-4, I have created the ultimate cross-platform window opening and closing sample. It takes into account the lack of the `opener` property in Navigator 2, the missing `closed` property in Navigator 2 and Internet Explorer 3, and it even provides an ugly but necessary workaround for the inability of Internet Explorer 3 to gracefully see if a subwindow is still open.

The script begins by initializing a global variable, `newWind`, which is used to hold the object reference to the second window. This value needs to be global so that other functions can reference the window for tasks, such as closing. Another global variable, `isIE3`, is a Boolean flag that lets the window closing routines know whether the visitor is using Internet Explorer 3 (see details about the `navigator.appVersion` property in Chapter 28).

For this example, the new window contains some HTML code written dynamically to it, rather than loading an existing HTML file into it. Therefore, the URL parameter of the `window.open()` method is left as an empty string. It is vital, however, to assign a name in the second parameter to accommodate the Internet Explorer 3 workaround for closing the window. After the new window is opened, an `opener` property is assigned to the object if one is not already assigned (this property is needed only for Navigator 2). Next comes a brief delay to allow Internet Explorer (especially versions 3 and 4) to catch up with opening the window so that content can be written to it. The delay (using the `setTimeout()` method described later in this chapter) invokes the `finishNewWindow()` function, which uses the global `newWind` variable to reference the window for writing. The `document.close()` method closes writing to the document — a different kind of close than a window close.

A separate function, `closeWindow()`, is responsible for closing the subwindow. To accommodate Internet Explorer 3, the script appears to create another window with the same characteristics as the one opened earlier in the script. This is the trick: If the earlier window exists (with exactly the same parameters and a name *other* than an empty string), Internet Explorer does not create a new window even with the `window.open()` method executing in plain sight. To the user, nothing unusual appears on the screen. Only if the user has closed the subwindow do things look weird for Internet Explorer 3 users. The `window.open()` method momentarily creates that subwindow. This subwindow is necessary because a "living" `window` object must be available for the upcoming test of window existence (Internet Explorer 3 displays a script error if you try to address a missing window, while NN2+ and IE4+ simply return friendly `null` values).

As a final test, an `if` condition looks at two conditions: 1) if the `window` object has ever been initialized with a value other than `null` (in case you click the window closing button before ever having created the new window) and 2) if the window's `closed` property is `null` or `false`. If either condition is true, the `close()` method is sent to the second window.

Listing 16-4: **Checking Before Closing a Window**

```
<HTML>
<HEAD>
<TITLE>window.closed Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// initialize global var for new window object
// so it can be accessed by all functions on the page
```

```
var newWind
// set flag to help out with special handling for window closing
var isIE3 = (navigator.appVersion.indexOf("MSIE 3") != -1) ? true : false
// make the new window and put some stuff in it
function newWindow() {
    newWind = window.open("","subwindow","HEIGHT=200,WIDTH=200")
    // take care of Navigator 2
    if (newWind.opener == null) {
        newWind.opener = window
    }
    setTimeout("finishNewWindow()", 100)
}
function finishNewWindow() {
    var output = ""
    output += "<HTML><BODY><H1>A Sub-window</H1>"
    output += "<FORM><INPUT TYPE='button' VALUE='Close Main Window'"
    output +="onClick='window.opener.close()'></FORM></BODY></HTML>"
    newWind.document.write(output)
    newWind.document.close()
}
// close subwindow, including ugly workaround for IE3
function closeWindow() {
    if (isIE3) {
        // if window is already open, nothing appears to happen
        // but if not, the subwindow flashes momentarily (yech!)
        newWind = window.open("","subwindow","HEIGHT=200,WIDTH=200")
    }
    if (newWind && !newWind.closed) {
        newWind.close()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="button" VALUE="Open Window" onClick="newWindow()"><BR>
<INPUT TYPE="button" VALUE="Close it if Still Open" onClick="closeWindow()">
</FORM>
</BODY>
</HTML>
```

To complete the example of the window opening and closing, notice that the subwindow is given a button whose `onClick` event handler closes the main window. In Navigator 2 and Internet Explorer 3, this occurs without complaint. But in NN3+ and IE4+, the user is presented with an alert asking to confirm the closure of the main browser window.

defaultStatus

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Unless you plan to change the default statusbar text while a user spends time at your Web page, the best time to set the property is when the document loads. In Listing 16-5, notice how I also read this property to reset the statusbar in an `onMouseOut` event handler. Setting the `status` property to empty also resets the statusbar to the `defaultStatus` setting.

Listing 16-5: Setting the Default Status Message

```
<HTML>
<HEAD>
<TITLE>window.defaultStatus property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
window.defaultStatus = "Welcome to my Web site."
</SCRIPT>
</HEAD>
<BODY>
<A HREF="http://www.microsoft.com"
onMouseOver="window.status = 'Visit Microsoft\'s Home page.';return true"
onMouseOut="window.status = '';return true">Microsoft</A><P>
<A HREF="http://home.netscape.com"
onMouseOver="window.status = 'Visit Netscape\'s Home page.';return true"
onMouseOut="window.status = window.defaultStatus;return true">Netscape</A>
</BODY>
</HTML>
```

If you need to display single or double quotes in the statusbar (as in the second link in Listing 16-5), use escape characters (`\'` and `\"`) as part of the strings being assigned to these properties.

dialogArguments

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 16-38 for the `window.showModalDialog()` method to see how arguments can be passed to a dialog box and retrieved via the `dialogArguments` property.

dialogHeight
dialogWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Dialog boxes sometimes provide a button or icon that reveals more details or more complex settings for advanced users. You can create a function that handles the toggle between two sizes. The following function assumes that the document in the dialog box has a button whose label also toggles between "Show Details" and "Hide Details." The button's `onClick` event handler invokes the function as `toggleDetails(this)`.

```
function toggleDetails(btn) {
    if (dialogHeight == "200px") {
        dialogHeight = "350px"
        btn.value = "Hide Details"
    } else {
        dialogHeight = "200px"
        btn.value = "Show Details"
    }
}
```

In practice, you also have to toggle the `display` style sheet property of the extra material between `none` and `block` to make sure that the dialog box does not display scrollbars in the smaller dialog box version.

dialogLeft
dialogTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Although usually not a good idea because of the potentially jarring effect on a user, you can reposition a dialog box window that has been resized by script (or by the user if you let the dialog box be resizable). The following statements in a dialog box window document's script recenters the dialog box window.

```
dialogLeft = (screen.availWidth/2) - (parseInt(dialogWidth)/2) + "px"
dialogHeight = (screen.availHeight/2) - (parseInt(dialogHeight)/2) + "px"
```

Note that the `parseInt()` functions are used to read the numeric portion of the `dialogWidth` and `dialogHeight` properties so that the values can be used for arithmetic.

directories
locationbar
menubar
personalbar
scrollbars
statusbar
toolbar

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

In Listing 16-6, you can experiment with the look of a browser window with any of the chrome elements turned on and off. To run this script, you must either sign the scripts or turn on codebase principals (see Chapter 46). Java must also be enabled to use the signed script statements.

As the page loads, it stores the current state of each chrome element. One button for each chrome element triggers the `toggleBar()` function. This function inverts the visible property for the chrome object passed as a parameter to the function. Finally, the Restore button returns visibility to their original settings. Notice that the `restore()` function is also called by the `onUnload` event handler for the document. Also, if you load this example into NN6, non-fatal script errors occur when the scrollbars are turned on or off.

Listing 16-6: **Controlling Window Chrome**

```
<HTML>
<HEAD>
<TITLE>Bars Bars Bars</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// store original outer dimensions as page loads
var originalLocationbar = window.locationbar.visible
var originalMenubar = window.menubar.visible
var originalPersonalbar = window.personalbar.visible
var originalScrollbars = window.scrollbars.visible
var originalStatusbar = window.statusbar.visible
var originalToolbar = window.toolbar.visible

// generic function to set inner dimensions
function toggleBar(bar) {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    bar.visible = !bar.visible
    netscape.security.PrivilegeManager.revertPrivilege("UniversalBrowserWrite")
}
// restore settings
function restore() {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    window.locationbar.visible = originalLocationbar
    window.menubar.visible = originalMenubar
    window.personalbar.visible = originalPersonalbar
    window.scrollbars.visible = originalScrollbars
    window.statusbar.visible = originalStatusbar
    window.toolbar.visible = originalToolbar
    netscape.security.PrivilegeManager.revertPrivilege("UniversalBrowserWrite")
}
</SCRIPT>
</HEAD>
<BODY onUnload="restore()">
<FORM>
<B>Toggle Window Bars</B><BR>
<INPUT TYPE="button" VALUE="Location Bar"
onClick="toggleBar(window.locationbar)"><BR>
<INPUT TYPE="button" VALUE="Menu Bar" onClick="toggleBar(window.menubar)"><BR>
```

Continued

Listing 16-6 *(continued)*

```
<INPUT TYPE="button" VALUE="Personal Bar"
onClick="toggleBar(window.personalbar)"><BR>
<INPUT TYPE="button" VALUE="Scrollbars"
onClick="toggleBar(window.scrollbars)"><BR>
<INPUT TYPE="button" VALUE="Status Bar"
onClick="toggleBar(window.statusbar)"><BR>
<INPUT TYPE="button" VALUE="Tool Bar" onClick="toggleBar(window.toolbar)"><BR>
<HR>
<INPUT TYPE="button" VALUE="Restore Original Settings" onClick="restore()"><BR>
</FORM>
</BODY>
</HTML>
```

external

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The first example asks the user if it is okay to add a Web site to the Active Desktop. If Active Desktop is not enabled, the user is given the choice of enabling it at this point.

```
external.AddDesktopComponent("http://www.nytimes.com","website", 200, 100,
400, 400)
```

In the next example, the user is asked to approve the addition of a URL to the Favorites list. The user can follow the normal procedure for filing the item in a folder in the list.

```
external.AddFavorite("http://www.dannyg.com/update6.html",
"JSBible 4 Support Center")
```

The final example assumes that a user makes a choice from a SELECT list of items. The `onChange` event handler of the SELECT list invokes the following function to navigate to a fictitious page and locate listings for a chosen sports team on the page.

```
function locate(list) {
    var choice = list.options[list.selectedIndex].value
```

```
    external.NavigateAndFind("http://www.collegesports.net/scores.html", choice,
"scores")
}
```

frames

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listings 16-7 and 16-8 demonstrate how JavaScript treats values of frame references from objects inside a frame. The same document is loaded into each frame. A script in that document extracts info about the current frame and the entire frameset. Figure 16-5 shows the results after loading the HTML document in Listing 16-7.

Listing 16-7: **Framesetting Document for Listing 16-8**

```
<HTML>
<HEAD>
<TITLE>window.frames property</TITLE>
</HEAD>
<FRAMESET COLS="50%,50%">
    <FRAME NAME="JustAKid1" SRC="lst16-08.htm">
    <FRAME NAME="JustAKid2" SRC="lst16-08.htm">
</FRAMESET>
</HTML>
```

A call to determine the number (length) of frames returns 0 from the point of view of the current frame referenced. That's because each frame here is a window that has no nested frames within it. But add the `parent` property to the reference, and the scope zooms out to take into account all frames generated by the parent window's document.

Listing 16-8: **Showing Various Window Properties**

```
<HTML>
<HEAD>
<TITLE>Window Revealer II</TITLE>
```

Continued

Listing 16-8 *(continued)*

```
<SCRIPT LANGUAGE="JavaScript">
function gatherWindowData() {
    var msg = ""
    msg += "<B>From the point of view of this frame:</B><BR>"
    msg += "window.frames.length: " + window.frames.length + "<BR>"
    msg += "window.name: " + window.name + "<P>"
    msg += "<B>From the point of view of the framesetting document:</B><BR>"
    msg += "parent.frames.length: " + parent.frames.length + "<BR>"
    msg += "parent.frames[0].name: " + parent.frames[0].name
    return msg
}
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
document.write(gatherWindowData())
</SCRIPT>
</BODY>
</HTML>
```

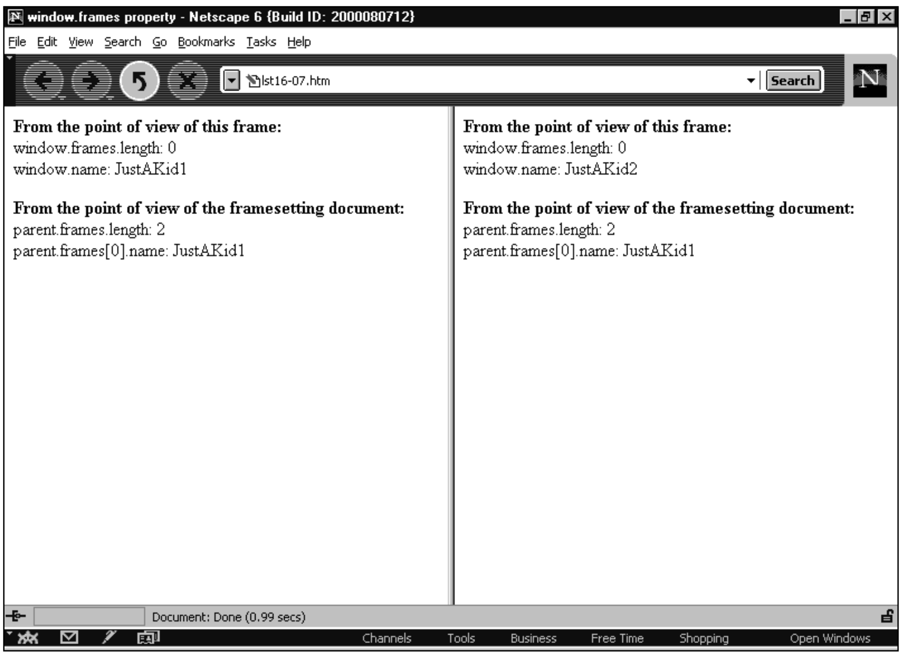

Figure 16-5: Property readouts from both frames loaded from Listing 16-7

The last statement in the example shows how to use the array syntax (brackets) to refer to a specific frame. All array indexes start with 0 for the first entry. Because the document asks for the name of the first frame (`parent.frames[0]`), the response is `JustAKid1` for both frames.

innerHeight
innerWidth
outerHeight
outerWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

In Listing 16-9, a number of buttons let you see the results of setting the `innerHeight`, `innerWidth`, `outerHeight`, and `outerWidth` properties.

Listing 16-9: Setting Window Height and Width

```
<HTML>
<HEAD>
<TITLE>Window Sizer</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// store original outer dimensions as page loads
var originalWidth = window.outerWidth
var originalHeight = window.outerHeight
// generic function to set inner dimensions
function setInner(width, height) {
    window.innerWidth = width
    window.innerHeight = height
}
// generic function to set outer dimensions
function setOuter(width, height) {
    window.outerWidth = width
    window.outerHeight = height
}
```

Continued

Listing 16-9 *(continued)*

```
// restore window to original dimensions
function restore() {
    window.outerWidth = originalWidth
    window.outerHeight = originalHeight
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<B>Setting Inner Sizes</B><BR>
<INPUT TYPE="button" VALUE="600 Pixels Square" onClick="setInner(600,600)"><BR>
<INPUT TYPE="button" VALUE="300 Pixels Square" onClick="setInner(300,300)"><BR>
<INPUT TYPE="button" VALUE="Available Screen Space"
onClick="setInner(screen.availWidth, screen.availHeight)"><BR>
<HR>
<B>Setting Outer Sizes</B><BR>
<INPUT TYPE="button" VALUE="600 Pixels Square" onClick="setOuter(600,600)"><BR>
<INPUT TYPE="button" VALUE="300 Pixels Square" onClick="setOuter(300,300)"><BR>
<INPUT TYPE="button" VALUE="Available Screen Space"
onClick="setOuter(screen.availWidth, screen.availHeight)"><BR>
<HR>
<INPUT TYPE="button" VALUE="Cinch up for Win95" onClick="setInner(273,304)"><BR>
<INPUT TYPE="button" VALUE="Cinch up for Mac" onClick="setInner(273,304)"><BR>
<INPUT TYPE="button" VALUE="Restore Original" onClick="restore()"><BR>
</FORM>
</BODY>
</HTML>
```

As the document loads, it saves the current outer dimensions in global variables. One of the buttons restores the windows to these settings. Two parallel sets of buttons set the inner and outer dimensions to the same pixel values so that you can see the effects on the overall window and document area when a script changes the various properties.

Because Navigator 4 displays different-looking buttons in different platforms (as well as other elements), the two buttons contain script instructions to size the window to best display the window contents. Unfortunately, no measure of the active area of a document is available, so that the dimension values were determined by trial and error before being hard-wired into the script.

navigator

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

This book is littered with examples of using the `navigator` object, primarily for performing browser detection. Examples of specific `navigator` object properties can be found in Chapter 28.

offscreenBuffering

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

If you want to turn off buffering for an entire page, include the following statement at the beginning of your script statements:

```
window.offscreenBuffering = false
```

onerror

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

In Listing 16-10, one button triggers a script that contains an error. I've added an error handling function to process the error so that it opens a separate window and fills in a textarea form element (see Figure 16-6). If you load Listing 16-10 in NN6, some of the reporting categories report "undefined" because the browser unfortunately does not pass error properties to the `handleError()` function. A Submit button is also provided to mail the bug information to a support center e-mail address — an example of how to handle the occurrence of a bug in your scripts.

Listing 16-10: **Controlling Script Errors**

```
<HTML>
<TITLE>Error Dialog Control</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
// function with invalid variable value
function goWrong() {
    var x = fred
}
// turn off error dialogs
function errOff() {
    window.onerror = doNothing
}
// turn on error dialogs with hard reload
function errOn() {
    window.onerror = handleError
}

// assign default error handler
window.onerror = handleError

// error handler when errors are turned off...prevents error dialog
function doNothing() {return true}

function handleError(msg, URL, lineNum) {
    var errWind = window.open("","errors","HEIGHT=270,WIDTH=400")
    var wintxt = "<HTML><BODY BGCOLOR=RED>"
    wintxt += "<B>An error has occurred on this page.  "
    wintxt += "Please report it to Tech Support.</B>"
    wintxt += "<FORM METHOD=POST ENCTYPE='text/plain' "
    wintxt += "ACTION=mailTo:support4@dannyg.com >"
    wintxt += "<TEXTAREA NAME='errMsg' COLS=45 ROWS=8 WRAP=VIRTUAL>"
    wintxt += "Error: " + msg + "\n"
    wintxt += "URL: " + URL + "\n"
    wintxt += "Line: " + lineNum + "\n"
    wintxt += "Client: " + navigator.userAgent + "\n"
    wintxt += "-----------------------------------------\n"
    wintxt += "Please describe what you were doing when the error occurred:"
    wintxt += "</TEXTAREA><P>"
    wintxt += "<INPUT TYPE=SUBMIT VALUE='Send Error Report'>"
    wintxt += "<INPUT TYPE=button VALUE='Close' onClick='self.close()'>"
    wintxt += "</FORM></BODY></HTML>"
    errWind.document.write(wintxt)
    errWind.document.close()
    return true
}
```

```
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="myform">
<INPUT TYPE="button" VALUE="Cause an Error" onClick="goWrong()"><P>
<INPUT TYPE="button" VALUE="Turn Off Error Dialogs" onClick="errOff()">
<INPUT TYPE="button" VALUE="Turn On Error Dialogs" onClick="errOn()">
</FORM>
</BODY>
</HTML>
```

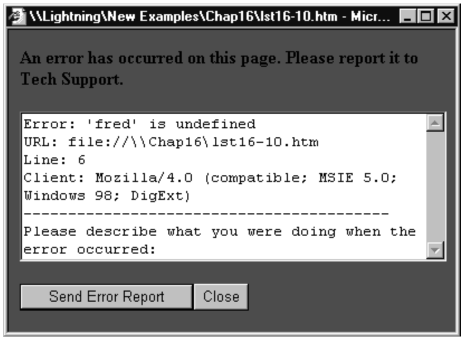

Figure 16-6: An example of a self-reporting error window

I provide a button that performs a hard reload, which, in turn, resets the `window.onerror` property to its default value. With error dialog boxes turned off, the error handling function does not run.

opener

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	✓	✓	✓	✓	✓

Example

To demonstrate the importance of the `opener` property, take a look at how a new window can define itself from settings in the main window (Listing 16-11). The `doNew()` function generates a small subwindow and loads the file in Listing 16-12 into the window. Notice the initial conditional statements in doNew() to make sure that if the new window already exists, it comes to the front by invoking the new window's focus() method. You can see the results in Figure 16-7. Because the doNew() function in Listing 16-11 uses window methods and properties not available in IE3, this example does not work correctly in IE3.

Listing 16-11: Contents of a Main Window Document That Generates a Second Window

```
<HTML>
<HEAD>
<TITLE>Master of all Windows</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
var myWind
function doNew() {
    if (!myWind || myWind.closed) {
        myWind = window.open("lst16-12.htm","subWindow",
           "HEIGHT=200,WIDTH=350,resizable")
    } else {
        // bring existing subwindow to the front
        myWind.focus()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="input">
Select a color for a new window:
<INPUT TYPE="radio" NAME="color" VALUE="red" CHECKED>Red
<INPUT TYPE="radio" NAME="color" VALUE="yellow">Yellow
<INPUT TYPE="radio" NAME="color" VALUE="blue">Blue
<INPUT TYPE="button" NAME="storage" VALUE="Make a Window" onClick="doNew()">
<HR>
This field will be filled from an entry in another window:
<INPUT TYPE="text" NAME="entry" SIZE=25>
</FORM>
</BODY>
</HTML>
```

The window.open() method doesn't provide parameters for setting the new window's background color, so I let the getColor() function in the new window do the job as the document loads. The function uses the opener property to find out which radio button on the main page is selected.

Listing 16-12: References to the opener Property

```
<HTML>
<HEAD>
<TITLE>New Window on the Block</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function getColor() {
    // shorten the reference
    colorButtons = self.opener.document.forms[0].color
    // see which radio button is checked
    for (var i = 0; i < colorButtons.length; i++) {
        if (colorButtons[i].checked) {
            return colorButtons[i].value
        }
    }
    return "white"
}
</SCRIPT>
</HEAD>
<SCRIPT LANGUAGE="JavaScript">
document.write("<BODY BGCOLOR='" + getColor() + "'>")
</SCRIPT>
<H1>This is a new window.</H1>
<FORM>
<INPUT TYPE="button" VALUE="Who's in the Main window?"
onClick="alert(self.opener.document.title)"><P>
Type text here for the main window:
<INPUT TYPE="text" SIZE=25 onChange="self.opener.document.forms[0].entry.value =
this.value">
</FORM>
</BODY>
</HTML>
```

In the `getColor()` function, the multiple references to the radio button array can be very long. To simplify the references, the `getColor()` function starts out by assigning the radio button array to a variable I arbitrarily call `colorButtons`. That shorthand now stands in for lengthy references as I loop through the radio buttons to determine which button is checked and retrieve its value property.

A button in the second window simply fetches the title of the opener window's document. Even if another document loads in the main window in the meantime, the `opener` reference still points to the main window: Its `document` object, however, will change.

Finally, the second window contains a text input object. Enter any text there that you like and either tab or click out of the field. The `onChange` event handler updates the field in the opener's document (provided that document is still loaded).

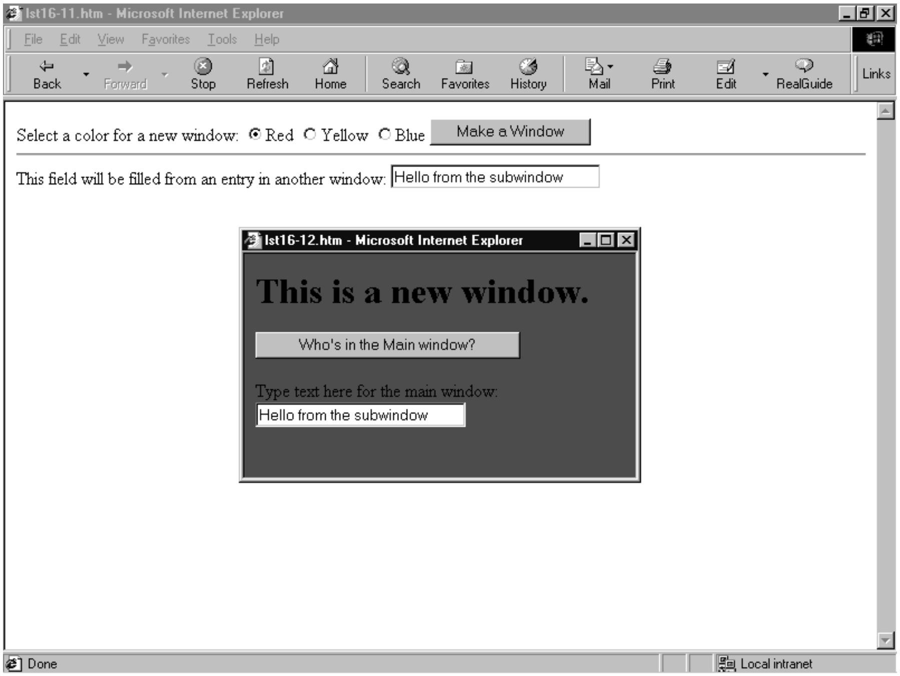

Figure 16-7: The main and subwindows, inextricably linked via the `window.opener` property

pageXOffset
pageYOffset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

The script in Listing 16-13 is an unusual construction that creates a frameset and creates the content for each of the two frames all within a single HTML document (see "Frame Object" later in this chapter for more details). The purpose of this example is to provide you with a playground to become familiar with the page offset concept and how the values of these properties correspond to physical activity in a scrollable document.

In the left frame of the frameset are two fields that are ready to show the pixel values of the right frame's `pageXOffset` and `pageYOffset` properties. The content of the right frame is a 30-row table of fixed width (800 pixels). Mouse click events are captured by the document level (see Chapter 18), allowing you to click any table or cell border or outside the table to trigger the `showOffsets()` function in the right frame. That function is a simple script that displays the page offset values in their respective fields in the left frame.

Listing 16-13: Viewing the pageXOffset and pageYOffset Properties

```
<HTML>
<HEAD>
<TITLE>Master of all Windows</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function leftFrame() {
    var output = "<HTML><BODY><H3>Page Offset Values</H3><HR>\n"
    output += "<FORM>PageXOffset:<INPUT TYPE='text' NAME='xOffset'
SIZE=4><BR>\n"
    output += "PageYOffset:<INPUT TYPE='text' NAME='yOffset' SIZE=4><BR>\n"
    output += "</FORM></BODY></HTML>"
    return output
}

function rightFrame() {
    var output = "<HTML><HEAD><SCRIPT LANGUAGE='JavaScript'>\n"
    output += "function showOffsets() {\n"
    output += "parent.readout.document.forms[0].xOffset.value =
self.pageXOffset\n"
    output += "parent.readout.document.forms[0].yOffset.value =
self.pageYOffset\n}\n"
    output += "document.captureEvents(Event.CLICK)\n"
    output += "document.onclick = showOffsets\n"
    output += "<\/SCRIPT></HEAD><BODY><H3>Content Page</H3>\n"
    output += "Scroll this frame and click on a table border to view " +
              "page offset values.<BR><HR>\n"
    output += "<TABLE BORDER=5 WIDTH=800>"
    var oneRow = "<TD>Cell 1</TD><TD>Cell 2</TD><TD>Cell 3</TD><TD>Cell 4</TD>" +
                 "<TD>Cell 5</TD>"
    for (var i = 1; i <= 30; i++) {
        output += "<TR><TD><B>Row " + i + "</B></TD>" + oneRow + "</TR>"
    }
    output += "</TABLE></BODY></HTML>"
    return output
}
</SCRIPT>
</HEAD>
```

Continued

Listing 16-13 *(continued)*

```
<FRAMESET COLS="30%,70%">
    <FRAME NAME="readout" SRC="javascript:parent.leftFrame()">
    <FRAME NAME="display" SRC="javascript:parent.rightFrame()">
</FRAMESET>
</HTML>
```

To gain an understanding of how the offset values work, scroll the window slightly in the horizontal direction and notice that the `pageXOffset` value increases; the same goes for the `pageYOffset` value as you scroll down. Remember that these values reflect the coordinate in the document that is currently under the top-left corner of the window (frame) holding the document. You can see an IE4+ version of this example in Listing 18-20. A cross-browser version would require very little browser branching.

parent

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

To demonstrate how various `window` object properties refer to window levels in a multiframe environment, use your browser to load the Listing 16-14 document. It, in turn, sets each of two equal-size frames to the same document: Listing 16-15. This document extracts the values of several window properties, plus the `document.title` properties of two different window references.

Listing 16-14: **Framesetting Document for Listing 16-15**

```
<HTML>
<HEAD>
<TITLE>The Parent Property Example</TITLE>
<SCRIPT LANGUAGE="JavaScript">
self.name = "Framesetter"
</SCRIPT>
```

```
</HEAD>
<FRAMESET COLS="50%,50%" onUnload="self.name = ''">
    <FRAME NAME="JustAKid1" SRC="lst16-15.htm">
    <FRAME NAME="JustAKid2" SRC="lst16-15.htm">
</FRAMESET>
</HTML>
```

Listing 16-15: **Revealing Various Window-Related Properties**

```
<HTML>
<HEAD>
<TITLE>Window Revealer II</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function gatherWindowData() {
    var msg = ""
    msg = msg + "top name: " + top.name + "<BR>"
    msg = msg + "parent name: " + parent.name + "<BR>"
    msg = msg + "parent.document.title: " + parent.document.title + "<P>"
    msg = msg + "window name: " + window.name + "<BR>"
    msg = msg + "self name: " + self.name + "<BR>"
    msg = msg + "self.document.title: " + self.document.title
    return msg
}
</SCRIPT>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
document.write(gatherWindowData())
</SCRIPT>
</BODY>
</HTML>
```

In the two frames (Figure 16-8), the references to the `window` and `self` object names return the name assigned to the frame by the frameset definition (`JustAKid1` for the left frame, `JustAKid2` for the right frame). In other words, from each frame's point of view, the `window` object is its own frame. References to `self.document.title` refer only to the document loaded into that window frame. But references to the top and parent windows (which are one and the same in this example) show that those object properties are shared between both frames.

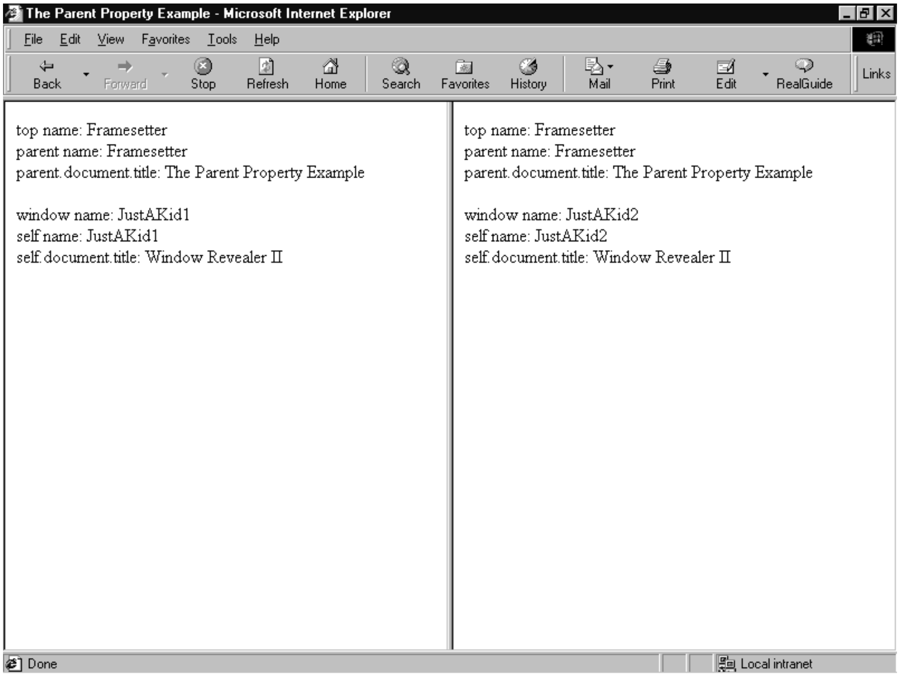

Figure 16-8: Parent and top properties being shared by both frames.

A couple other fine points are worth highlighting. First, the name of the framesetting window is set as Listing 16-14 loads, rather than in response to an `onLoad` event handler in the `<FRAMESET>` tag. The reason for this is that the name must be set in time for the documents loading in the frames to get that value. If I had waited until the frameset's `onLoad` event handler, the name wouldn't be set until after the frame documents had loaded. Second, I restore the parent window's name to an empty string when the framesetting document unloads. This is to prevent future pages from getting confused about the window name.

returnValue

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 16-39 for the `showModalDialog()` method for an example of how to get data back from a dialog box in IE4+.

screenLeft
screenTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `screenLeft` and `screenTop` properties. Start with the browser window maximized (if you are using Windows). Enter the following property name into the top text box:

```
window.screenLeft
```

Click the Evaluate button to see the current setting. Unmaximize the window and drag it around the screen. Each time you finish dragging, click the Evaluate button again to see the current value. Do the same for `window.screenTop`.

screenX
screenY

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `screenX` and `screenY` properties in NN6. Start with the browser window maximized (if you are using Windows). Enter the following property name into the top text box:

```
window.screenY
```

Click the Evaluate button to see the current setting. Unmaximize the window and drag it around the screen. Each time you finish dragging, click the Evaluate button again to see the current value. Do the same for `window.screenY`.

scrollX
scrollY

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `scrollX` and `scrollY` properties in NN6. Enter the following property into the top text box:

```
window.scrollY
```

Now manually scroll the page down so that you can still see the Evaluate button. Click the button to see how far the window has scrolled along the y-axis.

self

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 16-16 uses the same operations as Listing 16-5 but substitutes the `self` property for all `window` object references. The application of this reference is entirely optional, but it can be helpful for reading and debugging scripts if the HTML document is to appear in one frame of a multiframe window — especially if other JavaScript code in this document refers to documents in other frames. The `self` reference helps anyone reading the code know precisely which frame was being addressed.

Listing 16-16: **Using the self Property**

```
<HTML>
<HEAD>
<TITLE>self Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
self.defaultStatus = "Welcome to my Web site."
</SCRIPT>
</HEAD>
<BODY>
<A HREF="http:// www.microsoft.com"
onMouseOver="self.status = 'Visit Microsoft\'s Home page.';return true"
onMouseOut="self.status = '';return true">Microsoft</A><P>
<A HREF="http://home.netscape.com"
onMouseOver="self.status = 'Visit Netscape\'s Home page.';return true"
onMouseOut="self.status = self.defaultStatus;return true">Netscape</A>
</BODY>
</HTML>
```

status

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

In Listing 16-17, the `status` property is set in a handler embedded in the `onMouseOver` attribute of two HTML link tags. Notice that the handler requires a `return true` statement (or any expression that evaluates to `return true`) as the last statement of the handler. This statement is required or the status message will not display, particularly in early browsers.

Listing 16-17: **Links with Custom Statusbar Messages**

```
<HTML>
<HEAD>
<TITLE>window.status Property</TITLE>
</HEAD>
<BODY>
<A HREF="http://www.dannyg.com" onMouseOver="window.status = 'Go to my Home
page. (www.dannyg.com)'; return true">Home</A><P>
<A HREF="http://home.netscape.com" onMouseOver="window.status = 'Visit Netscape
Home page. (home.netscape.com)'; return true">Netscape</A>
</BODY>
</HTML>
```

As a safeguard against platform-specific anomalies that affect the behavior of `onMouseOver` event handlers and the `window.status` property, you should also include an `onMouseOut` event handler for links and client-side image map area objects. Such `onMouseOut` event handlers should set the `status` property to an empty string. This setting ensures that the statusbar message returns to the `defaultStatus` setting when the pointer rolls away from these objects. If you want to write a generalizable function that handles all window status changes, you can do so, but word the `onMouseOver` attribute carefully so that the event handler evaluates to `return true`. Listing 16-18 shows such an alternative.

Listing 16-18: **Handling Status Message Changes**

```
<HTML>
<HEAD>
<TITLE>Generalizable window.status Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function showStatus(msg) {
    window.status = msg
    return true
}
</SCRIPT>
</HEAD>
<BODY>
<A HREF="http:// www.dannyg.com " onMouseOver="return showStatus('Go to my Home
page (www.dannyg.com).')" onMouseOut="return showStatus('')">Home</A><P>
<A HREF="http://home.netscape.com" onMouseOver="return showStatus('Visit
Netscape Home page.')" onMouseOut="return showStatus('')">Netscape</A>
</BODY>
</HTML>
```

Notice how the event handlers return the results of the `showStatus()` method to the event handler, allowing the entire handler to evaluate to `return true`.

One final example of setting the statusbar (shown in Listing 16-19) also demonstrates how to create a simple scrolling banner in the statusbar.

Listing 16-19: **Creating a Scrolling Banner**

```
<HTML>
<HEAD>
<TITLE>Message Scroller</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
```

```
var msg = "Welcome to my world..."
var delay = 150
var timerId
var maxCount = 0
var currCount = 1

function scrollMsg() {
    // set the number of times scrolling message is to run
    if (maxCount == 0) {
        maxCount = 3 * msg.length
    }
    window.status = msg
    // keep track of how many characters have scrolled
    currCount++
    // shift first character of msg to end of msg
    msg = msg.substring (1, msg.length) + msg.substring (0, 1)
    // test whether we've reached maximum character count
    if (currCount >= maxCount) {
        timerID = 0        // zero out the timer
        window.status = ""    // clear the status bar
        return            // break out of function
    } else {
        // recursive call to this function
        timerId = setTimeout("scrollMsg()", delay)
   }
}
// -->
</SCRIPT>
</HEAD>
<BODY onLoad="scrollMsg()">
</BODY>
</HTML>
```

Because the statusbar is being set by a standalone function (rather than by an `onMouseOver` event handler), you do not have to append a `return true` statement to set the `status` property. The `scrollMsg()` function uses more advanced JavaScript concepts, such as the `window.setTimeout()` method (covered later in this chapter) and string methods (covered in Chapter 34). To speed the pace at which the words scroll across the statusbar, reduce the value of `delay`.

Many Web surfers (myself included) don't care for these scrollers that run forever in the statusbar. Rolling the mouse over links disturbs the banner display. Scrollers can also crash earlier browsers, because the `setTimeout()` method eats application memory in Navigator 2. Use scrolling bars sparingly or design them to run only a few times after the document loads.

Tip

Setting the `status` property with `onMouseOver` event handlers has had a checkered career along various implementations in Navigator. A script that sets the statusbar is always in competition against the browser itself, which uses the statusbar to report loading progress. When a "hot" area on a page is at the edge of a frame, many times the `onMouseOut` event fails to fire, thus preventing the statusbar from clearing itself. Be sure to torture test any such implementations before declaring your page ready for public access.

Methods

alert("*message*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The parameter for the example in Listing 16-20 is a concatenated string. It joins together two fixed strings and the value of the browser's `navigator.appName` property. Loading this document causes the alert dialog box to appear, as shown in several configurations in Figure 16-10. The JavaScript Alert: line cannot be deleted from the dialog box in earlier browsers, nor can the title bar be changed in later browsers.

Listing 16-20: Displaying an Alert Dialog Box

```
<HTML>
<HEAD>
<TITLE>window.alert() Method</TITLE>
</HEAD>
<BODY>
<SCRIPT LANGUAGE="JavaScript">
alert("You are running the " + navigator.appName + " browser.")
</SCRIPT>
</BODY>
</HTML>
```

Figure 16-10: Results of the `alert()` method in Listing 16-20 in Internet Explorer 5 and Navigator 6 for Windows 98

captureEvents(*eventTypeList*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

The page in Listing 16-21 is an exercise in capturing and releasing click events in the `window` object. Whenever the window is capturing click events, the `flash()` function runs. In that function, the event is examined so that only if the Control key is also being held down and the name of the button starts with “button” does the document background color flash red. For all click events (that is, those directed at objects on the page capable of their own `onClick` event handlers), the click is processed with the `routeEvent()` method to make sure the target buttons execute their own `onClick` event handlers.

Listing 16-21: **Capturing Click Events in the Window**

```
<HTML>
<HEAD>
<TITLE>Window Event Capture</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
// function to run when window captures a click event
function flash(e) {
    if (e.modifiers = Event.CONTROL_MASK &&
    e.target.name.indexOf("button") == 0) {
```

Continued

Listing 16-21 *(continued)*

```
        document.bgColor = "red"
        setTimeout("document.bgColor = 'white'", 500)
    }
    // let event continue to target
    routeEvent(e)
}
// default setting to capture click events
window.captureEvents(Event.CLICK)
// assign flash() function to click events captured by window
window.onclick = flash
</SCRIPT>
</HEAD>
<BODY BGCOLOR="white">
<FORM NAME="buttons">
<B>Turn window click event capture on or off (Default is "On")</B><P>
<INPUT NAME="captureOn" TYPE="button" VALUE="Capture On"
onClick="window.captureEvents(Event.CLICK)"> 
<INPUT NAME="captureOff" TYPE="button" VALUE="Capture Off"
onClick="window.releaseEvents(Event.CLICK)">
<HR>
<B>Ctrl+Click on a button to see if clicks are being captured by the window
(background color will flash red):</B><P>
<UL>
<LI><INPUT NAME="button1" TYPE="button" VALUE="Informix" onClick="alert('You
clicked on Informix.')">
<LI><INPUT NAME="button2" TYPE="button" VALUE="Oracle" onClick="alert('You
clicked on Oracle.')">
<LI><INPUT NAME="button3" TYPE="button" VALUE="Sybase" onClick="alert('You
clicked on Sybase.')">
</UL>
</FORM>
</BODY>
</HTML>
```

When you try this page, also turn off window event capture. Now only the buttons' `onClick` event handlers execute, and the page does not flash red.

`clearInterval(`*`intervalIDnumber`*`)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

See Listings 16-36 and 16-37 for an example of how `setInterval()` and `clearInterval()` are used together on a page.

clearTimeout(*timeoutIDnumber*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The page in Listing 16-22 features one text field and two buttons (Figure 16-11). One button starts a countdown timer coded to last one minute (easily modifiable for other durations); the other button interrupts the timer at any time while it is running. When the minute is up, an alert dialog box lets you know.

Listing 16-22: A Countdown Timer

```
<HTML>
<HEAD>
<TITLE>Count Down Timer</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
var running = false
var endTime = null
var timerID = null

function startTimer() {
    running = true
    now = new Date()
    now = now.getTime()
    // change last multiple for the number of minutes
    endTime = now + (1000 * 60 * 1)
    showCountDown()
}

function showCountDown() {
    var now = new Date()
    now = now.getTime()
    if (endTime - now <= 0) {
        stopTimer()
```

Continued

Listing 16-22 *(continued)*

```
        alert("Time is up.  Put down your pencils.")
    } else {
        var delta = new Date(endTime - now)
        var theMin = delta.getMinutes()
        var theSec = delta.getSeconds()
        var theTime = theMin
        theTime += ((theSec < 10) ? ":0" : ":") + theSec
        document.forms[0].timerDisplay.value = theTime
        if (running) {
            timerID = setTimeout("showCountDown()",1000)
        }
    }
}

function stopTimer() {
    clearTimeout(timerID)
    running = false
    document.forms[0].timerDisplay.value = "0:00"
}
//-->
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="button" NAME="startTime" VALUE="Start 1 min. Timer"
onClick="startTimer()">
<INPUT TYPE="button" NAME="clearTime" VALUE="Clear Timer"
onClick="stopTimer()"><P>
<INPUT TYPE="text" NAME="timerDisplay" VALUE="">
</FORM>
</BODY>
</HTML>
```

Notice that the script establishes three variables with global scope in the window: `running`, `endTime`, and `timerID`. These values are needed inside multiple functions, so they are initialized outside of the functions.

In the `startTimer()` function, you switch the running flag on, meaning that the timer should be going. Using some date functions (Chapter 36), you extract the current time in milliseconds and add the number of milliseconds for the next minute (the extra multiplication by one is the place where you can change the amount to the desired number of minutes). With the end time stored in a global variable, the function now calls another function that compares the current and end times and displays the difference in the text field.

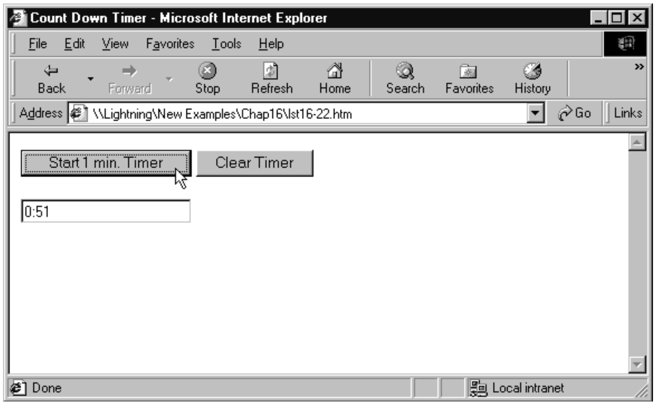

Figure 16-11: The countdown timer page as it displays the time remaining

Early in the `showCountDown()` function, check to see if the timer has wound down. If so, you stop the timer and alert the user. Otherwise, the function continues to calculate the difference between the two times and formats the time in mm:ss format. As long as the `running` flag is set to `true`, the function sets the one-second timeout timer before repeating itself. To stop the timer before it has run out (in the `stopTimer()` function), the most important step is to cancel the timeout running inside the browser. The `clearTimeout()` method uses the global `timerID` value to do that. Then the function turns off the running switch and zeros out the display.

When you run the timer, you may occasionally notice that the time skips a second. It's not cheating. It just takes slightly more than one second to wait for the timeout and then finish the calculations for the next second's display. What you're seeing is the display catching up with the real time left.

close()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listing 16-4 (for the `window.closed` property), which provides an elaborate, cross-platform, bug-accommodating example of applying the `window.close()` method across multiple windows.

confirm("*message*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The example in Listing 16-23 shows the user interface part of how you can use a confirm dialog box to query a user before clearing a table full of user-entered data. The line in the title bar, as shown in Figure 16-12, or the “JavaScript Confirm” legend in earlier browser versions cannot be removed from the dialog box.

Listing 16-23: **The Confirm Dialog Box**

```
<HTML>
<HEAD>
<TITLE>window.confirm() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function clearTable() {
    if (confirm("Are you sure you want to empty the table?")) {
        alert("Emptying the table...") // for demo purposes
        //statements that actually empty the fields
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<!-- other statements that display and populate a large table -->
<INPUT TYPE="button" NAME="clear" VALUE="Reset Table" onClick="clearTable()">
</FORM>
</BODY>
</HTML>
```

Figure 16-12: A JavaScript confirm dialog box (IE5/Windows format)

createPopup()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

See Listing 16-49 later in this chapter for an example of the `createPopup()` method.

disableExternalCapture()
enableExternalCapture()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

As this was a little-used feature of NN4 even while the browser enjoyed a substantial installed base, it becomes less important as that browser version recedes into history. You can find an example of this feature at the Support Center for this edition (`http://www.dannyg.com/update6.html`) or on pp.213–214 of the previous edition.

execScript("*exprList*"[, *language*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `execScript()` method. The Evaluator has predeclared global variables for the lowercase letters `a` through `z`.

Enter each of the following statements into the top text box and observe the results for each.

```
a
```

When first loaded, the variable is declared but assigned no value, so it is undefined.

```
window.execScript("a = 5")
```

The method returns no value, so the mechanism inside The Evaluator says that the statement is undefined.

```
a
```

The variable is now 5.

```
window.execScript("b = a * 50")
b
```

The `b` global variable has a value of 250. Continue exploring with additional script statements. Use semicolons to separate multiple statements within the string parameter.

find(["*searchString*" [, *matchCaseBoolean*, *searchUpBoolean*]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

A simple call to the `window.find()` method looks as follows:

```
var success = window.find("contract")
```

And if you want the search to be case-sensitive, add at least one of the two optional parameters:

```
success = wind.find(matchString,caseSensitive,backward)
```

Because this method works only in NN4, refer to discussions of the `TextRange` and `Range` objects in Chapter 19 for more modern implementations of body text searching.

GetAttention()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) in NN6 to set a timer that gives you enough time to switch to another application and wait for the attention signal to fire. Enter the following statement into the top text box, click the Evaluate button, and then quickly switch to another program:

```
setTimeout("GetAttention()", 5000)
```

After a total of five seconds, the attention signal fires.

moveBy(*deltaX*,*deltaY*)
moveTo(*x*,*y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Several examples of using the `window.moveTo()` and `window.moveBy()` methods are shown in Listing 16-24. The page presents four buttons, each of which performs a different kind of browser window movement.

Listing 16-24: **Window Boogie**

```
<HTML>
<HEAD>
<TITLE>Window Gymnastics</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
var isNav4 = ((navigator.appName == "Netscape") &&
(parseInt(navigator.appVersion) >= 4))
// wait in onLoad for page to load and settle in IE
function init() {
    // fill missing IE properties
    if (!window.outerWidth) {
        window.outerWidth = document.body.clientWidth
        window.outerHeight = document.body.clientHeight + 30
    }
    // fill missing IE4 properties
    if (!screen.availWidth) {
        screen.availWidth = 640
        screen.availHeight = 480
    }
}
// function to run when window captures a click event
function moveOffScreen() {
    // branch for NN security
    if (isNav4) {

netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserWrite")
    }
    var maxX = screen.width
    var maxY = screen.height
    window.moveTo(maxX+1, maxY+1)
    setTimeout("window.moveTo(0,0)",500)
    if (isNav4) {

netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserWrite")
    }
}
// moves window in a circular motion
function revolve() {
    var winX = (screen.availWidth - window.outerWidth) / 2
    var winY = 50
    window.resizeTo(400,300)
    window.moveTo(winX, winY)

    for (var i = 1; i < 36; i++) {
        winX += Math.cos(i * (Math.PI/18)) * 5
        winY += Math.sin(i * (Math.PI/18)) * 5
        window.moveTo(winX, winY)
    }
}
```

```
// moves window in a horizontal zig-zag pattern
function zigzag() {
    window.resizeTo(400,300)
    window.moveTo(0,80)
    var incrementX = 2
    var incrementY = 2
    var floor = screen.availHeight - window.outerHeight
    var rightEdge = screen.availWidth - window.outerWidth
    for (var i = 0; i < rightEdge; i += 2) {
        window.moveBy(incrementX, incrementY)
        if (i%60 == 0) {
            incrementY = -incrementY
        }
    }
}
// resizes window to occupy all available screen real estate
function maximize() {
    window.moveTo(0,0)
    window.resizeTo(screen.availWidth, screen.availHeight)
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<FORM NAME="buttons">
<B>Window Gymnastics</B><P>
<UL>
<LI><INPUT NAME="offscreen" TYPE="button" VALUE="Disappear a Second"
onClick="moveOffScreen()">
<LI><INPUT NAME="circles" TYPE="button" VALUE="Circular Motion"
onClick="revolve()">
<LI><INPUT NAME="bouncer" TYPE="button" VALUE="Zig Zag" onClick="zigzag()">
<LI><INPUT NAME="expander" TYPE="button" VALUE="Maximize" onClick="maximize()">
</UL>
</FORM>
</BODY>
</HTML>
```

To run successfully in NN, the first button requires that you have codebase principals turned on (see Chapter 46) to take advantage of what would normally be a signed script. The `moveOffScreen()` function momentarily moves the window entirely out of view. Notice how the script determines the size of the screen before deciding where to move the window. After the journey off screen, the window comes back into view at the upper-left corner of the screen.

If using the Web sometimes seems like going around in circles, then the second function, `revolve()`, should feel just right. After reducing the size of the window and positioning it near the top center of the screen, the script uses a bit of math to position the window along 36 places around a perfect circle (at 10-degree increments).

This is an example of how to control a window's position dynamically based on math calculations. IE complicates the job a bit by not providing properties that reveal the outside dimensions of the browser window.

To demonstrate the `moveBy()` method, the third function, `zigzag()`, uses a `for` loop to increment the coordinate points to make the window travel in a saw tooth pattern across the screen. The x coordinate continues to increment linearly until the window is at the edge of the screen (also calculated on the fly to accommodate any size monitor). The y coordinate must increase and decrease as that parameter changes direction at various times across the screen.

In the fourth function, you see some practical code (finally) that demonstrates how best to simulate maximizing the browser window to fill the entire available screen space on the visitor's monitor.

navigate("*URL*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility					✓	✓	✓	✓	✓

Example

Supply any valid URL as the parameter to the method, as in

```
window.navigate("http://www.dannyg.com")
```

open("*URL*", "*windowName*" [, "*windowFeatures*"][,*replaceFlag*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The page rendered by Listing 16-26 displays a single button that generates a new window of a specific size that has only the statusbar turned on. The script here shows all the elements necessary to create a new window that has all the right stuff on most platforms. The new window object reference is assigned to a global variable, `newWindow`. Before a new window is generated, the script looks to see if the window has never been generated before (in which case `newWindow` would be `null`) or, for newer browsers, the window is closed. If either condition is true, the window is created with the `open()` method. Otherwise, the existing window is brought forward with the `focus()` method (NN3+ and IE4+).

As a safeguard against older browsers, the script manually adds an `opener` property to the new window if one is not already assigned by the `open()` method. The current `window` object reference is assigned to that property.

Due to the timing problem that afflicts all IE generations, the HTML assembly and writing to the new window is separated into its own function that is invoked after a 50 millisecond delay (NN goes along for the ride, but it could accommodate the assembly and writing without the delay). To build the string that is eventually written to the document, I use the += (add-by-value) operator, which appends the string on the right side of the operator to the string stored in the variable on the left side. In this example, the new window is handed an `<H1>`-level line of text to display.

Listing 16-26: Creating a New Window

```
<HTML>
<HEAD>
<TITLE>New Window</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var newWindow
function makeNewWindow() {
    if (!newWindow || newWindow.closed) {
        newWindow = window.open("","","status,height=200,width=300")
        if (!newWindow.opener) {
        newWindow.opener = window
        }
        // force small delay for IE to catch up
        setTimeout("writeToWindow()", 50)
    } else {
        // window's already open; bring to front
        newWindow.focus()
    }
}
function writeToWindow() {
    // assemble content for new window
    var newContent = "<HTML><HEAD><TITLE>One Sub Window</TITLE></HEAD>"
    newContent += "<BODY><H1>This window is brand new.</H1>"
    newContent += "</BODY></HTML>"
    // write HTML to new window document
    newWindow.document.write(newContent)
    newWindow.document.close() // close layout stream
}
```

Continued

Listing 16-26 *(continued)*

```
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="button" NAME="newOne" VALUE="Create New Window"
 onClick="makeNewWindow()">
</FORM>
</BODY>
</HTML>
```

If you need to create a new window for the lowest common denominator of scriptable browser, you will have to omit the `focus()` method and the `window.closed` property from the script (as well as add the NN2 bug workaround described earlier). Or you may prefer to forego a subwindow for all browsers below a certain level. See Listing 16-3 (in the `window.closed` property discussion) for other ideas about cross-browser authoring for subwindows.

print()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓				✓	✓

Example

Listing 16-27 is a frameset that loads Listing 16-28 into the top frame and a copy of the Bill of Rights into the bottom frame.

Listing 16-27: **Print Frameset**

```
<HTML>
<HEAD>
<TITLE>window.print() method</TITLE>
</HEAD>
<FRAMESET ROWS="25%,75%">
    <FRAME NAME="controls" SRC="lst16-28.htm">
    <FRAME NAME="display" SRC="bofright.htm">
</FRAMESET>
</HTML>
```

Two buttons in the top control panel (Listing 16-28) let you print the whole frameset (in those browsers and OSes that support it) or just the lower frame. To print the entire frameset, the reference includes the parent window; to print the lower frame, the reference is directed at the `parent.display` frame.

Listing 16-28: **Printing Control**

```
<HTML>
<HEAD>
<TITLE>Print()</TITLE>
</HEAD>
<BODY>
<FORM>
<INPUT TYPE="button" NAME="printWhole" VALUE="Print Entire Frameset"
onClick="parent.print()"><P>
<INPUT TYPE="button" NAME="printFrame" VALUE="Print Bottom Frame Only"
onClick="parent.display.print()"><P>
</FORM>
</BODY>
</HTML>
```

If you don't like some facet of the printed output, blame the browser's print engine, and not JavaScript. The `print()` method merely invokes the browser's regular printing routines. Pages whose content is generated entirely by JavaScript print only in NN3+ and IE4+.

`prompt("`*`message`*`","`*`defaultReply`*`")`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The function that receives values from the prompt dialog box in Listing 16-29 (see the dialog box in Figure 16-13) does some data-entry validation (but certainly not enough for a commercial site). The function first checks to make sure that the returned value is neither `null` (Cancel) nor an empty string (the user clicked OK without entering any values). See Chapter 43 for more about data-entry validation.

Listing 16-29: **The Prompt Dialog Box**

```
<HTML>
<HEAD>
<TITLE>window.prompt() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function populateTable() {
    var howMany = prompt("Fill in table for how many factors?","")
    if (howMany != null && howMany != "") {
        alert("Filling the table for " + howMany) // for demo
        //statements that validate the entry and
        //actually populate the fields of the table
    }
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<!-- other statements that display and populate a large table -->
<INPUT TYPE="button" NAME="fill" VALUE="Fill Table..."
onClick="populateTable()">
</FORM>
</BODY>
</HTML>
```

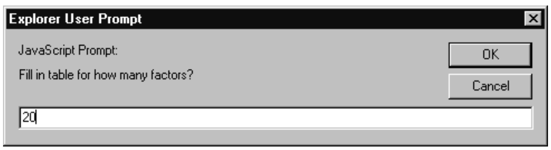

Figure 16-13: The prompt dialog box displayed from Listing 16-29 (Windows format)

Notice one important user interface element in Listing 16-29. Because clicking the button leads to a dialog box that requires more information from the user, the button's label ends in an ellipsis (or, rather, three periods acting as an ellipsis character). The ellipsis is a common courtesy to let users know that a user interface element leads to a dialog box of some sort. As in similar situations in Windows and Macintosh programs, the user should be able to cancel out of that dialog box and return to the same screen state that existed before the button was clicked.

resizeBy(*deltaX*,*deltaY*)
resizeTo(*outerwidth*,*outerheight*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

You can experiment with the resize methods with the page in Listing 16-30. Two parts of a form let you enter values for each method. The one for `window.resize()` also lets you enter a number of repetitions to better see the impact of the values. Enter zero and negative values to see how those affect the method. Also test the limits of different browsers.

Listing 16-30: **Window Resize Methods**

```
<HTML>
<HEAD>
<TITLE>Window Resize Methods</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doResizeBy(form) {
    var x = parseInt(form.resizeByX.value)
    var y = parseInt(form.resizeByY.value)
    var count = parseInt(form.count.value)
    for (var i = 0; i < count; i++) {
        window.resizeBy(x, y)
    }
}
function doResizeTo(form) {
    var x = parseInt(form.resizeToX.value)
    var y = parseInt(form.resizeToY.value)
    window.resizeTo(x, y)
}
</SCRIPT>
</HEAD>
<BODY>
<FORM>
<B>Enter the x and y increment, plus how many times the window should be resized
by these increments:</B><BR>
Horiz:<INPUT TYPE="text" NAME="resizeByX" SIZE=4>
Vert:<INPUT TYPE="text" NAME="resizeByY" SIZE=4>
How Many:<INPUT TYPE="text" NAME="count" SIZE=4>
```

Continued

Listing 16-30 *(continued)*

```
<INPUT TYPE="button" NAME="ResizeBy" VALUE="Show resizeBy()"
onClick="doResizeBy(this.form)">
<HR>
<B>Enter the desired width and height of the current window:</B><BR>
Width:<INPUT TYPE="text" NAME="resizeToX" SIZE=4>
Height:<INPUT TYPE="text" NAME="resizeToY" SIZE=4>
<INPUT TYPE="button" NAME="ResizeTo" VALUE="Show resizeTo()"
onClick="doResizeTo(this.form)">
</FORM>
</BODY>
</HTML>
```

`routeEvent(`*`event`*`)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

The `window.routeEvent()` method is used in the example for `window.captureEvents()`, Listing 16-21.

`scroll(`*`horizontalCoord, verticalCoord`*`)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

To demonstrate the `scroll()` method, Listing 16-31 defines a frameset with a document in the top frame (Listing 16-32) and a control panel in the bottom frame (Listing 16-33). A series of buttons and text fields in the control panel frame directs the scrolling of the document. I've selected an arbitrary, large GIF image to use in the example. To see results of some horizontal scrolling values, you may need to shrink the width of the browser window until a horizontal scrollbar appears in the top frame. If you substitute `scrollTo()` for the `scroll()` methods in Listing 16-33, the results will be the same, but you will need version browsers at a minimum to run it.

Listing 16-31: A Frameset for the scroll() Demonstration

```
<HTML>
<HEAD>
<TITLE>window.scroll() Method</TITLE>
</HEAD>

<FRAMESET ROWS="50%,50%">
    <FRAME SRC="lst16-32.htm" NAME="display">
    <FRAME SRC="lst16-33.htm" NAME="control">
</FRAMESET>
</HTML>
```

Listing 16-32: The Image to Be Scrolled

```
<HTML>
<HEAD>
<TITLE>Arch</TITLE>
</HEAD>

<BODY>
<H1>A Picture is Worth...</H1>
<HR>
<CENTER>
<TABLE BORDER=3>
<CAPTION ALIGN=bottom>A Splendid Arch</CAPTION>
<TD>
<IMG SRC="arch.gif">
</TD></TABLE></CENTER>
</BODY>
</HTML>
```

Listing 16-33: **Controls to Adjust Scrolling of the Upper Frame**

```
<HTML>
<HEAD>
<TITLE>Scroll Controller</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function scroll(x,y) {
    parent.frames[0].scroll(x,y)
}
function customScroll(form) {
    parent.frames[0].scroll(parseInt(form.x.value),parseInt(form.y.value))
}
</SCRIPT>
</HEAD>
<BODY>
<H2>Scroll Controller</H2>
<HR>
<FORM NAME="fixed">
Click on a scroll coordinate for the upper frame:<P>
<INPUT TYPE="button" VALUE="0,0" onClick="scroll(0,0)">
<INPUT TYPE="button" VALUE="0,100" onClick="scroll(0,100)">
<INPUT TYPE="button" VALUE="100,0" onClick="scroll(100,0)">
<P>
<INPUT TYPE="button" VALUE="-100,100" onClick="scroll(-100,100)">
<INPUT TYPE="button" VALUE="20,200" onClick="scroll(20,200)">
<INPUT TYPE="button" VALUE="1000,3000" onClick="scroll(1000,3000)">
</FORM>
<HR>
<FORM NAME="custom">
Enter a Horizontal
<INPUT TYPE="text" NAME="x" VALUE="0" SIZE=4>
and Vertical
<INPUT TYPE="text" NAME="y" VALUE="0" SIZE=4>
value.  Then
<INPUT TYPE="button" VALUE="click to scroll" onClick="customScroll(this.form)">
</FORM>
</BODY>
</HTML>
```

Notice that in the `customScroll()` function, JavaScript must convert the string values from the two text boxes to integers (with the `parseInt()` method) for the `scroll()` method to accept them. Nonnumeric data can produce very odd results. Also be aware that although this example shows how to adjust the scroll values in another frame, you can set such values in the same frame or window as the script, as well as in subwindows, provided that you use the correct object references to the window.

scrollBy(*deltaX*,*deltaY*)
scrollTo(*x*,*y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

To work with the `scrollTo()` method, you can use Listings 16-31 through 16-33 (the `window.scroll()` method) but substitute `window.scrollTo()` for `window.scroll()`. The results should be the same. For `scrollBy()`, the example starts with the frameset in Listing 16-34. It loads the same content document as the `window.scroll()` example (Listing 16-32), but the control panel (Listing 16-35) provides input to experiment with the `scrollBy()` method.

Listing 16-34: **Frameset for ScrollBy Controller**

```
<HTML>
<HEAD>
<TITLE>window.scrollBy() Method</TITLE>
</HEAD>

<FRAMESET ROWS="50%,50%">
    <FRAME SRC="lst16-32.htm" NAME="display">
    <FRAME SRC="lst16-35.htm" NAME="control">
</FRAMESET>
</HTML>
```

Notice in Listing 16-35 that all references to window properties and methods are directed to the `display` frame. String values retrieved from text fields are converted to number with the `parseInt()` global function.

Listing 16-35: **ScrollBy Controller**

```
<HTML>
<HEAD>
<TITLE>ScrollBy Controller</TITLE>
```

Continued

Listing 16-35 *(continued)*

```
<SCRIPT LANGUAGE="JavaScript1.2">
function page(direction) {
    var pixFrame = parent.display
    var deltaY = (pixFrame.innerHeight) ? pixFrame.innerHeight :
        pixFrame.document.body.scrollHeight
    if (direction == "up") {
        deltaY = -deltaY
    }
    parent.display.scrollBy(0, deltaY)
}
function customScroll(form) {
    parent.display.scrollBy(parseInt(form.x.value), parseInt(form.y.value))
}
</SCRIPT>
</HEAD>
<BODY>
<B>ScrollBy Controller</B>
<FORM NAME="custom">
Enter an Horizontal increment
<INPUT TYPE="text" NAME="x" VALUE="0" SIZE=4>
and Vertical
<INPUT TYPE="text" NAME="y" VALUE="0" SIZE=4>
value.<BR>Then
<INPUT TYPE="button" VALUE="click to scrollBy()"
onClick="customScroll(this.form)">
<HR>
<INPUT TYPE="button" VALUE="PageDown" onClick="page('down')">
<INPUT TYPE="button" VALUE="PageUp" onClick="page('up')">

</FORM>
</BODY>
</HTML>
```

setCursor("*cursorType*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) in NN6 to experiment with setting the cursor. After clicking the top text box in preparation for typing, roll the cursor to a location atop an empty spot on the page. Then enter the following statements one at a time into the top text box, and press Enter/Return:

```
setCursor("wait")
setCursor("spinning"
setCursor("move")
```

After evaluating each statement, roll the cursor around the page, and notice where the cursor reverts to its normal appearance.

setInterval("*expr*", *msecDelay* [, *language*]) setInterval(*funcRef*, *msecDelay* [, *funcarg1*, ..., *funcargn*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

The demonstration of the `setInterval()` method entails a two-framed environment. The framesetting document is shown in Listing 16-36.

Listing 16-36: **SetInterval() Demonstration Frameset**

```
<HTML>
<HEAD>
<TITLE>setInterval() Method</TITLE>
</HEAD>

<FRAMESET ROWS="50%,50%">
    <FRAME SRC="lst16-37.htm" NAME="control">
    <FRAME SRC="bofright.htm" NAME="display">
</FRAMESET>
</HTML>
```

In the top frame is a control panel with several buttons that control the automatic scrolling of the Bill of Rights text document in the bottom frame. Listing 16-37 shows the control panel document. Many functions here control the interval, scrolling jump size, and direction, and they demonstrate several aspects of applying `setInterval()`.

Notice that in the beginning the script establishes a number of global variables. Three of them are parameters that control the scrolling; the last one is for the ID value returned by the `setInterval()` method. The script needs that value to be a global value so that a separate function can halt the scrolling with the `clearInterval()` method.

All scrolling is performed by the `autoScroll()` function. For the sake of simplicity, all controlling parameters are global variables. In this application, placement of those values in global variables helps the page restart autoscrolling with the same parameters as it had when it last ran.

Listing 16-37: **setInterval() Control Panel**

```
<HTML>
<HEAD>
<TITLE>ScrollBy Controller</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
var scrollSpeed = 500
var scrollJump = 1
var scrollDirection = "down"
var intervalID

function autoScroll() {
    if (scrollDirection == "down") {
        scrollJump = Math.abs(scrollJump)
    } else if (scrollDirection == "up" && scrollJump > 0) {
        scrollJump = -scrollJump
    }
    parent.display.scrollBy(0, scrollJump)
    if (parent.display.pageYOffset <= 0) {
        clearInterval(intervalID)
    }
}

function reduceInterval() {
    stopScroll()
    scrollSpeed -= 200
    startScroll()
}
function increaseInterval() {
```

```
    stopScroll()
    scrollSpeed += 200
    startScroll()
}
function reduceJump() {
    scrollJump -= 2
}
function increaseJump() {
    scrollJump += 2
}
function swapDirection() {
    scrollDirection = (scrollDirection == "down") ? "up" : "down"
}
function startScroll() {
    parent.display.scrollBy(0, scrollJump)
    if (intervalID) {
        clearInterval(intervalID)
    }
    intervalID = setInterval("autoScroll()",scrollSpeed)
}
function stopScroll() {
    clearInterval(intervalID)
}
</SCRIPT>
</HEAD>
<BODY onLoad="startScroll()">
<B>AutoScroll by setInterval() Controller</B>
<FORM NAME="custom">
<INPUT TYPE="button" VALUE="Start Scrolling" onClick="startScroll()">
<INPUT TYPE="button" VALUE="Stop Scrolling" onClick="stopScroll()"><P>
<INPUT TYPE="button" VALUE="Shorter Time Interval" onClick="reduceInterval()">
<INPUT TYPE="button" VALUE="Longer Time Interval"
onClick="increaseInterval()"><P>
<INPUT TYPE="button" VALUE="Bigger Scroll Jumps" onClick="increaseJump()">
<INPUT TYPE="button" VALUE="Smaller Scroll Jumps" onClick="reduceJump()"><P>
<INPUT TYPE="button" VALUE="Change Direction" onClick="swapDirection()">

</FORM>
</BODY>
</HTML>
```

The `setInterval()` method is invoked inside the `startScroll()` function. This function initially "burps" the page by one `scrollJump` interval so that the test in `autoScroll()` for the page being scrolled all the way to the top doesn't halt a page from scrolling before it gets started. Notice, too, that the function checks for the existence of an interval ID. If one is there, it is cleared before the new one is set. This is crucial within the design of the example page, because repeated clicking of the Start Scrolling button triggers multiple interval timers inside the browser. Only the most recent one's ID would be stored in `intervalID`, allowing no way to clear the older ones. But this little side trip makes sure that only one interval timer is running. One of the global variables, `scrollSpeed`, is used to fill the delay parameter for `setInterval()`. To change this value on the fly, the script must stop the current interval process, change the `scrollSpeed` value, and start a new process.

The intensely repetitive nature of this application is nicely handled by the `setInterval()` method.

setTimeout("*expr*", *msecDelay*[, *language*]) setTimeout(*functionRef*, *msecDelay*[, *funcarg1*, ..., *funcargn*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

When you load the HTML page in Listing 16-38, it triggers the `updateTime()` function, which displays the time (in hh:mm am/pm format) in the statusbar. Instead of showing the seconds incrementing one by one (which may be distracting to someone trying to read the page), this function alternates the last character of the display between an asterisk and nothing, like a visual "heartbeat."

Listing 16-38: Display the Current Time

```
<HTML>
<HEAD>
<TITLE>Status Bar Clock</TITLE>
<SCRIPT LANGUAGE="JavaScript">
<!--
var flasher = false
// calculate current time, determine flasher state,
// and insert time into status bar every second
function updateTime() {
    var now = new Date()
    var theHour = now.getHours()
    var theMin = now.getMinutes()
    var theTime = "" + ((theHour > 12) ? theHour - 12 : theHour)
    theTime += ((theMin < 10) ? ":0" : ":") + theMin
    theTime  += (theHour >= 12) ? " pm" : " am"
    theTime += ((flasher) ? " " : "*")
```

```
    flasher = !flasher
    window.status = theTime
    // recursively call this function every second to keep timer going
    timerID = setTimeout("updateTime()",1000)
}
//-->
</SCRIPT>
</HEAD>

<BODY onLoad="updateTime()">
</BODY>
</HTML>
```

In this function, the `setTimeout()` method works in the following way: Once the current time (including the flasher status) appears in the statusbar, the function waits approximately one second (1,000 milliseconds) before calling the same function again. You don't have to clear the `timerID` value in this application because JavaScript does it for you every time the 1,000 milliseconds elapse.

A logical question to ask is whether this application should be using `setInterval()` instead of `setTimeout()`. This is a case in which either one does the job. To use `setInterval()` here would require that the interval process start outside of the `updateTime()` function, because you need only one process running that repeatedly calls `updateTime()`. It would be a cleaner implementation in that regard, instead of the tons of timeout processes spawned by Listing 16-38. On the other hand, the application would not run in any browsers before NN4 or IE4, as Listing 16-38 does.

To demonstrate passing parameters, you can modify the `updateTime()` function to add the number of times it gets invoked to the display in the statusbar. For that to work, the function must have a parameter variable so that it can catch a new value each time it is invoked by `setTimeout()`'s expression. For all browsers, the function would be modified as follows (unchanged lines are represented by the ellipsis):

```
function updateTime(i) {
    ...
    window.status = theTime + "  (" + i + ")"
    // pass updated counter value with next call to this function
    timerID = setTimeout("updateTime(" + i+1 + ")",1000)
}
```

If you were running this exclusively in NN4+, you could use its more convenient way of passing parameters to the function:

```
timerID = setTimeout(updateTime,1000, i+1)
```

In either case, the `onLoad` event handler would also have to be modified to get the ball rolling with an initial parameter:

```
onLoad = "updateTime(0)"
```

Caution

One warning about `setTimeout()` functions that dive into themselves as frequently as this one does: Each call eats up a bit more memory for the browser application in Navigator 2. If you let this clock run for a while, some browsers may encounter memory difficulties, depending on which operating system they're using. But considering the amount of time the typical user spends on Web pages (even if only 10 or 15 minutes), the function shouldn't present a problem. And any reloading invoked by the user (such as by resizing the window in Navigator 2) frees up memory once again.

showModalDialog("*URL*"[, *arguments*] [, *features*]) showModelessDialog("*URL*"[, *arguments*] [, *features*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							(✓)	✓	✓

Example

To demonstrate the two styles of dialog boxes, I have implemented the same functionality (setting some session visual preferences) for both modal and modeless dialog boxes. This tactic shows you how to pass data back and forth between the main page and both styles of dialog box windows.

The first example demonstrates how to use a modal dialog box. In the process, data is passed into the dialog box window and values are returned. Listing 16-39 is the HTML and scripting for the main page. A button's `onClick` event handler invokes a function that opens the modal dialog box. The dialog box's document (Listing 16-40) contains several form elements for entering a user name and selecting a few color styles for the main page. Data from the dialog is fashioned into an array to be sent back to the main window. That array is initially assigned to a local variable, `prefs`, as the dialog box closes. If the user cancels the dialog box, the returned value is an empty string, so nothing more in `getPrefsData()` executes. But when the user clicks OK, the array comes back. Each of the array items is read and assigned to its respective form value or style property. These values are also preserved in the global `currPrefs` array. This allows the settings to be sent to the modal dialog box (as the second parameter to `showModalDialog()`) the next time the dialog box is opened.

Listing 16-39: Main Page for showModalDialog()

```
<HTML>
<HEAD>
<TITLE>window.setModalDialog() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var currPrefs = new Array()
function getPrefsData() {
    var prefs = showModalDialog("lst16-40.htm", currPrefs,
        "dialogWidth:400px; dialogHeight:300px")
    if (prefs) {
        if (prefs["name"]) {
            document.all.firstName.innerText = prefs["name"]
            currPrefs["name"] = prefs["name"]
        }
        if (prefs["bgColor"]) {
            document.body.style.backgroundColor = prefs["bgColor"]
            currPrefs["bgColor"] = prefs["bgColor"]
        }
        if (prefs["textColor"]) {
            document.body.style.color = prefs["textColor"]
            currPrefs["textColor"] = prefs["textColor"]
        }
        if (prefs["h1Size"]) {
            document.all.welcomeHeader.style.fontSize = prefs["h1Size"]
            currPrefs["h1Size"] = prefs["h1Size"]
        }
    }
}
function init() {
    document.all.firstName.innerText = "friend"
}
</SCRIPT>

</HEAD>
<BODY BGCOLOR="#eeeeee" STYLE="margin:20px" onLoad="init()">
<H1>window.setModalDialog() Method</H1>
<HR>
<H2 ID="welcomeHeader">Welcome, <SPAN ID="firstName"> </SPAN>!</H2>
<HR>
<P>Use this button to set style preferences for this page:
<BUTTON ID="prefsButton" onClick="getPrefsData()">
Preferences
</BUTTON>
</BODY>
</HTML>
```

The dialog box's document, shown in Listing 16-40, is responsible for reading the incoming data (and setting the form elements accordingly) and assembling form data for return to the main window's script. Notice when you load the example that the TITLE element of the dialog box's document appears in the dialog box window's title bar.

When the page loads into the dialog box window, the `init()` function examines the `window.dialogArguments` property. If it has any data, the data is used to pre-set the form elements to mirror the current settings of the main page. A utility function, `setSelected()`, pre-selects the option of a SELECT element to match the current settings.

Buttons at the bottom of the page are explicitly positioned to be at the lower-right corner of the window. Each button invokes a function to do what is needed to close the dialog box. In the case of the OK button, the `handleOK()` function sets the `window.returnValue` property to the data that come back from the `getFormData()` function. This latter function reads the form element values and packages them in an array using the form elements' names as array indices. This helps keep everything straight back in the main window's script, which uses the index names, and is therefore not dependent upon the precise sequence of the form elements in the dialog box window.

Listing 16-40: **Document for the Modal Dialog**

```
<HTML>
<HEAD>
<TITLE>User Preferences</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// Close the dialog
function closeme() {
    window.close()
}

// Handle click of OK button
function handleOK() {
    window.returnValue = getFormData()
    closeme()
}

// Handle click of Cancel button
function handleCancel() {
    window.returnValue = ""
    closeme()
}
// Generic function converts form element name-value pairs
// into an array
```

```
function getFormData() {
    var form = document.prefs
    var returnedData = new Array()
    // Harvest values for each type of form element
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].type == "text") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else if (form.elements[i].type.indexOf("select") != -1) {
            returnedData[form.elements[i].name] =
            form.elements[i].options[form.elements[i].selectedIndex].value
        } else if (form.elements[i].type == "radio") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else if (form.elements[i].type == "checkbox") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else continue
    }
    return returnedData
}
// Initialize by setting form elements from passed data
function init() {
    if (window.dialogArguments) {
        var args = window.dialogArguments
        var form = document.prefs
        if (args["name"]) {
            form.name.value = args["name"]
        }
        if (args["bgColor"]) {
            setSelected(form.bgColor, args["bgColor"])
        }
        if (args["textColor"]) {
            setSelected(form.textColor, args["textColor"])
        }
        if (args["h1Size"]) {
            setSelected(form.h1Size, args["h1Size"])
        }
    }
}
// Utility function to set a SELECT element to one value
function setSelected(select, value) {
    for (var i = 0; i < select.options.length; i++) {
        if (select.options[i].value == value) {
            select.selectedIndex = i
            break
        }
    }
    return
}
// Utility function to accept a press of the
// Enter key in the text field as a click of OK
```

Continued

Listing 16-40 *(continued)*

```
function checkEnter() {
    if (window.event.keyCode == 13) {
        handleOK()
    }
}
</SCRIPT>
</HEAD>

<BODY BGCOLOR="#eeeeee" onLoad="init()">
<H2>Web Site Preferences</H2>
<HR>
<TABLE BORDER=0 CELLSPACING=2>
<FORM NAME="prefs" onSubmit="return false">
<TR>
<TD>Enter your first name:<INPUT NAME="name" TYPE="text" VALUE="" SIZE=20
onKeyDown="checkEnter()">
</TR>

<TR>
<TD>Select a background color:
<SELECT NAME="bgColor">
    <OPTION VALUE="beige">Beige
    <OPTION VALUE="antiquewhite">Antique White
    <OPTION VALUE="goldenrod">Goldenrod
    <OPTION VALUE="lime">Lime
    <OPTION VALUE="powderblue">Powder Blue
    <OPTION VALUE="slategray">Slate Gray
</SELECT>
</TR>

<TR>
<TD>Select a text color:
<SELECT NAME="textColor">
    <OPTION VALUE="black">Black
    <OPTION VALUE="white">White
    <OPTION VALUE="navy">Navy Blue
    <OPTION VALUE="darkorange">Dark Orange
    <OPTION VALUE="seagreen">Sea Green
    <OPTION VALUE="teal">Teal
</SELECT>
</TR>

<TR>
<TD>Select "Welcome" heading font point size:
<SELECT NAME="h1Size">
    <OPTION VALUE="12">12
    <OPTION VALUE="14">14
    <OPTION VALUE="18">18
```

```
    <OPTION VALUE="24">24
    <OPTION VALUE="32">32
    <OPTION VALUE="48">48
</SELECT>
</TR>
</TABLE>
</FORM>
<DIV STYLE="position:absolute; left:200px; top:220px">
<BUTTON STYLE="width:80px" onClick="handleOK()">OK</BUTTON>  
<BUTTON STYLE="width:80px" onClick="handleCancel()">Cancel</BUTTON>
</DIV>
</BODY>
</HTML>
```

One last convenience feature of the dialog box window is the `onKeyPress` event handler in the text box. The function it invokes looks for the Enter key. If that key is pressed while the box has focus, the same `handleOK()` function is invoked, as if the user had clicked the OK button. This feature makes the dialog box behave as if the OK button is an automatic default, just as "real" dialog boxes.

You should observe several important structural changes that were made to turn the modal approach into a modeless one. Listing 16-41 shows the version of the main window modified for use with a modeless dialog box. Another global variable, `prefsDlog`, is initialized to eventually store the reference to the modeless window returned by the `showModelessDialog()` method. The variable gets used to invoke the `init()` function inside the modeless dialog box, but also as conditions in an `if` construction surrounding the generation of the dialog box. The reason this is needed is to prevent multiple instances of the dialog box being created (the button is still alive while the modeless window is showing). The dialog box won't be created again as long as there is a value in `prefsDlog`, and the dialog box window has not been closed (picking up the `window.closed` property of the dialog box window).

The `showModelessDialog()` method's second parameter is a reference to the function in the main window that updates the main document. As you see in a moment, that function is invoked from the dialog box when the user clicks the OK or Apply buttons.

Listing 16-41: **Main Page for showModelessDialog()**

```
<HTML>
<HEAD>
<TITLE>window.setModelessDialog() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var currPrefs = new Array()
```

Continued

Listing 16-41 *(continued)*

```
var prefsDlog
function getPrefsData() {
    if (!prefsDlog || prefsDlog.closed) {
        prefsDlog = showModelessDialog("lst16-42.htm", setPrefs,
        "dialogWidth:400px; dialogHeight:300px")
        prefsDlog.init(currPrefs)
    }
}

function setPrefs(prefs) {
    if (prefs["bgColor"]) {
        document.body.style.backgroundColor = prefs["bgColor"]
        currPrefs["bgColor"] = prefs["bgColor"]
    }
    if (prefs["textColor"]) {
        document.body.style.color = prefs["textColor"]
        currPrefs["textColor"] = prefs["textColor"]
    }
    if (prefs["h1Size"]) {
        document.all.welcomeHeader.style.fontSize = prefs["h1Size"]
        currPrefs["h1Size"] = prefs["h1Size"]
    }
    if (prefs["name"]) {
        document.all.firstName.innerText = prefs["name"]
        currPrefs["name"] = prefs["name"]
    }
}

function init() {
    document.all.firstName.innerText = "friend"
}
</SCRIPT>

</HEAD>
<BODY BGCOLOR="#eeeeee" STYLE="margin:20px" onLoad="init()">
<H1>window.setModelessDialog() Method</H1>
<HR>
<H2 ID="welcomeHeader">Welcome, <SPAN ID="firstName"> </SPAN>!</H2>
<HR>
<P>Use this button to set style preferences for this page:
<BUTTON ID="prefsButton" onClick="getPrefsData()">
Preferences
</BUTTON>
</BODY>
</HTML>
```

Changes to the dialog box window document for a modeless version (Listing 16-42) are rather limited. A new button is added to the bottom of the screen for an Apply button. As in many dialog box windows you see in Microsoft products, the Apply button lets current settings in dialog boxes be applied to the current document but without closing the dialog box. This approach makes experimenting with settings easier.

The Apply button invokes a `handleApply()` function, which works the same as `handleOK()`, except the dialog box is not closed. But these two functions communicate back to the main window differently than a modal dialog box. The main window's processing function is passed as the second parameter of `showModelessDialog()` and is available as the `window.dialogArguments` property in the dialog box window's script. That function reference is assigned to a local variable in both functions, and the remote function is invoked, passing the results of the `getFormData()` function as parameter values back to the main window.

Listing 16-42: **Document for the Modeless Dialog Box**

```
<HTML>
<HEAD>
<TITLE>User Preferences</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// Close the dialog
function closeme() {
    window.close()
}

// Handle click of OK button
function handleOK() {
    var returnFunc = window.dialogArguments
    returnFunc(getFormData())
    closeme()
}

// Handle click of Apply button
function handleApply() {
    var returnFunc = window.dialogArguments
    returnFunc(getFormData())
}

// Handle click of Cancel button
function handleCancel() {
    window.returnValue = ""
    closeme()
}
// Generic function converts form element name-value pairs
// into an array
```

Continued

Listing 16-42 *(continued)*

```
function getFormData() {
    var form = document.prefs
    var returnedData = new Array()
    // Harvest values for each type of form element
    for (var i = 0; i < form.elements.length; i++) {
        if (form.elements[i].type == "text") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else if (form.elements[i].type.indexOf("select") != -1) {
            returnedData[form.elements[i].name] =
            form.elements[i].options[form.elements[i].selectedIndex].value
        } else if (form.elements[i].type == "radio") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else if (form.elements[i].type == "checkbox") {
            returnedData[form.elements[i].name] = form.elements[i].value
        } else continue
    }
    return returnedData
}
// Initialize by setting form elements from passed data
function init(currPrefs) {
    if (currPrefs) {
        var form = document.prefs
        if (currPrefs["name"]) {
            form.name.value = currPrefs["name"]
        }
        if (currPrefs["bgColor"]) {
            setSelected(form.bgColor, currPrefs["bgColor"])
        }
        if (currPrefs["textColor"]) {
            setSelected(form.textColor, currPrefs["textColor"])
        }
        if (currPrefs["h1Size"]) {
            setSelected(form.h1Size, currPrefs["h1Size"])
        }
    }
}
// Utility function to set a SELECT element to one value
function setSelected(select, value) {
    for (var i = 0; i < select.options.length; i++) {
        if (select.options[i].value == value) {
            select.selectedIndex = i
            break
        }
    }
    return
}
```

```
// Utility function to accept a press of the
// Enter key in the text field as a click of OK
function checkEnter() {
    if (window.event.keyCode == 13) {
        handleOK()
    }
}
</SCRIPT>
</HEAD>

<BODY BGCOLOR="#eeeeee" onLoad="init()">
<H2>Web Site Preferences</H2>
<HR>
<TABLE BORDER=0 CELLSPACING=2>
<FORM NAME="prefs" onSubmit="return false">
<TR>
<TD>Enter your first name:<INPUT NAME="name" TYPE="text" VALUE="" SIZE=20
onKeyDown="checkEnter()">
</TR>

<TR>
<TD>Select a background color:
<SELECT NAME="bgColor">
    <OPTION VALUE="beige">Beige
    <OPTION VALUE="antiquewhite">Antique White
    <OPTION VALUE="goldenrod">Goldenrod
    <OPTION VALUE="lime">Lime
    <OPTION VALUE="powderblue">Powder Blue
    <OPTION VALUE="slategray">Slate Gray
</SELECT>
</TR>

<TR>
<TD>Select a text color:
<SELECT NAME="textColor">
    <OPTION VALUE="black">Black
    <OPTION VALUE="white">White
    <OPTION VALUE="navy">Navy Blue
    <OPTION VALUE="darkorange">Dark Orange
    <OPTION VALUE="seagreen">Sea Green
    <OPTION VALUE="teal">Teal
</SELECT>
</TR>

<TR>
<TD>Select "Welcome" heading font point size:
<SELECT NAME="h1Size">
    <OPTION VALUE="12">12
    <OPTION VALUE="14">14
```

Continued

Listing 16-42 *(continued)*

```
    <OPTION VALUE="18">18
    <OPTION VALUE="24">24
    <OPTION VALUE="32">32
    <OPTION VALUE="48">48
</SELECT>
</TR>
</TABLE>
</FORM>
<DIV STYLE="position:absolute; left:120px; top:220px">
<BUTTON STYLE="width:80px" onClick="handleOK()">OK</BUTTON>  
<BUTTON STYLE="width:80px" onClick="handleCancel()">Cancel</BUTTON>  
<BUTTON STYLE="width:80px" onClick="handleApply()">Apply</BUTTON>
</DIV>
</BODY>
</HTML>
```

The biggest design challenge you probably face with respect to these windows is deciding between a modal and modeless dialog box style. Some designers insist that modality has no place in a graphical user interface; others say that there are times when you need to focus the user on a very specific task before any further processing can take place. That's where a modal dialog box makes perfect sense.

sizeToContent()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) in NN6 to try the `sizeToContent()` method. Assuming that you are running The Evaluator from the `Chap13` directory on the CD-ROM (or the directory copied as-is to your hard disk), you can open a subwindow with one of the other files in the directory, and then size the subwindow. Enter the following statements into the top text box:

```
a = window.open("lst13-02.htm","")
a.sizeToContent()
```

The resized subwindow is at the minimum recommended width for a browser window, and at a height tall enough to display the little bit of content in the document.

Event handlers

onAfterPrint
onBeforePrint

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

The following script fragment assumes that the page includes a DIV element whose style sheet includes a setting of `display:none` as the page loads. Somewhere in the Head, the print-related event handlers are set as properties:

```
function showPrintCopyright() {
    document.all.printCopyright.style.display = "block"
}
function hidePrintCopyright() {
    document.all.printCopyright.style.display = "none"
}
window.onbeforeprint = showPrintCopyright
window.onafterprint = hidePrintCopyright
```

onBeforeUnload

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The simple page in Listing 16-43 shows you how to give the user a chance to stay on the page.

Listing 16-43: Using the onBeforeUnload Event Handler

```
<HTML>
<HEAD>
<TITLE>onBeforeUnload Event Handler</TITLE>
```

Continued

Listing 16-43 *(continued)*

```
<SCRIPT LANGUAGE="JavaScript">
function verifyClose() {
    event.returnValue = "We really like you and hope you will stay longer."
}
window.onbeforeunload = verifyClose
</SCRIPT>

</HEAD>
<BODY>
<H1>onBeforeUnload Event Handler</H1>
<HR>
<P>Use this button to navigate to the previous page:
<BUTTON ID="go" onClick="history.back()">
Go Back
</BUTTON>
</BODY>
</HTML>
```

onHelp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The following script fragment can be embedded in the IE5-only modeless dialog box code in Listing 16-44 to provide context-sensitive help within the dialog box. Help messages for only two of the form elements are shown here, but in a real application you add messages for the rest.

```
function showHelp() {
    switch (event.srcElement.name) {
        case "bgColor" :
            alert("Choose a color for the main window\'s background.")
            break
        case "name" :
            alert("Enter your first name for a friendly greeting.")
            break
        default :
            alert("Make preference settings for the main page styles.")
    }
```

```
    event.returnValue = false
}
window.onhelp = showHelp
```

Because this page's help focuses on form elements, the `switch` construction cases are based on the `name` properties of the form elements. For other kinds of pages, the `id` properties may be more appropriate.

FRAME Element Object

Properties

borderColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Although you may experience problems (especially in IE5) changing the color of a single frame border, the W3C DOM syntax would look like the following if the script were inside the framesetting document:

```
document.getElementById("contentsFrame").borderColor = "red"
```

The IE-only version would be:

```
document.all["contentsFrame"].borderColor = "red"
```

These examples assume the frame name arrives to a script function as a string. If the script is executing in one of the frames of the frameset, add a reference to `parent` in the preceding statements.

contentDocument

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

A framesetting document script might be using the ID of a FRAME element to read or adjust one of the element properties, and then need to perform some action on the content of the page through its `document` object. You can get the reference to the `document` object via a statement, such as the following:

```
var doc = document.getElementById("FRAME3").contentDocument
```

Then your script can, for example, dive into a form in the document:

```
var val = doc.mainForm.entry.value
```

Document

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

While you have far easier ways to reach the `document` object of another frame (`parent.otherFrameName.document`), the following statement takes the long way to get there to retrieve the number of forms in the document of another frame:

```
var formCount = parent.document.all.contentsFrame.Document.forms.length
```

Using the `Document` property only truly makes sense when a function is passed a FRAME or IFRAME element object reference as a parameter, and the script must, among other things more related to those objects, access the document contained by those elements.

frameBorder

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The default value for the `frameBorder` property is `yes`. You can use this setting to create a toggle script (which, unfortunately, does not change the appearance in IE). The W3C-compatible version looks like the following:

```
function toggleFrameScroll(frameID) {
    var theFrame = document.getElementById(frameID)
    if (theFrame.frameBorder == "yes") {
        theFrame.frameBorder = "no"
    } else {
        theFrame.frameBorder    = "yes"
    }
}
```

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The following fragment assumes a frameset defined with two frames set up as two columns within the frameset. The statements here live in the framesetting document. They retrieve the current width of the left frame and increase the width of that frame by ten percent. Syntax shown here is for the W3C DOM, but can be easily adapted to IE-only terminology.

```
var frameWidth = document.getElementById("leftFrame").width
document.getElementById("mainFrameset").cols = (Math.round(frameWidth * 1.1)) +
",*"
```

Notice how the numeric value of the existing frame width is first increased by ten percent and then concatenated to the rest of the string property assigned to the frameset's `cols` property. The asterisk after the comma means that the browser should figure out the remaining width and assign it to the right-hand frame.

noResize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement turns off the ability for a frame to be resized:

```
parent.document.getElementById("myFrame1").noResize = true
```

Because of the negative nature of the property name, it may be difficult to keep the logic straight (setting `noResize` to `true` means that resizability is turned off). Keep a watchful eye on your Boolean values.

scrolling

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 16-45 produces a frameset consisting of eight frames. The content for the frames is generated by a script within the frameset (via the `fillFrame()` function). Event handlers in the Body of each frame invoke the `toggleFrameScroll()` function. Both ways of referencing the FRAME element object are shown, with the IE-only version commented out.

In the `toggleFrameScroll()` function, the `if` condition checks whether the property is set to something other than `no`. This allows the condition to evaluate to `true` if the property is set to either `auto` (the first time) or `yes` (as set by the function). Note that the scrollbars don't disappear from the frames in IE5.5 or NN6.

Listing 16-45: Controlling the FRAME.scrolling Property

```
<HTML>
<HEAD>
<TITLE>frame.scrolling Property</TITLE>
</HEAD>
<SCRIPT LANGUAGE="JavaScript">
function toggleFrameScroll(frameID) {
    // IE5 & NN6 version
    var theFrame = document.getElementById(frameID)
    // IE4+ version
    // var theFrame = document.all[frameID]

    if (theFrame.scrolling != "no") {
        theFrame.scrolling = "no"
```

```
    } else {
        theFrame.scrolling = "yes"
    }
}
// generate content for each frame
function fillFrame(frameID) {
    var page = "<HTML><BODY onClick='parent.toggleFrameScroll(\"" +
        frameID + "\")'><SPAN STYLE='font-size:24pt'>"
    page += "<P>This frame has the ID of:</P><P>" + frameID + ".</P>"
    page += "</SPAN></BODY></HTML>"
    return page
}
</SCRIPT>
<FRAMESET ID="outerFrameset" COLS="50%,50%">
    <FRAMESET ID="innerFrameset1" ROWS="25%,25%,25%,25%">
        <FRAME ID="myFrame1" SRC="javascript:parent.fillFrame('myFrame1')">
        <FRAME ID="myFrame2" SRC="javascript:parent.fillFrame('myFrame2')">
        <FRAME ID="myFrame3" SRC="javascript:parent.fillFrame('myFrame3')">
        <FRAME ID="myFrame4" SRC="javascript:parent.fillFrame('myFrame4')">
    </FRAMESET>
    <FRAMESET ID="innerFrameset2" ROWS="25%,25%,25%,25%">
        <FRAME ID="myFrame5" SRC="javascript:parent.fillFrame('myFrame5')">
        <FRAME ID="myFrame6" SRC="javascript:parent.fillFrame('myFrame6')">
        <FRAME ID="myFrame7" SRC="javascript:parent.fillFrame('myFrame7')">
        <FRAME ID="myFrame8" SRC="javascript:parent.fillFrame('myFrame8')">
    </FRAMESET>
</FRAMESET>
</HTML>
```

src

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

For best results, use fully formed URLs as value for the `src` property, as shown here:

```
parent.document.getElementById("mainFrame").src = "http://www.dannyg.com"
```

Relative URLs and `javascript:` pseudo-URLs will also work most of the time.

FRAMESET Element Object

Properties

border

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Even though the property is read/write in IE4+, changing the value does not change the thickness of the border you see in the browser. If you need to find the thickness of the border, a script reference from one of the frame's documents would look like the following:

```
var thickness = parent.document.all.outerFrameset.border
```

borderColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To retrieve the current color setting in a frameset, a script reference from one of the frame's documents would look like the following:

```
var borderColor = parent.document.all.outerFrameset.borderColor
```

cols
rows

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listings 16-46 through 16-48 show the HTML for a frameset and two of the three documents that go into the frameset. The final document is an HTML version of the U.S. Bill of Rights, which is serving here as a content frame for the demonstration.

The frameset listing (16-46) shows a three-frame setup. Down the left column is a table of contents (16-47). The right column is divided into two rows. In the top row is a simple control (16-48) that hides and shows the table of contents frame. As the user clicks the hot text of the control (located inside a SPAN element), the `onClick` event handler invokes the `toggleTOC()` function in the frameset.

Syntax used in this example is W3C-compatible. To modify this for IE-only, you replace `document.getElementById("outerFrameset")` with `document.all.outerFrameset` and `elem.firstChild.nodeValue` to `elem.innerText`. You can also branch within the scripts to accommodate both styles.

Listing 16-46: **Frameset and Script for Hiding/Showing a Frame**

```
<HTML>
<HEAD>
<TITLE>Hide/Show Frame Example</TITLE>
</HEAD>
<SCRIPT LANGUAGE="JavaScript">
var origCols
function toggleTOC(elem, frm) {
    if (origCols) {
        showTOC(elem)
    } else {
        hideTOC(elem, frm)
    }
}
function hideTOC(elem, frm) {
    var frameset = document.getElementById("outerFrameset")
    origCols = frameset.cols
    frameset.cols = "0,*"
}
function showTOC(elem) {
    if (origCols) {
        document.getElementById("outerFrameset").cols = origCols
        origCols = null
    }
}
</SCRIPT>
```

Continued

Listing 16-46 *(continued)*

```
<FRAMESET ID="outerFrameset" FRAMEBORDER="no" COLS="150,*">
    <FRAME ID="TOC" NAME="TOCFrame" SRC="lst16-47.htm">
    <FRAMESET ID="innerFrameset1" ROWS="80,*">
        <FRAME ID="controls" NAME="controlsFrame" SRC="lst16-48.htm">
        <FRAME ID="content" NAME="contentFrame" SRC="bofright.htm">
    </FRAMESET>
</FRAMESET>
</HTML>
```

When a user clicks the hot spot to hide the frame, the script copies the original `cols` property settings to a global variable. The variable is used in `showTOC()` to restore the frameset to its original proportions. This allows a designer to modify the HTML for the frameset without also having to dig into scripts to hard-wire the restored size.

Listing 16-47: **Table of Contents Frame Content**

```
<HTML>
<HEAD>
<TITLE>Table of Contents</TITLE>
</HEAD>
<BODY BGCOLOR="#eeeeee">
<H3>Table of Contents</H3>
<HR>
<UL STYLE="font-size:10pt">
<LI><A HREF="bofright.htm#article1" TARGET="contentFrame">Article I</A></LI>
<LI><A HREF="bofright.htm#article2" TARGET="contentFrame">Article II</A></LI>
<LI><A HREF="bofright.htm#article3" TARGET="contentFrame">Article III</A></LI>
<LI><A HREF="bofright.htm#article4" TARGET="contentFrame">Article IV</A></LI>
<LI><A HREF="bofright.htm#article5" TARGET="contentFrame">Article V</A></LI>
<LI><A HREF="bofright.htm#article6" TARGET="contentFrame">Article VI</A></LI>
<LI><A HREF="bofright.htm#article7" TARGET="contentFrame">Article VII</A></LI>
<LI><A HREF="bofright.htm#article8" TARGET="contentFrame">Article VIII</A></LI>
<LI><A HREF="bofright.htm#article9" TARGET="contentFrame">Article IX</A></LI>
<LI><A HREF="bofright.htm#article10" TARGET="contentFrame">Article X</A></LI>
</UL>
</BODY>
</HTML>
```

Listing 16-48: Control Panel Frame

```
<HTML>
<HEAD>
<TITLE>Control Panel</TITLE>
</HEAD>
<BODY>
<P>
<SPAN ID="tocToggle"
      STYLE="text-decoration:underline; cursor:hand"
      onClick="parent.toggleTOC(this)"> &lt;&lt;Hide/Show&gt;&gt;</SPAN>
Table of Contents
</P>
</BODY>
</HTML>
```

frameBorder

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The default value for the `frameBorder` property is `yes`. You can use this setting to create a toggle script (which, unfortunately, does not change the appearance in IE). The IE4+-compatible version looks like the following:

```
function toggleFrameScroll(framesetID) {
    var theFrameset = document.all(framesetID)
    if (theFrameset.frameBorder == "yes") {
        theFrameset.frameBorder = "no"
    } else {
        theFrameset.frameBorder = "yes"
    }
}
```

frameSpacing

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Even though the property is read/write in IE4+, changing the value does not change the thickness of the frame spacing you see in the browser. If you need to find the spacing as set by the tag's attribute, a script reference from one of the frame's documents would look like the following:

```
var spacing = parent.document.all.outerFrameset.frameSpacing
```

IFRAME Element Object

Properties

align

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The default setting for an IFRAME alignment is `baseline`. A script can shift the IFRAME to be flush with the right edge of the containing element as follows:

```
document.getElementById("iframe1").align = "right"
```

contentDocument

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

A document script might be using the ID of an IFRAME element to read or adjust one of the element properties; it then needs to perform some action on the content of the page through its `document` object. You can get the reference to the `document` object via a statement, such as the following:

```
var doc = document.getElementById("FRAME3").contentDocument
```

Then your script can, for example, dive into a form in the document:

```
var val = doc.mainForm.entry.value
```

frameBorder

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See the example for the `FRAME.frameBorder` property earlier in this chapter.

hspace
vspace

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The following fragment sets the white space surrounding an IFRAME element to an equal amount:

```
document.all.myIframe.hspace = 20
document.all.myIframe.vspace = 20
```

Unfortunately these changes do not work for IE5/Windows.

scrolling

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following `toggleIFrameScroll()` function accepts a string of the IFRAME element's ID as a parameter and switches between on and off scroll bars in the

IFRAME. The `if` condition checks whether the property is set to something other than `no`. This test allows the condition to evaluate to true `if` the property is set to either `auto` (the first time) or `yes` (as set by the function).

```
function toggleFrameScroll(frameID) {
    // IE5 & NN6 version
    var theFrame = document.getElementById(frameID)
    // IE4+ version
    // var theFrame = document.all[frameID]
    if (theFrame.scrolling != "no") {
        theFrame.scrolling = "no"
    } else {
        theFrame.scrolling = "yes"
    }
}
```

src

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

For best results, use fully formed URLs as value for the `src` property, as shown here:

```
document.getElementById("myIframe").src = "http://www.dannyg.com"
```

Relative URLs and `javascript:` pseudo-URLs also work most of the time.

popup Object

Properties

document

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with the `popup` object and its properties. Enter the following statements into the top text box. The first statement creates a pop-up window, whose reference is assigned to the `a` global variable. Next, a reference to the body of the pop-up's document is preserved in the `b` variable for the sake of convenience. Further statements work with thest two variables.

```
a = window.createPopup()
b = a.document.body
b.style.border = "solid 2px black"
b.style.padding = "5px"
b.innerHTML = "<P>Here is some text in a popup window</P>"
a.show(200,100, 200, 50, document.body)
```

See the description of the `show()` method for details on the parameters.

isOpen

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Use The Evaluator (Chapter 13) to experiment with the `isOpen` property. Enter the following statements into the top text box. The sequence begins with a creation of a simple pop-up window, whose reference is assigned to the `a` global variable. Note that the final statement is actually two statements, designed so that the second statement executes while the pop-up window is still open.

```
a = window.createPopup()
a.document.body.innerHTML = "<P>Here is a popup window</P>"
a.show(200,100, 200, 50, document.body); alert("Popup is open:" + a.isOpen)
```

If you then click into the main window to hide the pop-up, you will see a different result if you enter the following statement into the top text box by itself:

```
alert("Popup is open:" + a.isOpen)
```

Methods

hide()
show(*left*, *top*, *width*, *height* [, *positioningElementRef*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

Listing 16-49 demonstrates both the `show()` and `hide()` methods for a `popup` object. A click of the button on the page invokes the `selfTimer()` function, which acts as the main routine for this page. The goal is to produce a pop-up window that "self-destructs" five seconds after it appears. Along the way, a message in the pop-up counts down the seconds.

A reference to the pop-up window is preserved as a global variable, called `popup`. After the `popup` object is created, the `initContent()` function stuffs the content into the pop-up by way of assigning `style` properties and some `innerHTML` for the body of the document that is automatically created when the pop-up is generated. A SPAN element is defined so that another function later on can modify the content of just that segment of text in the pop-up. Notice that the assignment of content to the pop-up is predicated on the pop-up window having been initialized (by virtue of the `popup` variable having a value assigned to it) and that the pop-up window is not showing. While invoking `initContent()` under any other circumstances is probably impossible, the validation of the desired conditions is good programming practice.

Back in `selfTimer()`, the `popup` object is displayed. Defining the desired size requires some trial and error to make sure the pop-up window comfortably accommodates the text that is put into the pop-up in the `initContent()` function.

With the pop-up window showing, now is the time to invoke the `countDown()` function. Before the function performs any action, it validates that the pop-up has been initialized and is still visible. If a user clicks the main window while the counter is counting down, this changes the value of the `isOpen` property to `false`, and nothing inside the `if` condition executes.

This `countDown()` function grabs the inner text of the SPAN and uses `paresInt()` to extract just the integer number (using base 10 numbering, because we're dealing with zero-leading numbers that can potentially be regarded as octal values). The condition of the `if` construction decreases the retrieved integer by one. If the decremented value is zero, then the time is up, and the pop-up window is hidden with the `popup` global variable returned to its original, `null` value. But if the value is other than zero, then the inner text of the SPAN is set to the decremented value (with a leading zero), and the `setTimeout()` method is called upon to reinvoke the `countDown()` function in one second (1000 milliseconds).

Listing 16-49: **Hiding and Showing a Pop-up**

```
<HTML>
<HEAD>
<TITLE>popup Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var popup
function initContent() {
    if (popup && !popup.isOpen) {
        var popBody = popup.document.body
        popBody.style.border = "solid 3px red"
        popBody.style.padding = "10px"
        popBody.style.fontSize = "24pt"
        popBody.style.textAlign = "center"
        var bodyText = "<P>This popup will self-destruct in "
        bodyText += "<SPAN ID='counter'>05</SPAN>"
        bodyText += " seconds...</P>"
        popBody.innerHTML = bodyText
    }
}
function countDown() {
    if (popup && popup.isOpen) {
        var currCount = parseInt(popup.document.all.counter.innerText, 10)
        if (--currCount == 0) {
            popup.hide()
            popup = null
        } else {
            popup.document.all.counter.innerText = "0" + currCount
            setTimeout("countDown()", 1000)
        }
    }
}
function selfTimer() {
    popup = window.createPopup()
    initContent()
    popup.show(200,200,400,100,document.body)
    setTimeout("countDown()", 1000)
}
</SCRIPT>
</HEAD>
<BODY>
```

Continued

Listing 16-49 *(continued)*

```
<FORM>
<INPUT TYPE="button" VALUE="Impossible Mission" onClick="selfTimer()">
</FORM>
</BODY>
</HTML>
```

The `hide()` method here is invoked by a script that is running while the pop-up window is showing. Because a pop-up window automatically goes away if a user clicks the main window, it is highly unlikely that the `hide()` method would ever be invoked by itself in response to user action in the main window. If you want a script in the pop-up window to close the pop-up, use `parentWindow.close()`.

Chapter 17 Examples

The following sections contain examples from Chapter 17, "Location and History Objects."

Location Object

Properties

hash

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

When you load the script in Listing 17-1, adjust the size of the browser window so only one section is visible at a time. When you click a button, its script navigates to the next logical section in the progression and eventually takes you back to the top.

Listing 17-1: A Document with Anchors

```
<HTML>
<HEAD>
<TITLE>location.hash Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function goNextAnchor(where) {
    window.location.hash = where
}
</SCRIPT>
</HEAD>

<BODY>

<A NAME="start"><H1>Top</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec1')">
</FORM>
<HR>
<A NAME="sec1"><H1>Section 1</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec2')">
</FORM>
<HR>
<A NAME="sec2"><H1>Section 2</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec3')">
</FORM>
<HR>
<A NAME="sec3"><H1>Section 3</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="BACK TO TOP"
onClick="goNextAnchor('start')">
</FORM>

</BODY>
</HTML>
```

Anchor names are passed as parameters with each button's `onClick` event handler. Instead of going through the work of assembling a `window.location` value in the function by appending a literal hash mark and the value for the anchor, here I simply modify the `hash` property of the current window's location. This is the preferred, cleaner method.

If you attempt to read back the `window.location.hash` property in an added line of script, however, the window's actual URL probably will not have been updated yet, and the browser will appear to be giving your script false information. To prevent this problem in subsequent statements of the same function, construct the URLs of those statements from the same variable values you use to set the `window.location.hash` property — don't rely on the browser to give you the values you expect.

host

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Use the documents in Listings 17-2 through 17-4 as tools to help you learn the values that the various `window.location` properties return. In the browser, open the file for Listing 17-2. This file creates a two-frame window. The left frame contains a temporary placeholder (Listing 17-4) that displays some instructions. The right frame has a document (Listing 17-3) that enables you to load URLs into the left frame and get readings on three different windows available: the parent window (which creates the multiframe window), the left frame, and the right frame.

Listing 17-2: Frameset for the Property Picker

```
<HTML>
<HEAD>
<TITLE>window.location Properties</TITLE>
</HEAD>
<FRAMESET COLS="50%,50%" BORDER=1 BORDERCOLOR="black">
    <FRAME NAME="Frame1" SRC="lst17-04.htm">
    <FRAME NAME="Frame2" SRC="lst17-03.htm">
</FRAMESET>
</HTML>
```

Listing 17-3: Property Picker

```
<HTML>
<HEAD>
<TITLE>Property Picker</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var isNav4 = (navigator.appName == "Netscape" && navigator.appVersion.charAt(0)
>= 4) ? true : false
```

```
function fillLeftFrame() {
    newURL = prompt("Enter the URL of a document to show in the left frame:","")
    if (newURL != null && newURL != "") {
    parent.frames[0].location = newURL
    }
}

function showLocationData(form) {
    for (var i = 0; i <3; i++) {
        if (form.whichFrame[i].checked) {
            var windName = form.whichFrame[i].value
            break
        }
    }
    var theWind = "" + windName + ".location"
    if (isNav4) {
      netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserRead")
    }
    var theObj = eval(theWind)
    form.windName.value = windName
    form.windHash.value = theObj.hash
    form.windHost.value = theObj.host
    form.windHostname.value = theObj.hostname
    form.windHref.value = theObj.href
    form.windPath.value = theObj.pathname
    form.windPort.value = theObj.port
    form.windProtocol.value = theObj.protocol
    form.windSearch.value = theObj.search
    if (isNav4) {
      netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserRead")
    }
}
</SCRIPT>
</HEAD>
<BODY>
Click the "Open URL" button to enter the location of an HTML document to display
in the left frame of this window.
<FORM>
<INPUT TYPE="button" NAME="opener" VALUE="Open URL..."
onClick="fillLeftFrame()">
<HR>
<CENTER>
Select a window/frame. Then click the "Show Location Properties" button to view
each window.location property value for the desired window.<P>
<INPUT TYPE="radio" NAME="whichFrame" VALUE="parent" CHECKED>Parent window
<INPUT TYPE="radio" NAME="whichFrame" VALUE="parent.frames[0]">Left frame
<INPUT TYPE="radio" NAME="whichFrame" VALUE="parent.frames[1]">This frame
<P>
<INPUT TYPE="button" NAME="getProperties" VALUE="Show Location Properties"
onClick="showLocationData(this.form)">
```

Continued

Listing 17-3 *(continued)*

```
<INPUT TYPE="reset" VALUE="Clear"><P>
<TABLE BORDER=2>
<TR><TD ALIGN=right>Window:</TD><TD><INPUT TYPE="text" NAME="windName"
SIZE=30></TD></TR>
<TR><TD ALIGN=right>hash:</TD>
<TD><INPUT TYPE="text" NAME="windHash" SIZE=30></TD></TR>

<TR><TD ALIGN=right>host:</TD>
<TD><INPUT TYPE="text" NAME="windHost" SIZE=30></TD></TR>

<TR><TD ALIGN=right>hostname:</TD>
<TD><INPUT TYPE="text" NAME="windHostname" SIZE=30></TD></TR>

<TR><TD ALIGN=right>href:</TD>
<TD><TEXTAREA NAME="windHref" ROWS=3 COLS=30 WRAP="soft">
</TEXTAREA></TD></TR>

<TR><TD ALIGN=right>pathname:</TD>
<TD><TEXTAREA NAME="windPath" ROWS=3 COLS=30 WRAP="soft">
</TEXTAREA></TD></TR>

<TR><TD ALIGN=right>port:</TD>
<TD><INPUT TYPE="text" NAME="windPort" SIZE=30></TD></TR>

<TR><TD ALIGN=right>protocol:</TD>
<TD><INPUT TYPE="text" NAME="windProtocol" SIZE=30></TD></TR>

<TR><TD ALIGN=right>search:</TD>
<TD><TEXTAREA NAME="windSearch" ROWS=3 COLS=30 WRAP="soft">
</TEXTAREA></TD></TR>
</TABLE>
</CENTER>
</FORM>
</BODY>
</HTML>
```

Listing 17-4: **Placeholder Document for Listing 17-2**

```
<HTML>
<HEAD>
<TITLE>Opening Placeholder</TITLE>
</HEAD>
<BODY>
```

```
Initial placeholder. Experiment with other URLs for this frame (see right).
</BODY>
</HTML>
```

Figure 17-1 shows the dual-frame browser window with the left frame loaded with a page from my Web site.

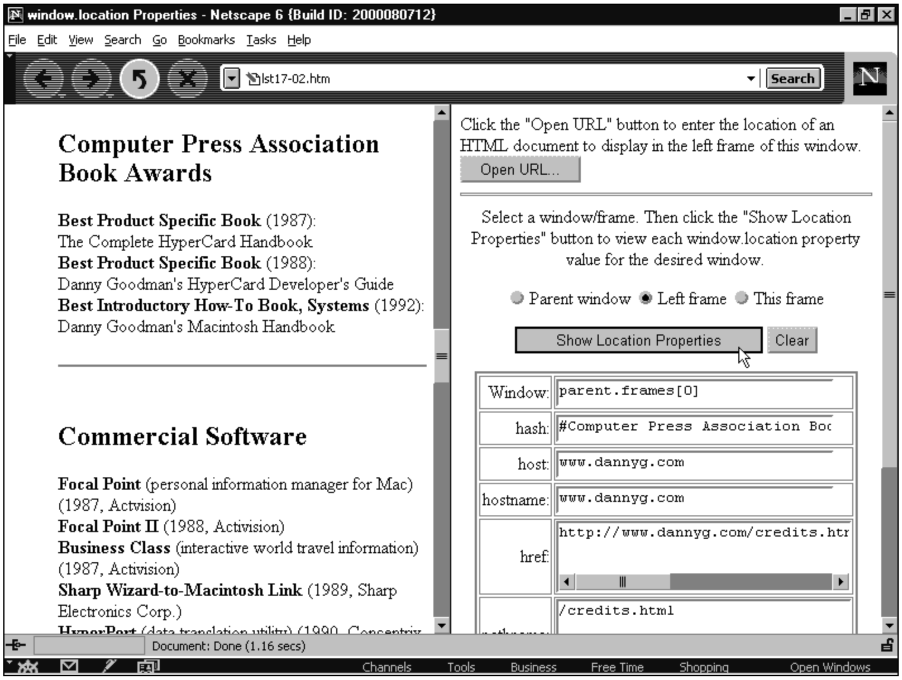

Figure 17-1: Browser window loaded to investigate window.location properties

For the best results, open a URL to a Web document on the network from the same domain and server from which you load the listings (perhaps your local hard disk). If possible, load a document that includes anchor points to navigate through a long document. Click the Left frame radio button, and then click the button that shows all properties. This action fills the table in the right frame with all the available `location` properties for the selected window. Figure 17-2 shows the complete results for a page from my Web site that is set to an anchor point.

Attempts to retrieve these properties from URLs outside of your domain and server result in a variety of responses based on your browser and browser version. NN2 returns `null` values for all properties. NN3 presents an “access disallowed” security alert. With codebase principals turned on in NN4 (see Chapter 46), the proper values appear in their fields. IE3 does not have the same security restrictions that Navigator does, so all values appear in their fields. But in IE4+, you get a "permission denied" error alert. See the following discussion for the meanings of the other listed properties and instructions on viewing their values.

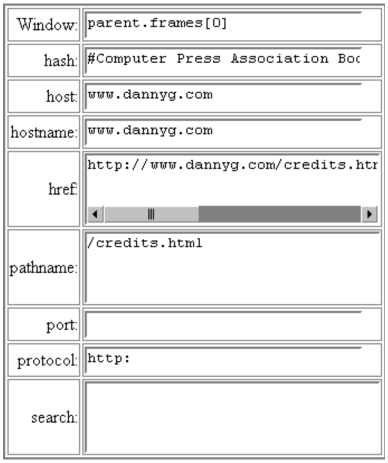

Figure 17-2: Readout of all window.location properties for the left frame

hostname

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listings 17-2 through 17-4 earlier in this chapter for a set of related pages to help you view the hostname data for a variety of other pages.

href

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 17-5 includes the `unescape()` function in front of the part of the script that captures the URL. This function serves cosmetic purposes by displaying the pathname in alert dialog boxes for browsers that normally display the ASCII-encoded version.

Listing 17-5: Extracting the Directory of the Current Document

```
<HTML>
<HEAD>
<TITLE>Extract pathname</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// general purpose function to extract URL of current directory
function getDirPath(URL) {
    var result = unescape(URL.substring(0,(URL.lastIndexOf("/")) + 1))
    return result
}
// handle button event, passing work onto general purpose function
function showDirPath(URL) {
    alert(getDirPath(URL))
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="button" VALUE="View directory URL"
onClick="showDirPath(window.location.href)">
</FORM>
</BODY>
</HTML>
```

pathname

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listings 17-2 through 17-4 earlier in this chapter for a multiple-frame example you can use to view the `location.pathname` property for a variety of URLs of your choice.

port

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

If you have access to URLs containing port numbers, use the documents in Listings 17-2 through 17-4 to experiment with the output of the `location.port` property.

protocol

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listings 17-2 through 17-4 for a multiple-frame example you can use to view the `location.protocol` property for a variety of URLs. Also try loading an FTP site to see the `location.protocol` value for that type of URL.

search

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

As mentioned in the opening of Chapter 16 about frames, you can force a particular HTML page to open inside the frameset for which it is designed. But with the help of the search string, you can reuse the same framesetting document to accommodate any number of content pages that go into one of the frames (rather than specifying a separate frameset for each possible combination of pages in the frameset). The listings in this section create a simple example of how to force a page to load in a frameset by passing some information about the page to the frameset. Thus, if a user has a URL to one of the content frames (perhaps it has been bookmarked by right-clicking the frame or it comes up as a search engine result), the page appears in its designated frameset the next time the user visits the page.

The fundamental task going on in this scheme has two parts. The first is in each of the content pages where a script checks whether the page is loaded inside a frameset. If the frameset is missing, then a search string is composed and appended to the URL for the framesetting document. The framesetting document has its own short script that looks for the presence of the search string. If the string is there, then the script extracts the search string data and uses it to load that specific page into the content frame of the frameset.

Listing 17-6 is the framesetting document. The `getSearchAsArray()` function is more complete than necessary for this simple example, but you can use it in other instances to convert any number of name/value pairs passed in the search string (in traditional format of `name1=value1&name2=value2&etc.`) into an array whose indexes are the names (making it easier for scripts to extract a specific piece of passed data). Version branching takes place because, for convenience, the `getSearchAsArray()` function uses text and array methods that don't exist in browsers prior to NN3 or IE4.

Listing 17-6: **A Smart Frameset**

```
<HTML>
<HEAD>
<TITLE>Example Frameset</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// Convert location.search into an array of values
// indexed by name.
function getSearchAsArray() {
    var minNav3 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) >= 3)
    var minIE4 = (navigator.appName.indexOf("Microsoft") >= 0 &&
parseInt(navigator.appVersion) >= 4)
    var minDOM = minNav3 || minIE4   // baseline DOM required for this function
    var results = new Array()
    if (minDOM) {
        var input = unescape(location.search.substr(1))
        if (input) {
            var srchArray = input.split("&")
            var tempArray = new Array()
            for (var i = 0; i < srchArray.length; i++) {
```

Continued

Listing 17-6 *(continued)*

```
                tempArray = srchArray[i].split("=")
                results[tempArray[0]] = tempArray[1]
            }
        }
    }
    return results
}
function loadFrame() {
    if (location.search) {
        var srchArray = getSearchAsArray()
        if (srchArray["content"]) {
            self.content.location.href = srchArray["content"]
        }
    }
}
</SCRIPT>
</HEAD>
<FRAMESET COLS="250,*" onLoad="loadFrame()">
    <FRAME NAME="toc" SRC="lst17-07.htm">
    <FRAME NAME="content" SRC="lst17-08.htm">
</FRAMESET>
</HTML>
```

Listing 17-7 is the HTML for the table of contents frame. Nothing elaborate goes on here, but you can see how normal navigation works for this simplified frameset.

Listing 17-7: **The Table of Contents**

```
<HTML>
<HEAD>
<TITLE>Table of Contents</TITLE>
</HEAD>
<BODY BGCOLOR="#eeeeee">
<H3>Table of Contents</H3>
<HR>
<UL>
<LI><A HREF="lst17-08.htm" TARGET="content">Page 1</A></LI>
<LI><A HREF="lst17-08a.htm" TARGET="content">Page 2</A></LI>
<LI><A HREF="lst17-08b.htm" TARGET="content">Page 3</A></LI>
</UL>
</BODY>
</HTML>
```

Listing 17-8 shows one of the content pages. As the page loads, the `checkFrameset()` function is invoked. If the window does not load inside a frameset, then the script navigates to the framesetting page, passing the current content URL as a search string. Notice that for browsers that support the `location.replace()` method, the loading of this page on its own does not get recorded to the browser's history and isn't accessed if the user hits the Back button.

Listing 17-8: **A Content Page**

```
<HTML>
<HEAD>
<TITLE>Page 1</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkFrameset() {
    var minNav3 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) >= 3)
    var minIE4 = (navigator.appName.indexOf("Microsoft") >= 0 &&
parseInt(navigator.appVersion) >= 4)
    var minDOM = minNav3 || minIE4   // baseline DOM required for this function
    var isNav4 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) == 4)
    if (parent == window) {
        // Don't do anything if running NN4
        // so that the frame can be printed on its own
        if (isNav4 && window.innerWidth == 0) {
            return
        }
        if (minDOM) {
            // Use replace() to keep current page out of history
            location.replace("lst17-06.htm?content=" + escape(location.href))
        } else {
            location.href = " lst17-06.htm?content=" + escape(location.href)
        }
    }
}
// Invoke the function
checkFrameset()
</SCRIPT>
</HEAD>
<BODY>
<H1>Page 1</H1>
<HR>
</BODY>
</HTML>
```

In practice, I recommend placing the code for the `checkFrameset()` function and call to it inside an external `.js` library and linking that library into each content document of the frameset. That's why the function assigns the generic `location.href` property to the search string—you can use it on any content page.

Methods

`reload(`*`unconditionalGETBoolean`*`)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

To experience the difference between the two loading styles, load the document in Listing 17-9. Click a radio button, enter some new text, and make a choice in the SELECT object. Clicking the Soft Reload/Refresh button invokes a method that reloads the document as if you had clicked the browser's Reload/Refresh button. It also preserves the visible properties of form elements. The Hard Reload button invokes the `location.reload()` method, which resets all objects to their default settings.

Listing 17-9: Hard versus Soft Reloading

```
<HTML>
<HEAD>
<TITLE>Reload Comparisons</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function hardReload() {
    location.reload(true)
}
function softReload() {
    history.go(0)
}
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="myForm">
<INPUT TYPE="radio" NAME="rad1" VALUE = 1>Radio 1<BR>
<INPUT TYPE="radio" NAME="rad1" VALUE = 2>Radio 2<BR>
<INPUT TYPE="radio" NAME="rad1" VALUE = 3>Radio 3<P>
<INPUT TYPE="text" NAME="entry" VALUE="Original"><P>
<SELECT NAME="theList">
<OPTION>Red
```

```
<OPTION>Green
<OPTION>Blue
</SELECT>
<HR>
<INPUT TYPE="button" VALUE="Soft Reload" onClick="softReload()">
<INPUT TYPE="button" VALUE="Hard Reload" onClick="hardReload()">
</FORM>
</BODY>
</HTML>
```

replace("*URL*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Calling the `location.replace()` method navigates to another URL similarly to assigning a URL to the location. The difference is that the document doing the calling doesn't appear in the history list after the new document loads. Check the history listing (in your browser's usual spot for this information) before and after clicking Replace Me in Listing 17-10.

Listing 17-10: **Invoking the location.replace() Method**

```
<HTML>
<HEAD>
<TITLE>location.replace() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function doReplace() {
    location.replace("lst17-01.htm")
}
</SCRIPT>
</HEAD>
<BODY>
<FORM NAME="myForm">
<INPUT TYPE="button" VALUE="Replace Me" onClick="doReplace()">
</FORM>
</BODY>
</HTML>
```

History Object

Properties

length

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The simple function in Listing 17-11 displays one of two alert messages based on the number of items in the browser's history.

Listing 17-11: A Browser History Count

```
<HTML>
<HEAD>
<TITLE>History Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function showCount() {
    var histCount = window.history.length
    if (histCount > 5) {
        alert("My, my, you\'ve been busy. You have visited " + histCount +
" pages so far.")
    } else {
        alert("You have been to " + histCount + " Web pages this session.")
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="button" NAME="activity" VALUE="My Activity" onClick="showCount()">
</FORM>
</BODY>
</HTML>
```

Methods

back()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listings 17-12 and 17-13 provide a little workshop in which you can test the behavior of a variety of backward and forward navigation in different browsers. Some features work only in NN4+.

Listing 17-12: Navigation Lab Frameset

```
<HTML>
<HEAD>
<TITLE>Back and Forward</TITLE>
</HEAD>
<FRAMESET COLS="45%,55%">
    <FRAME NAME="controller" SRC="lst17-13.htm">
    <FRAME NAME="display" SRC="lst17-01.htm">
</FRAMESET>
</HTML>
```

The top portion of Listing 17-13 contains simple links to other example files from this chapter. A click of any link loads a different document into the right-hand frame to let you build some history inside the frame.

Listing 17-13: Navigation Lab Control Panel

```
<HTML>
<HEAD>
<TITLE>Lab Controls</TITLE>
```

Continued

Listing 17-13 *(continued)*

```
</HEAD>
<BODY>
<B>Load a series of documents into the right frame by clicking some of these
links (make a note of the sequence you click on):</B><P>
<A HREF="lst17-01.htm" TARGET="display">Listing 17-1</A><BR>
<A HREF="lst17-05.htm" TARGET="display">Listing 17-5</A><BR>
<A HREF="lst17-09.htm" TARGET="display">Listing 17-9</A><BR>
<HR>
<FORM NAME="input">
<B>Click on the various buttons below to see the results in this
frameset:</B><P>
<UL>
<LI><B>NN4+</B> Substitute for toolbar buttons -- <TT>window.back()</TT> and
<TT>window.forward()</TT>:<INPUT TYPE="button" VALUE="Back"
onClick="window.back()"><INPUT TYPE="button" VALUE="Forward"
onClick="window.forward()"><P>

<LI><TT> history.back()</TT> and <TT>history.forward()</TT> for righthand frame:
<INPUT TYPE="button" VALUE="Back" onClick="parent.display.history.back()"><INPUT
TYPE="button" VALUE="Forward" onClick="parent.display.history.forward()"><P>

<LI><TT>history.back()</TT> for this frame:<INPUT TYPE="button" VALUE="Back"
onClick="history.back()"><P>

<LI><TT>history.back()</TT> for parent:<INPUT TYPE="button" VALUE="Back"
onClick="parent.history.back()"><P>
</UL>
</FORM>
</BODY>
</HTML>
```

go(*relativeNumber* | "*URLOrTitleSubstring*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Fill in either the number or text field of the page in Listing 17-14 and then click the associated button. The script passes the appropriate kind of data to the `go()` method. Be sure to use negative numbers for visiting a page earlier in the history.

Listing 17-14: **Navigating to an Item in History**

```
<HTML>
<HEAD>
<TITLE>history.go() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doGoNum(form) {
    window.history.go(parseInt(form.histNum.value))
}
function doGoTxt(form) {
    window.history.go(form.histWord.value)
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<B>Calling the history.go() method:</B>
<HR>
Enter a number (+/-):<INPUT TYPE="text" NAME="histNum" SIZE=3 VALUE="0">
<INPUT TYPE="button" VALUE="Go to Offset" onClick="doGoNum(this.form)"><P>
Enter a word in a title:<INPUT TYPE="text" NAME="histWord">
<INPUT TYPE="button" VALUE="Go to Match" onClick="doGoTxt(this.form)">
</FORM>
</BODY>
</HTML>
```

Chapter 18 Examples

The following sections contain examples from Chapter 18, "The Document and Body Objects."

Document Object

Properties

activeElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) with IE4+ to experiment with the `activeElement` property. Type the following statement into the top text box:

```
document.activeElement.value
```

After you press the Enter key, the Results box shows the value of the text box you just typed into (the very same expression you just typed). But if you then click the Evaluate button, you will see the `value` property of that button object appear in the Results box.

alinkColor
bgColor
fgColor
linkColor
vlinkColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

I select some color values at random to plug into three settings of the ugly colors group for Listing 18-1. The smaller window displays a dummy button so that you can see how its display contrasts with color settings. Notice that the script sets the colors of the smaller window by rewriting the entire window's HTML code. After changing colors, the script displays the color values in the original window's textarea. Even though some colors are set with the color constant values, properties come back in the hexadecimal triplet values. You can experiment to your heart's content by changing color values in the listing. Every time you change the values in the script, save the HTML file and reload it in the browser.

Listing 18-1: Color Sampler

```
<HTML>
<HEAD>
<TITLE>Color Me</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function defaultColors() {
    return "BGCOLOR='#c0c0c0' VLINK='#551a8b' LINK='#0000ff'"
}

function uglyColors() {
    return "BGCOLOR='yellow' VLINK='pink' LINK='lawngreen'"
}
function showColorValues() {
    var result = ""
    result += "bgColor: " + newWindow.document.bgColor + "\n"
    result += "vlinkColor: " + newWindow.document.vlinkColor + "\n"
    result += "linkColor: " + newWindow.document.linkColor + "\n"
    document.forms[0].results.value = result
}
// dynamically writes contents of another window
function drawPage(colorStyle) {
    var thePage = ""
    thePage += "<HTML><HEAD><TITLE>Color Sampler</TITLE></HEAD><BODY "
    if (colorStyle == "default") {
        thePage += defaultColors()
    } else {
        thePage += uglyColors()
    }
    thePage += ">Just so you can see the variety of items and color, <A "
    thePage += "HREF='http://www.nowhere.com'>here\'s a link</A>, and " +
               "<A HREF='http://home.netscape.com'> here is another link </A> " +
               "you can use on-line to visit and see how its color differs " +
               "from the standard link."
    thePage += "<FORM>"
```

Continued

Listing 18-1 *(continued)*

```
    thePage += "<INPUT TYPE='button' NAME='sample' VALUE='Just a Button'>"
    thePage += "</FORM></BODY></HTML>"
    newWindow.document.write(thePage)
    newWindow.document.close()
    showColorValues()
}
// the following works properly only in Windows Navigator
function setColors(colorStyle) {
    if (colorStyle == "default") {
        document.bgColor = "#c0c0c0"
    } else {
        document.bgColor = "yellow"
    }
}
var newWindow = window.open("","","height=150,width=300")
</SCRIPT>
</HEAD>

<BODY>
Try the two color schemes on the document in the small window.
<FORM>
<INPUT TYPE="button" NAME="default" VALUE='Default Colors'
    onClick="drawPage('default')">
<INPUT TYPE="button" NAME="weird" VALUE="Ugly Colors"
    onClick="drawPage('ugly')"><P>
<TEXTAREA NAME="results" ROWS=3 COLS=20></TEXTAREA><P><HR>
These buttons change the current document, but not correctly on all platforms<P>
<INPUT TYPE="button" NAME="default" VALUE='Default Colors'
    onClick="setColors('default')">
<INPUT TYPE="button" NAME="weird" VALUE="Ugly Colors"
    onClick="setColors('ugly')"><P>
</FORM>
<SCRIPT LANGUAGE="JavaScript">
drawPage("default")
</SCRIPT>
</BODY>
</HTML>
```

To satisfy the curiosity of those who want to change the color of a loaded document on the fly, the preceding example includes a pair of buttons that set the color properties of the current document. If you're running browsers and versions capable of this power (see Table 18-1), everything will look fine; but in other platforms or earlier versions, you may lose the buttons and other document content behind the color. You can still click and activate these items, but the color obscures them. Unless you know for sure that users of your Web page use only browsers and clients empowered for background color changes, do not change colors by setting properties of an existing document.

Note

If you are using Internet Explorer 3 for the Macintosh, you will experience some difficulties with Listing 18-1. The script in the main document loses its connection with the subwindow; it does not redraw the second window with other colors. You can, however, change the colors in the main document. The significant flicker you may experience is related to the way the Mac version redraws content after changing colors.

anchors

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

In Listing 18-2, I append an extra script to Listing 17-1 to demonstrate how to extract the number of anchors in the document. The document dynamically writes the number of anchors found in the document. You will not likely ever need to reveal such information to users of your page, and the `document.anchors` property is not one that you will call frequently. The object model defines it automatically as a document property while defining actual anchor objects.

Listing 18-2: Reading the Number of Anchors

```
<HTML>
<HEAD>
<TITLE>document.anchors Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function goNextAnchor(where) {
    window.location.hash = where
}
</SCRIPT>
</HEAD>

<BODY>

<A NAME="start"><H1>Top</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec1')">
</FORM>
```

Continued

Listing 18-2 *(continued)*

```
<HR>

<A NAME="sec1"><H1>Section 1</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec2')">
</FORM>
<HR>

<A NAME="sec2"><H1>Section 2</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="NEXT" onClick="goNextAnchor('sec3')">
</FORM>
<HR>

<A NAME="sec3"><H1>Section 3</H1></A>
<FORM>
<INPUT TYPE="button" NAME="next" VALUE="BACK TO TOP"
onClick="goNextAnchor('start')">
</FORM>
<HR><P>
<SCRIPT LANGUAGE="JavaScript">
document.write("<I>There are " + document.anchors.length +
" anchors defined for this document</I>")
</SCRIPT>
</BODY>
</HTML>
```

applets

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

The `document.applets` property is defined automatically as the browser builds the object model for a document that contains applet objects. You will rarely access this property, except to determine how many applet objects a document has.

bgColor

See alinkColor.

body

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to examine properties of the BODY element object. First, to prove that the `document.body` is the same as the element object that comes back from longer references, enter the following statement into the top text box with either IE5 or NN6:

```
document.body == document.getElementsByTagName("BODY")[0]
```

Next, check out the BODY object's property listings later in this chapter and enter the listings into the top text box to review their results. For example:

```
document.body.bgColor
document.body.tagName
```

charset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `charset` property. To see the default setting applied to the page, enter the following statement into the top text box:

```
document.charset
```

If you are running IE5+ for Windows 98 and you enter the following statement, the browser will apply a different character set to the page:

```
document.charset = "iso-8859-2"
```

If your version of Windows does not have that character set installed in the system, the browser may ask permission to download and install the character set.

characterSet

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `characterSet` property in NN6. To see the default setting applied to the page, enter the following statement into the top text box:

```
document.charset
```

cookie

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Experiment with the last group of statements in Listing 18-3 to create, retrieve, and delete cookies. You can also experiment with The Evaluator by assigning a name/value pair string to `document.cookie`, and then examining the value of the `cookie` property.

defaultCharset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `defaultCharset` property. To see the default setting applied to the page, enter the following statement into the top text box:

```
document.defaultCharset
```

documentElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to examine the behavior of the `documentElement` property. In IE5+ or NN6, enter the following statement into the top text field:

```
document.documentElement.tagName
```

The result is `HTML`, as expected.

expando

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `document.expando` property in IE4+. Begin by proving that the `document` object can normally accept custom properties. Type the following statement into the top text field:

```
document.spooky = "Boo!"
```

This property is now set and stays that way until the page is either reloaded or unloaded.

Now freeze the `document` object's properties with the following statement:

```
document.expando = false
```

If you try to add a new property, such as the following, you receive an error:

```
document.happy = "tra la"
```

Interestingly, even though `document.expando` is turned off, the first custom property is still accessible and modifiable.

fgColor

See `alinkColor`.

fileCreatedDate
fileModifiedDate
fileSize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 18-4 dynamically generates several pieces of content relating to the creation and modification dates of the file, as well as its size. More importantly, the listing demonstrates how to turn a value returned by the file date properties into a genuine date object that can be used for date calculations. In the case of Listing 18-4, the calculation is the number of full days between the creation date and the day someone views the file. Notice that the dynamically generated content is added very simply via the `innerText` properties of carefully-located SPAN elements in the body content.

Listing 18-4: **Viewing File Dates**

```
<HTML>
<HEAD>
<TITLE>fileCreatedDate and fileModifiedDate Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
function fillInBlanks() {
    var created = document.fileCreatedDate
    var modified = document.fileModifiedDate
    document.all.created.innerText = created
    document.all.modified.innerText = modified
    var createdDate = new Date(created).getTime()
    var today = new Date().getTime()
    var diff = Math.floor((today - createdDate) / (1000*60*60*24))
    document.all.diff.innerText = diff
    document.all.size.innerText = document.fileSize
}
</SCRIPT>
</HEAD>

<BODY onLoad="fillInBlanks()">
<H1>fileCreatedDate and fileModifiedDate Properties</H1>
<HR>
<P>This file (<SPAN ID="size"> </SPAN> bytes) was created
on <SPAN ID="created"> </SPAN> and most
recently modified on <SPAN ID="modified"> </SPAN>.</P>
<P>It has been <SPAN ID="diff"> </SPAN> days since this file was
created.</P>
</BODY>
</HTML>
```

forms

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The document in Listing 18-5 is set up to display an alert dialog box that simulates navigation to a particular music site, based on the checked status of the “bluish” check box. The user input here is divided into two forms: one form with the check box and the other form with the button that does the navigation. A block of copy fills the space in between. Clicking the bottom button (in the second form) triggers the function that fetches the checked property of the “bluish” checkbox by using the `document.forms[i]` array as part of the address.

Listing 18-5: **Using the document.forms Property**

```
<HTML>
<HEAD>
<TITLE>document.forms example</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function goMusic() {
    if (document.forms[0].bluish.checked) {
        alert("Now going to the Blues music area...")
    } else {
        alert("Now going to Rock music area...")
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM NAME="theBlues">
<INPUT TYPE="checkbox" NAME="bluish">Check here if you've got the blues.
</FORM>
<HR>
M<BR>
o<BR>
r<BR>
e<BR>
<BR>
C<BR>
o<BR>
p<BR>
y<BR>
<HR>
<FORM NAME="visit">
<INPUT TYPE="button" VALUE="Visit music site" onClick="goMusic()">
</FORM>
</BODY>
</HTML>
```

frames

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listings 16-7 and 16-8 for examples of using the `frames` property with window objects. The listings works with IE4+ if you swap references to the `window` with `document`.

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

Use The Evaluator (Chapter 13) to examine the `height` and `width` properties of that document. Enter the following statement into the top text box and click the Evaluate button:

```
"height=" + document.height + "; width=" + document.width
```

Resize the window so that you see both vertical and horizontal scrollbars in the browser window and click the Evaluate button again. If either or both numbers get smaller, the values in the Results box are the exact size of the space occupied by the document. But if you expand the window to well beyond where the scrollbars are needed, the values extend to the number of pixels in each dimension of the window's content region.

images

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	(✓)		✓	✓	✓

Example

The `document.images` property is defined automatically as the browser builds the object model for a document that contains image objects. See the discussion about the `Image` object in Chapter 22 for reference examples.

implementation

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `document.implementation.hasFeature()` method in NN6. Enter the following statements one at a time into the top text field and examine the results:

```
document.implementation.hasFeature("HTML","1.0")
document.implementation.hasFeature("HTML","2.0")
document.implementation.hasFeature("HTML","3.0")
document.implementation.hasFeature("CSS","2.0")
document.implementation.hasFeature("CSS2","2.0")
```

Feel free to try other values.

lastModified

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Experiment with the `document.lastModified` property with Listing 18-6. But also be prepared for inaccurate readings if the file is located on some servers or local hard disks.

Listing 18-6: document.lastModified Property in Another Format

```
<HTML>
<HEAD>
<TITLE>Time Stamper</TITLE>
</HEAD>
<BODY>
```

```
<CENTER> <H1>GiantCo Home Page</H1></CENTER>
<SCRIPT LANGUAGE="JavaScript">
update = new Date(document.lastModified)
theMonth = update.getMonth() + 1
theDate = update.getDate()
theYear = update.getFullYear()
document.writeln("<I>Last updated:" + theMonth + "/" + theDate + "/" + theYear +
"</I>")
</SCRIPT>
<HR>
</BODY>
</HTML>
```

As noted at great length in Chapter 36's discussion about the `Date` object, you should be aware that date formats vary greatly from country to country. Some of these formats use a different order for date elements. When you hard-code a date format, it may take a form that is unfamiliar to other users of your page.

layers

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Listing 18-7 demonstrates only for NN4 how to use the `document.layers` property to crawl through the entire set of nested layers in a document. Using reflexive calls to the `crawlLayers()` function, the script builds an indented list of layers in the same hierarchy as the objects themselves and displays the results in an alert dialog box. After you load this document (the script is triggered by the `onLoad` event handler), compare the alert dialog box contents against the structure of `<LAYER>` tags in the document.

Listing 18-7: **A Navigator 4 Layer Crawler**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript1.2">
var output = ""
```

Continued

Listing 18-7 *(continued)*

```
function crawlLayers(layerArray, indent) {
    for (var i = 0; i < layerArray.length; i++) {
        output += indent + layerArray[i].name + "\n"
        if (layerArray[i].document.layers.length) {
            var newLayerArray = layerArray[i].document.layers
            crawlLayers(newLayerArray, indent + "   ")
        }
    }
    return output
}
function revealLayers() {
    alert(crawlLayers(document.layers, ""))
}
</SCRIPT>
</HEAD>
<BODY onLoad="revealLayers()">
<LAYER NAME="Europe">
    <LAYER NAME="Germany"></LAYER>
    <LAYER NAME="Netherlands">
        <LAYER NAME="Amsterdam"></LAYER>
        <LAYER NAME="Rotterdam"></LAYER>
    </LAYER>
    <LAYER NAME="France"></LAYER>
</LAYER>
<LAYER NAME="Africa">
    <LAYER NAME="South Africa"></LAYER>
    <LAYER NAME="Ivory Coast"></LAYER>
</LAYER>
</BODY>
</HTML>
```

linkColor

See `alinkColor`.

links

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The `document.links` property is defined automatically as the browser builds the object model for a document that contains link objects. You rarely access this property, except to determine the number of link objects in the document.

location
URL

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	(✓)	✓	✓	✓	(✓)	(✓)	✓	✓	✓

Example

HTML documents in Listing 18-8 through 18-10 create a test lab that enables you to experiment with viewing the `document.URL` property for different windows and frames in a multiframe environment. Results are displayed in a table, with an additional listing of the `document.title` property to help you identify documents being referred to. The same security restrictions that apply to retrieving `window.location` object properties also apply to retrieving the `document.URL` property from another window or frame.

Listing 18-8: Frameset for document.URL Property Reader

```
<HTML>
<HEAD>
<TITLE>document.URL Reader</TITLE>
</HEAD>
<FRAMESET ROWS="60%,40%">
    <FRAME NAME="Frame1" SRC="lst18-10.htm">
    <FRAME NAME="Frame2" SRC="lst18-09.htm">
</FRAMESET>
</HTML>
```

Listing 18-9 document.URL Property Reader

```
<HTML>
<HEAD>
<TITLE>URL Property Reader</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
function fillTopFrame() {
    newURL=prompt("Enter the URL of a document to show in the top frame:","")
    if (newURL != null && newURL != "") {
        top.frames[0].location = newURL
    }
}

function showLoc(form,item) {
    var windName = item.value
    var theRef = windName + ".document"
    form.dLoc.value = unescape(eval(theRef + ".URL"))
    form.dTitle.value = unescape(eval(theRef + ".title"))
}
</SCRIPT>
</HEAD>

<BODY>
Click the "Open URL" button to enter the location of an HTML document to display
in the upper frame of this window.
<FORM>
<INPUT TYPE="button" NAME="opener" VALUE="Open URL..." onClick="fillTopFrame()">
</FORM>
<HR>
<FORM>
Select a window or frame to view each document property values.<P>
<INPUT TYPE="radio" NAME="whichFrame" VALUE="parent"
onClick="showLoc(this.form,this)">Parent window
<INPUT TYPE="radio" NAME="whichFrame" VALUE="top.frames[0]"
onClick="showLoc(this.form,this)">Upper frame
<INPUT TYPE="radio" NAME="whichFrame" VALUE="top.frames[1]"
onClick="showLoc(this.form,this)">This frame<P>
<TABLE BORDER=2>
<TR><TD ALIGN=RIGHT>document.URL:</TD>
<TD><TEXTAREA NAME="dLoc" ROWS=3 COLS=30 WRAP="soft"></TEXTAREA></TD></TR>

<TR><TD ALIGN=RIGHT>document.title:</TD>
<TD><TEXTAREA NAME="dTitle" ROWS=3 COLS=30 WRAP="soft"></TEXTAREA></TD></TR>
</TABLE>
</FORM>
</BODY>
</HTML>
```

Listing 18-10: Placeholder for Listing 18-8

```
<HTML>
<HEAD>
<TITLE>Opening Placeholder</TITLE>
</HEAD>
<BODY>
Initial place holder. Experiment with other URLs for this frame (see below).
</BODY>
</HTML>
```

parentWindow

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To prove the `parentWindow` property points to the document's window, you can enter the following statement into the top text field of The Evaluator (Chapter 13):

```
document.parentWindow == self
```

This expression evaluates to `true` only if both references are of the same object.

protocol

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

If you use The Evaluator (Chapter 13) to test the `document.protocol` property, you will find that it displays `File Protocol` in the results because you are accessing the listing from a local hard disk or CD-ROM.

referrer

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

This demonstration requires two documents (and for IE, you'll also need to access the documents from a Web server). The first document, in Listing 18-11, simply contains one line of text as a link to the second document. In the second document (Listing 18-12), a script verifies the document from which the user came via a link. If the script knows about that link, it displays a message relevant to the experience the user had at the first document. Also try opening Listing 18-12 in a new browser window from the Open File command in the File menu to see how the script won't recognize the referrer.

Listing 18-11: **A Source Document**

```
<HTML>
<HEAD>
<TITLE>document.referrer Property 1</TITLE>
</HEAD>

<BODY>
<H1><A HREF="lst18-12.htm">Visit my sister document</A>
</BODY>
</HTML>
```

Listing 18-12: **Checking document.referrer**

```
<HTML>
<HEAD>
<TITLE>document.referrer Property 2</TITLE>
</HEAD>

<BODY><H1>
<SCRIPT LANGUAGE="JavaScript">
if(document.referrer.length > 0 && document.referrer.indexOf("18-11.htm") != -1){
```

```
    document.write("How is my brother document?")
} else {
    document.write("Hello, and thank you for stopping by.")
}
</SCRIPT>
</H1></BODY>
</HTML>
```

scripts

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can experiment with the `document.scripts` array in The Evaluator (Chapter 13). For example, you can see that only one SCRIPT element object is in The Evaluator page if you enter the following statement into the top text field:

```
document.scripts.length
```

If you want to view all of the properties of that lone SCRIPT element object, enter the following statement into the bottom text field:

```
document.scripts[0]
```

Among the properties are both `innerText` and `text`. If you assign an empty string to either property, the scripts are wiped out from the object model, but not from the browser. The scripts disappear because after the scripts loaded, they were cached outside of the object model. Therefore, if you enter the following statement into the top field:

```
document.scripts[0].text = ""
```

the script contents are gone from the object model, yet subsequent clicks of the Evaluate and List Properties buttons (which invoke functions of the SCRIPT element object) still work.

selection

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listings 15-30 and 15-39 in Chapter 15 to see the `document.selection` property in action for script-controlled copying and pasting (IE/Windows only).

URL

See `location`.

vlinkColor

See `alinkColor`.

width

See `height`.

Methods

captureEvents(*eventTypeList*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

See the example for the NN4 `window.captureEvents()` method in Chapter 16 (Listing 16-21) to see how to capture events on their way to other objects. In that example, you can substitute the `document` reference for the `window` reference to see how the document version of the method works just like the window version. If you understand the mechanism for windows, you understand it for documents. The same is true for the other NN4 event methods.

close()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Before you experiment with the `document.close()` method, be sure you understand the `document.write()` method described later in this chapter. After that, make a separate set of the three documents for that method's example (Listings 18-16 through 18-18 in a different directory or folder). In the `takePulse()` function listing, comment out the `document.close()` statement, as shown here:

```
msg += "<P>Make it a great day!</BODY></HTML>"
parent.frames[1].document.write(msg)
//parent.frames[1].document.close()
```

Now try the pages on your browser. You see that each click of the upper button appends text to the bottom frame, without first removing the previous text. The reason is that the previous layout stream was never closed. The document thinks that you're still writing to it. Also, without properly closing the stream, the last line of text may not appear in the most recently written batch.

createAttribute("*attributeName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Unfortunately, the `setAttributeNode()` method in NN6 does not yet work with attributes generated by the `createAttribute()` method. This will be fixed eventually, and you can experiment adding attributes to sample elements in The Evaluator. In the meantime, you can still create an attribute and inspect its properties. Enter the following text into the top text box:

```
a = document.createAttribute("author")
```

Now enter `a` into the bottom text box to inspect the properties of an `Attr` object.

createElement("*tagName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Chapter 15 contains numerous examples of the `document.createElement()` method in concert with methods that add or replace content to a document. See Listings 15-10, 15-21, 15-22,15 -28, 15-29, and 15-31.

createEventObject([*eventObject*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility									✓

Example

See the discussion of the `fireEvent()` method in Chapter 15 for an example of the sequence to follow when creating an event to fire on an element.

createStyleSheet(["*URL*"[, *index*]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 18-13 demonstrates adding an internal and external style sheet to a document. For the internal addition, the `addStyle1()` function invokes `document.createStyleSheet()` and adds a rule governing the P elements of the page (not available for IE5/Mac). In the `addStyle2()` function, an external file is loaded. That file contains the following two style rules:

```
H2 {font-size:20pt; color:blue}
P  {color:blue}
```

Notice that by specifying a position of zero for the imported style sheet, the addition of the internal style sheet always comes afterward in `styleSheet` object sequence. Thus, except when you deploy only the external style sheet, the red text color of the P elements override the blue color of the external style sheet. If you remove the second parameter of the `createStyleSheet()` method in `addStyle2()`, the external style sheet is appended to the end of the list. If it is the last style sheet to be added, the blue color prevails. Repeatedly clicking the buttons in this example continues to add the style sheets to the document.

Listing 18-13: **Using document.createStyleSheet()**

```
<HTML>
<HEAD>
<TITLE>document.createStyleSheet() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function addStyle1() {
    var newStyle = document.createStyleSheet()
    newStyle.addRule("P", "font-size:16pt; color:red")
}

function addStyle2() {
    var newStyle = document.createStyleSheet("lst18-13.css",0)
}
</SCRIPT>
</HEAD>

<BODY>
<H1>document.createStyleSheet() Method</H1>
<HR>
<FORM>
<INPUT TYPE="button" VALUE="Add Internal" onClick="addStyle1()"> 
<INPUT TYPE="button" VALUE="Add External" onClick="addStyle2()">
</FORM>
<H2>Section 1</H2>
<P>Lorem ipsum dolor sit amet, consectetaur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim adminim veniam, quis nostrud exercitation ullamco laboris
nisi ut aliquip ex ea commodo consequat.</P>
<H2>Section 2</H2>
<P>Duis aute irure dolor in reprehenderit involuptate velit esse
cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat
cupidatat non proident, sunt in culpa qui officia deseruntmollit
anim id est laborum.</P>
</BODY>
</HTML>
```

createTextNode("*text*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

While Chapter 14 and 15 (Listing 15-21, for instance) provide numerous examples of the `createTextNode()` method at work, using The Evaluator (Chapter 13) is instructive to see just what the method generates in IE5+ and NN6. You can use one of the built-in global variables of The Evaluator to hold a reference to a newly generated text node by entering the following statement into the top text field:

```
a = document.createTextNode("Hello")
```

The Results box shows that an object was created. Now, look at the properties of the object by typing `a` into the bottom text field. The precise listings of properties varies between IE5+ and NN6, but the W3C DOM properties that they share in common indicate that the object is a node type 3 with a node name of `#text`. No parents, children, or siblings exist yet because the object created here is not part of the document hierarchy tree until it is explicitly added to the document.

To see how insertion works, enter the following statement into the top text field to append the text node to the `myP` paragraph:

```
document.getElementById("myP").appendChild(a)
```

The word "Hello" appears at the end of the simple paragraph lower on the page. Now you can modify the text of that node either via the reference from the point of view of the containing P element or via the global variable reference for the newly created node:

```
document.getElementById("myP").lastChild.nodeValue = "Howdy"
```

or

```
a.nodeValue = "Howdy"
```

elementFromPoint(*x*, *y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 18-14 is a document that contains many different types of elements, each of which has an ID attribute assigned to it. The `onMouseOver` event handler for the `document` object invokes a function that finds out which element the cursor is over when the event fires. Notice that the event coordinates are `event.clientX` and `event.clientY`, which use the same coordinate plane as the page for their point of reference. As you roll the mouse over every element, its ID appears on the page. Some elements, such as BR and TR, occupy no space in the document, so you cannot get their IDs to appear. On a typical browser screen size, a positioned element rests atop one of the paragraph elements so that you can see how the `elementFromPoint()` method handles overlapping elements. If you scroll the page, the coordinates for the event and the page's elements stay in sync.

Listing 18-14: **Using the elementFromPoint() Method**

```
<HTML>
<HEAD>
<TITLE>document.elementFromPoint() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function showElemUnderneath() {
    var elem = document.elementFromPoint(event.clientX, event.clientY)
    document.all.mySpan.innerText = elem.id
}
document.onmouseover = showElemUnderneath
</SCRIPT>
</HEAD>

<BODY ID="myBody">
<H1 ID="header">document.elementFromPoint() Method</H1>
<HR ID="myHR">
<P ID="instructions">Roll the mouse around the page. The coordinates
of the mouse pointer are currently atop an element<BR ID="myBR">whose ID
is:"<SPAN ID="mySpan" STYLE="font-weight:bold"></SPAN>".</P>
<FORM ID="myForm">
<INPUT ID="myButton" TYPE="button" VALUE="Sample Button" onClick=""> 
</FORM>
```

Continued

Listing 18-14 *(continued)*

```
<TABLE BORDER=1 ID="myTable">
<TR ID="tr1">
    <TD ID="td_A1">Cell A1</TD>
    <TD ID="td_B1">Cell B1</TD>
</TR>
<TR ID="tr2">
    <TD ID="td_A2">Cell A2</TD>
    <TD ID="td_B2">Cell B2</TD>
</TR>
</TABLE>
<H2 ID="sec1">Section 1</H2>
<P ID="p1">Lorem ipsum dolor sit amet, consectetaur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim adminim veniam, quis nostrud exercitation ullamco laboris
nisi ut aliquip ex ea commodo consequat.</P>
<H2 ID="sec2">Section 2</H2>
<P ID="p2">Duis aute irure dolor in reprehenderit involuptate velit esse
cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat
cupidatat non proident, sunt in culpa qui officia deseruntmollit
anim id est laborum.</P>
<DIV ID="myDIV" STYLE="position:absolute; top:340; left:300; background-
color:yellow">
Here is a positioned element.</DIV>
</BODY>
</HTML>
```

execCommand("*commandName*"[, *UIFlag*] [, *param*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can find many examples of the `execCommand()` method for the `TextRange` object in Chapter 19. But you can try out the document-specific commands in The Evaluator (Chapter 13) if you like. Try each of the following statements in the top text box and click the Evaluate button:

```
document.execCommand("Refresh")
document.execCommand("SelectAll")
document.execCommand("Unselect")
```

All methods return `true` in the Results box.

Because any way you can evaluate a statement in The Evaluator forces a body selection to become deselected before the evaluation takes place, you can't experiment this way with the selection-oriented commands.

getElementById("*elementID*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

You can find many examples of this method in use throughout this book, but you can take a closer look at how it works by experimenting in The Evaluator (Chapter 13). A number of elements in The Evaluator have IDs assigned to them, so that you can use the method to inspect the objects and their properties. Enter the following statements into both the top and bottom text fields of The Evaluator. Results from the top field are references to the objects; results from the bottom field are lists of properties for the particular object.

```
document.getElementById("myP")
document.getElementById("myEM")
document.getElementById("myTitle")
document.getElementById("myScript")
```

As you see in the Results field, NN6 is more explicit about the type of HTML element object being referenced in the top text field than IE5. But both browsers are pointing to the same objects just the same.

getElementsByName("*elementName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator to test out the `getElementsByName()` method. All form elements in the upper part of the page have names associated with them. Enter the following statements into the top text field and observe the results:

```
document.getElementsByName("output")
document.getElementsByName("speed").length
document.getElementsByName("speed")[0].value
```

You can also explore all of the properties of the text field by typing the following expression into the bottom field:

```
document.getElementsByName("speed")[0]
```

getSelection()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

The document in Listing 18-15 provides a cross-browser (but not IE5/Mac) solution to capturing text that a user selects in the page. Selected text is displayed in the textarea. The script uses browser detection and branching to accommodate the diverse ways of recognizing the event and reading the selected text.

Listing 18-15: **Capturing a Text Selection**

```
<HTML>
<HEAD>
<TITLE>Getting Selected Text</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var isNav4 = (navigator.appName == "Netscape" &&
parseInt(navigator.appVersion) == 4)
var isNav4Min = (navigator.appName == "Netscape" &&
    parseInt(navigator.appVersion) >= 4)
var isIE4Min = (navigator.appName.indexOf("Microsoft") != -1 &&
    parseInt(navigator.appVersion) >= 4)
function showSelection() {
    if (isNav4Min) {
        document.forms[0].selectedText.value = document.getSelection()
    } else if (isIE4Min) {
```

```
        if (document.selection) {
            document.forms[0].selectedText.value =
                document.selection.createRange().text
            event.cancelBubble = true
        }
    }
}
if (isNav4) {
    document.captureEvents(Event.MOUSEUP)
}
document.onmouseup = showSelection
</SCRIPT>
</HEAD>

<BODY>
<H1>Getting Selected Text</H1>
<HR>
<P>Select some text and see how JavaScript can capture the selection:</P>
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the
free exercise thereof; or abridging the freedom of speech, or of the press; or
the right of the people peaceably to assemble, and to petition the government
for a redress of grievances.
</P>
</HR>
<FORM>
<TEXTAREA NAME="selectedText" ROWS=3 COLS=40 WRAP="virtual"></TEXTAREA>
</FORM>
</BODY>
</HTML>
```

open(["*mimeType*"] [, *replace*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

You can see an example of where the `document.open()` method fits in the scheme of dynamically creating content for another frame in the discussion of the `document.write()` method, later in this chapter.

queryCommandEnabled("*commandName*")
queryCommandIndterm("*commandName*")
queryCommandCommandState("*commandName*")
queryCommandSupported("*commandName*")
queryCommandText("*commandName*")
queryCommandValue("*commandName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See the examples for these methods covered under the `TextRange` object in Chapter 19.

recalc([*allFlag*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can see an example of `recalc()` in Listing 15-32 for the `setExpression()` method. In that example, the dependencies are between the current time and properties of standard element objects.

write("*string1*"[,"*string2*" ...[, "*stringn*"]])
writeln("*string1*"[,"*string2*" ...[, "*stringn*"]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The example in Listings 18-16 through 18-18 demonstrates several important points about using the `document.write()` or `document.writeln()` methods for writing to another frame. First is the fact that you can write any HTML code to a frame, and the browser accepts it as if the source code came from an HTML file somewhere. In the example, I assemble a complete HTML document, including basic HTML tags for completeness.

Listing 18-16: Frameset for document.write() Example

```
<HTML>
<HEAD>
<TITLE>Writin' to the doc</TITLE>
</HEAD>
<FRAMESET ROWS="50%,50%">
    <FRAME NAME="Frame1" SRC="lst18-17.htm">
    <FRAME NAME="Frame2" SRC="lst18-18.htm">
</FRAMESET>
</HTML>
```

Listing 18-17: document.write() Example

```
<HTML>
<HEAD>
<TITLE>Document Write Controller</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function takePulse(form) {
    var msg = "<HTML><HEAD><TITLE>On The Fly with " + form.yourName.value +
        "</TITLE></HEAD>"
    msg += "<BODY BGCOLOR='salmon'><H1>Good Day " + form.yourName.value +
        "!</H1><HR>"
    for (var i = 0; i < form.how.length; i++) {
        if (form.how[i].checked) {
            msg += form.how[i].value
            break
        }
    }
    msg += "<P>Make it a great day!</BODY></HTML>"
    parent.Frame2.document.write(msg)
    parent.Frame2.document.close()
}
```

Continued

Listing 18-17 *(continued)*

```
function getTitle() {
    alert("Lower frame document.title is now:" + parent.Frame2.document.title)
}
</SCRIPT>
</HEAD>

<BODY>
Fill in a name, and select how that person feels today. Then click "Write To
Below"
to see the results in the bottom frame.
<FORM>
Enter your first name:<INPUT TYPE="text" NAME="yourName" VALUE="Dave"><P>
How are you today? <INPUT TYPE="radio" NAME="how"
VALUE="I hope that feeling continues forever." CHECKED>Swell
<INPUT TYPE="radio" NAME="how" VALUE="You may be on your way to feeling Swell">
Pretty Good
<INPUT TYPE="radio" NAME="how" VALUE="Things can only get better from here.">
So-So<P>
<INPUT TYPE="button" NAME="enter" VALUE="Write To Below"
    onClick="takePulse(this.form)">
<HR>
<INPUT TYPE="button" NAME="peek" VALUE="Check Lower Frame Title"
    onClick="getTitle()">
</BODY>
</HTML>
```

Listing 18-18: **Placeholder for Listing 18-16**

```
<HTML>
<HEAD>
<TITLE>Placeholder</TITLE>
<BODY>
</BODY>
</HTML>
```

Figure 18-2 shows an example of the frame written by the script.

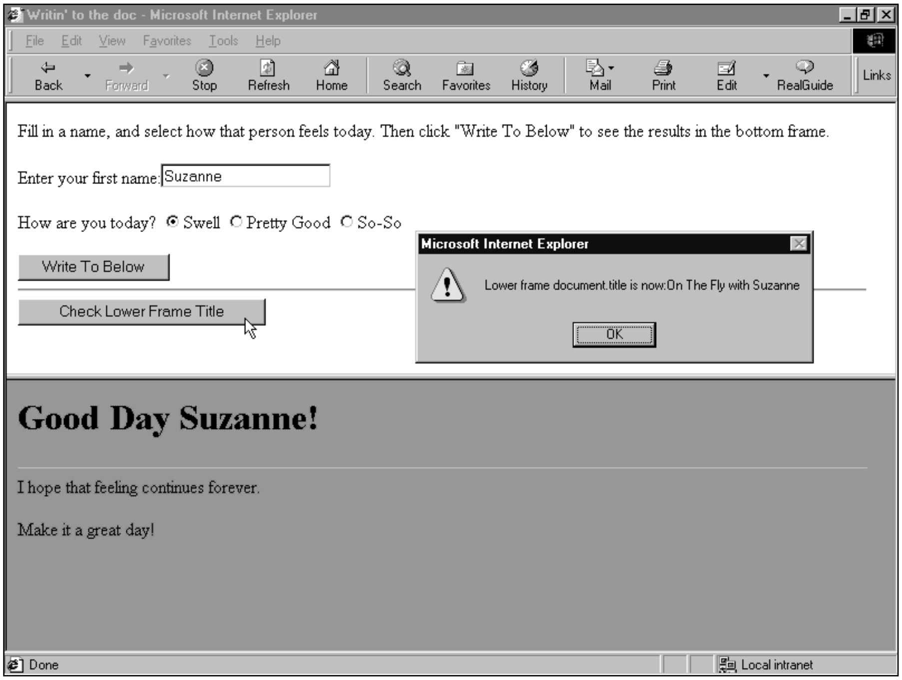

Figure 18-2: Clicking the Write To Below button in the upper frame causes a script to assemble and write HTML for the bottom frame.

A second point to note is that this example customizes the content of the document based on user input. This customization makes the experience of working with your Web page feel far more interactive to the user — yet you're doing it without any CGI programs running on the server.

The third point I want to bring home is that the document created in the separate frame by the `document.write()` method is a genuine `document` object. In this example, for instance, the `<TITLE>` tag of the written document changes if you redraw the lower frame after changing the entry of the name field in the upper frame. If you click the lower button after updating the bottom frame, you see that the `document.title` property has, indeed, changed to reflect the `<TITLE>` tag written to the browser in the course of displaying the frame's page (except in NN4/Mac, which exhibits a bug for this property in a dynamically written document). The fact that you can artificially create full-fledged, JavaScript `document` objects on the fly represents one of the most important powers of serverless CGI scripting (for information delivery to the user) with JavaScript. You have much to take advantage of here if your imagination is up to the task.

Notice that except for NN2, you can easily modify Listing 18-17 to write the results to the same frame as the document containing the field and buttons. Instead of specifying the lower frame

```
parent.frames[1].document.open()
parent.frames[1].document.write(msg)
parent.frames[1].document.close()
```

the code simply can use

```
document.open()
document.write(msg)
document.close()
```

This code would replace the form document with the results and not require any frames in the first place. Because the code assembles all of the content for the new document into one variable value, that data survive the one `document.write()` method.

The frameset document (Listing 18-18) creates a blank frame by loading a blank document (Listing 18-18). An alternative I highly recommend is to have the framesetting document fill the frame with a blank document of its own creation. See "Blank Frames" in Chapter 16 for further details about this technique for NN3+ and IE3+.

Event Handlers

onStop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 18-19 provides a simple example of an intentional infinitely looping script. In case you load this page into a browser other than IE5, you can click the Halt Counter button to stop the looping. The Halt Counter button as well as the `onStop` event handler invoke the same function.

Listing 18-19: Scripting the Browser Stop Button

```
<HTML>
<HEAD>
<TITLE>onStop Event Handler</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var counter = 0
var timerID
function startCounter() {
    document.forms[0].display.value = ++counter
    //clearTimeout(timerID)
    timerID = setTimeout("startCounter()", 10)
}
function haltCounter() {
    clearTimeout(timerID)
    counter = 0
}
document.onstop = haltCounter
</SCRIPT>
</HEAD>

<BODY>
<H1>onStop Event Handler</H1>
<HR>
<P>Click the browser's Stop button (in IE) to stop the script counter.</P>
<FORM>
<P><INPUT TYPE="text" NAME="display"></P>
<INPUT TYPE="button" VALUE="Start Counter" onClick="startCounter()">
<INPUT TYPE="button" VALUE="Halt Counter" onClick="haltCounter()">
</FORM>
</BODY>
</HTML>
```

BODY Element Object

Properties

aLink
bgColor
link
text
vLink

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

You can modify Listing 18-1 for use with IE4+ and NN6+ only by using the new property names instead. Replace all references to the `document` properties with their `document.body` equivalents. For example, the function would be reworked as the following (changes in boldface):

```
function showColorValues() {
    var result = ""
    result += "bgColor: " + newWindow.document.body.bgColor + "\n"
    result += "vLink: " + newWindow.document.body.vLink + "\n"
    result += "link: " + newWindow.document.body.link + "\n"
    document.forms[0].results.value = result
}
```

background

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

If you have a background image file named `images/logoBG.gif`, a script can set the background via the following statement:

```
document.body.background = "images/logoBG.gif"
```

To clear the background image:

```
document.body.background = ""
```

If a background color has been previously set, the color becomes visible after the image disappears.

bgColor

See `aLink`.

bgProperties

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Both of the following statements change the default behavior of background image scrolling in IE4+:

```
document.body.bgProperties = "fixed"
```

or

```
document.body.style.backgroundAttachment = "fixed"
```

The added benefit of using the style sheet version is that it also works in NN6.

bottomMargin
leftMargin
rightMargin
topMargin

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Both of the following statements change the default left margin in IE4+:

```
document.body.leftMargin = 30
```

or

```
document.body.style.marginLeft = 30
```

leftMargin

See `bottomMargin`.

link

See `aLink`.

noWrap

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To change the word wrapping behavior from the default, the statement is:

```
document.body.noWrap = true
```

rightMargin

See `bottomMargin`.

scroll

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To change the scrollbar appearance from the default, the statement is:

```
document.body.scroll = "no"
```

scrollLeft
scrollTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 18-20 is the IE4+ version of the NN example for `pageXOffset` and `pageYOffset` properties (Listing 16-13). Everything about these two examples is the same except for the syntax that retrieves the values indicating how much the document is scrolled in a window.

Listing 18-20: Viewing the scrollLeft and scrollTop Properties

```
<HTML>
<HEAD>
<TITLE>Master of all Windows</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function leftFrame() {
    var output = "<HTML><BODY><H3>Body Scroll Values</H3><HR>\n"
```

Continued

Listing 18-20 *(continued)*

```
    output += "<FORM>body.scrollLeft:<INPUT TYPE='text' NAME='xOffset'
SIZE=4><BR>\n"
    output += "body.scrollTop:<INPUT TYPE='text' NAME='yOffset' SIZE=4><BR>\n"
    output += "</FORM></BODY></HTML>"
    return output
}

function rightFrame() {
    var output = "<HTML><HEAD><SCRIPT LANGUAGE='JavaScript'>\n"
    output += "function showOffsets() {\n"
    output += "parent.readout.document.forms[0].xOffset.value =  " +
        "document.body.scrollLeft\n"
    output += "parent.readout.document.forms[0].yOffset.value =  " +
        "document.body.scrollTop\n}\n"
    output += "document.onclick = showOffsets\n"
    output += "<\/SCRIPT></HEAD><BODY><H3>Content Page</H3>\n"
    output += "Scroll this frame and click on a table border to view " +
        "page offset values.<BR><HR>\n"
    output += "<TABLE BORDER=5 WIDTH=800>"
    var oneRow = "<TD>Cell 1</TD><TD>Cell 2</TD><TD>Cell 3</TD><TD>Cell 4</TD>" +
        "<TD>Cell 5</TD>"
    for (var i = 1; i <= 30; i++) {
         output += "<TR><TD><B>Row " + i + "</B></TD>" + oneRow + "</TR>"
    }
    output += "</TABLE></BODY></HTML>"
    return output
}
</SCRIPT>
</HEAD>
<FRAMESET COLS="30%,70%">
    <FRAME NAME="readout" SRC="javascript:parent.leftFrame()">
    <FRAME NAME="display" SRC="javascript:parent.rightFrame()">
</FRAMESET>
</HTML>
```

text

See `aLink`.

topMargin

See `bottomMargin`.

vLink

See `aLink`.

Methods

createTextRange()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-8 for an example of the `createTextRange()` method in action.

doScroll(["*scrollAction*"])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `doScroll()` method in IE5+. Size the browser window so that at least the vertical scrollbar is active (meaning it has a thumb region). Enter the following statement into the top text field and press Enter a few times to simulate clicking the PgDn key:

```
document.body.doScroll()
```

Return to the top of the page and now do the same for scrolling by the increment of the scrollbar down arrow:

```
document.body.doScroll("down")
```

You can also experiment with upward scrolling. Enter the desired statement in the top text field and leave the text cursor in the field. Manually scroll to the bottom of the page and then press Enter to activate the command.

Event Handlers

onAfterPrint
onBeforePrint

See the `onAfterPrint` event handler for the `window` object, Chapter 16.

onScroll

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 18-21 is a highly artificial demonstration of what can be a useful tool for some page designs. Consider a document that occupies a window or frame, but one that you don't want scrolled, even by accident with one of the newer mouse wheels that are popular with Wintel PCs. If scrolling of the content would destroy the appearance or value of the content, then you want to make sure that the page always zips back to the top. The `onScroll` event handler in Listing 18-21 does just that. Notice that the event handler is set as a property of the `document.body` object after the page has loaded. While the event handler can also be set as an attribute of the `<BODY>` tag, to assign it as a property requires the page to load first. Until then, the `document.body` object does not yet officially exist in the object model for this page.

Listing 18-21: Forcing Scrolling to Stay at the Page Top

```
<HTML>
<HEAD>
<TITLE>onScroll Event Handler</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function zipBack() {
    window.scroll(0,0)
}
function init() {
    document.body.onscroll = zipBack
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()">
```

```
<H1>onScroll Event Handler</H1>
<HR>
This page always zips back to the top if you try to scroll it.
<P>
<IFRAME FRAMEBORDER=0 SCROLLING="no" HEIGHT=1000 SRC="bofright.htm"></IFRAME>
</P>
</BODY>
</HTML>
```

Chapter 19 Examples

The following sections contain examples from Chapter 19, "Body Text Objects."

FONT Element Object

Properties

color

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 19-1 contains a page that demonstrates changes to the three FONT element object properties: `color`, `face`, and `size`. Along the way, you can see an economical use of the `setAttribute()` method to do the work for all of the property changes. This page loads successfully in all browsers, but the `SELECT` lists make changes to the text only in IE4+ and NN6+.

A P element contains a nested FONT element that encompasses three words whose appearance is controlled by three select lists. Each list controls one of the three `FONT` object properties, and their `NAME` attributes are strategically assigned the names of the properties (as you see in a moment). `VALUE` attributes for OPTION elements contain strings that are to be assigned to the various properties. Each SELECT element invokes the same `setFontAttr()` function, passing a reference to itself so that the function can inspect details of the element.

The first task of the `setFontAttr()` function is to make sure that only browsers capable of treating the FONT element as an object get to the meat of the function. The test for the existence of `document.all` and the `myFONT` element blocks all older browsers from changing the font characteristics. As the page loads, the `document.all` property is set for NN6 by using a variation of the normalization technique described in Chapter 14.

For suitably equipped browsers, the function next extracts the string from the `value` property of the SELECT object that was passed to the function. If a selection is made (meaning other than the first, empty one), then the single nested statement uses the `setAttribute()` method to assign the value to the attribute whose name matches the name of the SELECT element.

Note

An odd bug in IE5/Mac doesn't let the rendered color change when changing the `color` property. But the setting is valid, as proven by selecting any of the other two property choices.

Listing 19-1: **Controlling FONT Object Properties**

```
<HTML>
<HEAD>
<TITLE>FONT Object Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// document.all normalization trick for NN6
if (navigator.appName == "Netscape" && parseInt(navigator.appVersion) >= 5) {
   document.all = document.getElementsByTagName("*")
}

// one function does all!
function setFontAttr(select) {
    if (document.all && document.all.myFONT) {
        var choice = select.options[select.selectedIndex].value
        if (choice) {
            document.all.myFONT.setAttribute(select.name, choice)
        }
    }
}
</SCRIPT>
</HEAD>

<BODY>
<H1>Font Object Properties</H1>
<BR>
<P>This may look like a simple sentence, but
<FONT ID="myFONT">THESE THREE WORDS</FONT>
are contained by a FONT element.</P>
```

```
<FORM>
Select a text color:
<SELECT NAME="color" onChange="setFontAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="red">Red</OPTION>
    <OPTION VALUE="green">Green</OPTION>
    <OPTION VALUE="blue">Blue</OPTION>
    <OPTION VALUE="#FA8072">Some Hex Triplet Value</OPTION>
</SELECT>
<BR>
Select a font face:
<SELECT NAME="face" onChange="setFontAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="Helvetica">Helvetica</OPTION>
    <OPTION VALUE="Times">Times</OPTION>
    <OPTION VALUE="Comic Sans MS, sans-serif">Comic Sans MS, sans-serif</OPTION>
    <OPTION VALUE="Courier, monospace">Courier, monospace</OPTION>
    <OPTION VALUE="Zapf Dingbats, serif">Zapf Dingbats, serif</OPTION>
</SELECT>
<BR>
Select a font size:
<SELECT NAME="size" onChange="setFontAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="3">3 (Default)</OPTION>
    <OPTION VALUE="+1">Increase Default by 1</OPTION>
    <OPTION VALUE="-1">Decrease Default by 1</OPTION>
    <OPTION VALUE="1">Smallest</OPTION>
    <OPTION VALUE="7">Biggest</OPTION>
</SELECT>
</BODY>
</HTML>
```

face

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-1 for an example of values that can be used to set the `face` property of a FONT element object. While you will notice visible changes to most choices on the page, the font face selections may not change from one choice to another, which all depends on the fonts that are installed on your PC.

size

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-1 for an example of values that can be used to set the `size` property of a FONT element object. Notice that incrementing or decrementing the `size` property is applied only to the size assigned to the `SIZE` attribute of the element (or the default, if none is specified) and not the current setting adjusted by script.

HR Element Object

Properties

align

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 19-2 contains a page that demonstrates the changes to the five HR element object properties: `align`, `color`, `noShade`, `size`, and `width`. Along the way, you can see an economical use of the `setAttribute()` method to do the work for all of the property changes. This page loads successfully in all browsers, but the SELECT lists make changes to the text only in IE4+ and NN6+ (because they treat the element as an object).

An HR element (whose ID is `myHR`) is displayed with the browser default settings (100% width, centered, and its "magic" color). Each list controls one of the five HR object properties, and their `NAME` attributes are strategically assigned the names of the properties (as you see in a moment). `VALUE` attributes for OPTION elements contain strings that are to be assigned to the various properties. Each SELECT element invokes the same `setHRAttr()` function, passing a reference to itself so that the function can inspect details of the element.

The first task of the `setHRAttr()` function is to make sure that only browsers capable of treating the `HR` element as an object get to the meat of the function. As the page loads, the `document.all` property is set for NN6 using a normalization technique described in Chapter 14.

For suitably equipped browsers, the function next reads the string from the `value` property of the SELECT object that is passed to the function. If a selection is made (that is, other than the first, empty one), then the single, nested statement uses the `setAttribute()` method to assign the value to the attribute whose name matches the name of the SELECT element.

Listing 19-2: **Controlling HR Object Properties**

```
<HTML>
<HEAD>
<TITLE>HR Object Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// document.all normalization trick for NN6
if (navigator.appName == "Netscape" && parseInt(navigator.appVersion) >= 5) {
   document.all = document.getElementsByTagName("*")
}

// one function does all!
function setHRAttr(select) {
    if (document.all && document.all.myHR) {
        var choice = select.options[select.selectedIndex].value
        if (choice) {
            document.all.myHR.setAttribute(select.name, choice)
        }
    }
}
</SCRIPT>
</HEAD>

<BODY>
<H1>HR Object Properties</H1>
<BR>
<P>Here is the HR element you will be controlling:</P>
<HR ID="myHR">
<FORM>
Select an alignment:
<SELECT NAME="align" onChange="setHRAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="left">Left</OPTION>
    <OPTION VALUE="center">Center</OPTION>
    <OPTION VALUE="right">Right</OPTION>
```

Continued

Listing 19-2 *(continued)*

```
</SELECT>
<BR>
Select a rule color (IE only):
<SELECT NAME="color" onChange="setHRAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="red">Red</OPTION>
    <OPTION VALUE="green">Green</OPTION>
    <OPTION VALUE="blue">Blue</OPTION>
    <OPTION VALUE="#FA8072">Some Hex Triplet Value</OPTION>
</SELECT>
<BR>
Select a rule shading:
<SELECT NAME="noShade" onChange="setHRAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE=true>No Shading</OPTION>
    <OPTION VALUE=false>Shading</OPTION>
</SELECT>
<BR>
Select a rule height:
<SELECT NAME="size" onChange="setHRAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE=2>2 (Default)</OPTION>
    <OPTION VALUE=4>4 Pixels</OPTION>
    <OPTION VALUE=10>10 Pixels</OPTION>
</SELECT>
<BR>
Select a rule width:
<SELECT NAME="width" onChange="setHRAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="100%">100% (Default)</OPTION>
    <OPTION VALUE="80%">80%</OPTION>
    <OPTION VALUE=300>300 Pixels </OPTION>
</SELECT>
</BODY>
</HTML>
```

color

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-2 earlier in this chapter for an example of values that can be used to set the `color` property of an HR element object.

noShade

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-2 earlier in this chapter for an example of values that can be used to set the `noShade` property of an HR element object. Because of the buggy behavior associated with setting this property, adjusting the property in the example has unexpected (and usually undesirable) consequences.

size

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-2 earlier in this chapter for an example of values that can be used to set the `size` property of an HR element object.

width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 19-2 earlier in this chapter for an example of values that can be used to set the `width` property of an HR element object.

MARQUEE Element Object

Properties

behavior

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-3 contains a page that demonstrates the changes to several MARQUEE element object properties: `behavior`, `bgColor`, `direction`, `scrollAmount`, and `scrollDelay`. This page and scripts are intended only for IE4+. See the description of Listing 19-1 for details on the attribute setting script.

Listing 19-3: Controlling MARQUEE Object Properties

```
<HTML>
<HEAD>
<TITLE>MARQUEE Object Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// one function does all!
function setMARQUEEAttr(select) {
    if (document.all && document.all.myMARQUEE) {
        var choice = select.options[select.selectedIndex].value
        if (choice) {
            document.all.myMARQUEE.setAttribute(select.name, choice)
        }
    }
}
</SCRIPT>
</HEAD>

<BODY>
<H1>MARQUEE Object Properties</H1>
<BR>
<HR>
<MARQUEE ID="myMARQUEE" WIDTH=400 HEIGHT=24>This is the MARQUEE element object
you will be controlling.</MARQUEE>
<FORM>
```

```
<INPUT TYPE="button" VALUE="Start Marquee"
onClick="document.all.myMARQUEE.start()">
<INPUT TYPE="button" VALUE="Stop Marquee"
onClick="document.all.myMARQUEE.stop()">
<BR>
Select a behavior:
<SELECT NAME="behavior" onChange="setMARQUEEAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="alternate">Alternate</OPTION>
    <OPTION VALUE="scroll">Scroll</OPTION>
    <OPTION VALUE="slide">Slide</OPTION>
</SELECT>
<BR>
Select a background color:
<SELECT NAME="bgColor" onChange="setMARQUEEAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="red">Red</OPTION>
    <OPTION VALUE="green">Green</OPTION>
    <OPTION VALUE="blue">Blue</OPTION>
    <OPTION VALUE="#FA8072">Some Hex Triplet Value</OPTION>
</SELECT>
<BR>
Select a scrolling direction:
<SELECT NAME="direction" onChange="setMARQUEEAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE="left">Left</OPTION>
    <OPTION VALUE="right">Right</OPTION>
    <OPTION VALUE="up">Up</OPTION>
    <OPTION VALUE="down">Down</OPTION>
</SELECT>
<BR>
Select a scroll amount:
<SELECT NAME="scrollAmount" onChange="setMARQUEEAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE=4>4</OPTION>
    <OPTION VALUE=6>6 (Default)</OPTION>
    <OPTION VALUE=10>10</OPTION>
</SELECT>
<BR>
Select a scroll delay:
<SELECT NAME="scrollDelay" onChange="setMARQUEEAttr(this)">
    <OPTION></OPTION>
    <OPTION VALUE=50>Short</OPTION>
    <OPTION VALUE=85>Normal</OPTION>
    <OPTION VALUE=125>Long</OPTION>
</SELECT>
</BODY>
</HTML>
```

bgColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-3 earlier in this chapter for an example of how to apply values to the `bgColor` property.

direction

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-3 earlier in this chapter for an example of how to apply values to the `direction` property.

scrollAmount
scrollDelay

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-3 earlier in this chapter for an example of how to apply values to the `scrollAmount` and `scrollDelay` properties.

Methods

start()
stop()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-3 earlier in this chapter for examples of both the `start()` and `stop()` methods, which are invoked in event handlers of separate controlling buttons on the page. Notice, too, that when you have the behavior set to `slide`, stopping and restarting the MARQUEE does not cause the scroll action to start from a blank region.

Range Object

Properties

collapsed

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `collapsed` property. Reload the page and assign a new range to the `a` global variable by typing the following statement into the top text box:

```
a = document.createRange()
```

Next, set the range to encompass a node:

```
a.selectNode(document.body)
```

Enter a.collapsed into the top text box . The expression returns false because the end points of the range are not the same.

commonAncestorContainer

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the commonAncestorContainer property. Reload the page and assign a new range to the a global variable by typing the following statement into the top text box:

```
a = document.createRange()
```

Now set the start point to the beginning of the contents of the myEM element and set the end point to the end of the surrounding myP element:

```
a.setStartBefore(document.getElementById("myEM").firstChild)
a.setEndAfter(document.getElementById("myP").lastChild)
```

Verify that the text range is set to encompass content from the myEM node (the word “all”) and end of myP nodes:

```
a.toString()
```

Verify, too, that the two end point containers are different nodes:

```
a.startContainer.tagName
a.endContainer.tagName
```

Finally, see what node contains both of these two end points:

```
a.commonAncestorContainer.id
```

The result is the myP element, which both the myP and myEM nodes have in common.

endContainer
startContainer

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `endContainer` and `startContainer` properties. Reload the page and assign a new range to the `a` global variable by typing the following statement into the top text box:

```
a = document.createRange()
```

Now set the range to encompass the `myEM` element:

```
a.selectNode(document.getElementById("myEM")
```

Inspect the containers for both the start and end points of the selection:

```
a.startContainer.id
a.endContainer.id
```

The range encompasses the entire `myEM` element, so the start and end points are outside of the element. Therefore, the container of both start and end points is the `myP` element that also surrounds the `myEM` element.

endOffset
startOffset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with the `endOffset` and `startOffset` properties, following similar paths you just saw in the description.

Reload the page and assign a new range to the a global variable by typing the following statement into the top text box:

```
a = document.createRange()
```

Now set the range to encompass the myEM element and then move the start point outward to a character within the myP element's text node:

```
a.selectNode(document.getElementById("myEM"))
a.setStart(document.getElementById("myP").firstChild, 7)
```

Inspect the node types of the containers for both the start and end points of the selection:

```
a.startContainer.nodeType
a.endContainer.nodeType
```

The startContainer node type is 3 (text node), while the endContainer node type is 1 (element). Now inspect the offsets for both the start and end points of the selection:

```
a.startOffset
a.endOffset
```

Methods

cloneContents()
cloneRange()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

When Netscape outfits the NN6 browser with the cloneContents() method, use The Evaluator (Chapter 13) to see the method in action. Begin by creating a new range object that contains the text of the myP paragraph element.

```
a = document.createRange()
a.selectNode(document.getElementById("myP")
```

Next, clone the original range and preserve the copy in variable `b`:

```
b = a.cloneContents()
```

Move the original range so that it is an insertion point at the end of the body by first expanding it to encompass the entire body and then collapse it to the end

```
a.selectNode(document.body)
a.collapse(false)
```

Now, insert the copy at the very end of the body:

```
a.insertNode(b)
```

If you scroll to the bottom of the page, you see a copy of the text.

See the description of the `compareBoundaryPoints()` method later in this chapter to see an example of the `cloneRange()` method.

collapse([*startBoolean*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

See Listings 19-11 and 15-14 to see the `collapse()` method at work (albeit with the IE `TextRange` object).

compareBoundaryPoints(*typeInteger*, *sourceRangeRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

The page rendered by Listing 19-4 lets you experiment with text range comparisons in NN6+. The bottom paragraph contains a SPAN element that has a `Range` object assigned to its nested text node after the page loads (in the `init()` function). That fixed range becomes a solid reference point for you to use while you select text in the paragraph.

> **Note**
>
> Unfortunately, the `window` object method that converts a user selection into an object is not connected correctly in the first release of NN6. Even if it were, the inverted values returned by the `compareBoundaryPoints()` method would give you incorrect results. Try this example on subsequent versions of NN6.

After you make a selection, all four versions of the `compareBoundaryPoints()` method run to compare the start and end points of the fixed range against your selection. One column of the results table shows the raw value returned by the `compareBoundaryPoints()` method, while the third column puts the results into plain language.

To see how this page works, begin by selecting the first word of the fixed text range (carefully drag the selection from the first red character). You can see that the starting positions of both ranges are the same, because the returned value is `0`. Because all of the invocations of the `compareBoundaryPoints()` method are on the fixed text range, all comparisons are from the point of view of that range. Thus, the first row of the table for the `START_TO_END` parameter indicates that the start point of the fixed range comes before the end point of the selection, yielding a return value of `-1`.

Other selections to make include:

- ✦ Text that starts before the fixed range and ends inside the range
- ✦ Text that starts inside the fixed range and ends beyond the range
- ✦ Text that starts and ends precisely at the fixed range boundaries
- ✦ Text that starts and ends before the fixed range
- ✦ Text that starts after the fixed range

Study the returned values and the plain language results and see how they align with the selection you made.

Listing 19-4: **Lab for NN6 compareBoundaryPoints() Method**

```
<HTML>
<HEAD>
<TITLE>TextRange.compareBoundaryPoints() Method</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
.propName {font-family:Courier, monospace}
```

```
#fixedRangeElem {color:red; font-weight:bold}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
var fixedRange

function setAndShowRangeData() {
    try {
        var selectedRange = window.getSelection()
        selectedRange = selectedRange.getRangeAt(0)
        var result1 = fixedRange.compareBoundaryPoints(Range.START_TO_END,
            selectedRange)
        var result2 = fixedRange.compareBoundaryPoints(Range.START_TO_START,
            selectedRange)
        var result3 = fixedRange.compareBoundaryPoints(Range.END_TO_START,
            selectedRange)
        var result4 = fixedRange.compareBoundaryPoints(Range.END_TO_END,
            selectedRange)

        document.getElementById("B1").innerHTML = result1
        document.getElementById("compare1").innerHTML = getDescription(result1)
        document.getElementById("B2").innerHTML = result2
        document.getElementById("compare2").innerHTML = getDescription(result2)
        document.getElementById("B3").innerHTML = result3
        document.getElementById("compare3").innerHTML = getDescription(result3)
        document.getElementById("B4").innerHTML = result4
        document.getElementById("compare4").innerHTML = getDescription(result4)
    }
    catch(err) {
        alert("Vital Range object services are not yet implemented in this
browser.")
    }
}

function getDescription(comparisonValue) {
    switch (comparisonValue) {
        case -1 :
            return "comes before"
            break
        case 0 :
            return "is the same as"
            break
        case 1 :
            return "comes after"
            break
        default :
            return "vs."
    }
}
```

Continued

Listing 19-4 *(continued)*

```
function init() {
    fixedRange = document.createRange()
    fixedRange.selectNodeContents(document.getElementById("fixedRangeElem").
    firstChild)
    fixedRange.setEnd(fixedRange.endContainer,
fixedRange.endContainer.nodeValue.length)
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()">
<H1>TextRange.compareBoundaryPoints() Method</H1>
<HR>
<P>Select text in the paragraph in various places relative to
the fixed text range (shown in red). See the relations between
the fixed and selected ranges with respect to their start
and end points.</P>
<TABLE ID="results" BORDER=1 CELLSPACING=2 CELLPADDING=2>
<TR><TH>Property</TH><TH>Returned Value</TH><TH>Fixed Range vs. Selection</TR>
<TR>
    <TD CLASS="propName">StartToEnd</TD>
    <TD CLASS="count" ID="B1"> </TD>
    <TD CLASS="count" ID="C1">Start of Fixed <SPAN ID="compare1">vs.</SPAN>
    End of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">StartToStart</TD>
    <TD CLASS="count" ID="B2"> </TD>
    <TD CLASS="count" ID="C2">Start of Fixed <SPAN ID="compare2">vs.</SPAN>
    Start of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">EndToStart</TD>
    <TD CLASS="count" ID="B3"> </TD>
    <TD CLASS="count" ID="C3">End of Fixed <SPAN ID="compare3">vs.</SPAN>
    Start of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">EndToEnd</TD>
    <TD CLASS="count" ID="B4"> </TD>
    <TD CLASS="count" ID="C4">End of Fixed <SPAN ID="compare4">vs.</SPAN>
    End of Selection</TD>
</TR>
</TABLE>
<HR>
<P onMouseUp="setAndShowRangeData()">
```

```
Lorem ipsum dolor sit, <SPAN ID="fixedRangeElem">consectetaur adipisicing
elit</SPAN>,
sed do eiusmod tempor incididunt ut labore et dolore aliqua. Ut enim adminim
veniam,
quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo
consequat.</P>
</BODY>
</HTML>
```

createContextualFragment("*text*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to create a document fragment and replace an existing document tree node with the fragment. Begin by creating the range and fragment:

```
a = document.createRange()
a.selectNode(document.body)
b = a.createContextualFragment("<SPAN STYLE='font-size:22pt'>a bunch of
</SPAN>")
```

This fragment consists of a SPAN element node with a text node nested inside. At this point, you can inspect the properties of the document fragment by entering `b` into the bottom text box.

To replace the `myEM` element on the page with this new fragment, use the `replaceChild()` method on the enclosing `myP` element:

```
document.getElementById("myP").replaceChild(b, document.getElementById("myEM"))
```

The fragment now becomes a legitimate child node of the `myP` element and can be referenced like any node in the document tree. For example, if you enter the following statement into the top text box of The Evaluator, you can retrieve a copy of the text node inside the new SPAN element:

```
document.getElementById("myP").childNodes[1].firstChild.nodeValue
```

deleteContents()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with deleting contents of both a text node and a complete element node. Begin by creating a text range for the text node inside the `myEM` element (enter the third statement, which wraps below, as one continous expression):

```
a = document.createRange()
a.setStart(document.getElementById("myEM").firstChild, 0)
a.setEnd(document.getElementById("myEM").lastChild,
    document.getElementById("myEM").lastChild.length)
```

Verify the makeup of the range by entering `a` into the bottom text box and inspect its properties. Both containers are text nodes (they happen to be the same text node), and offsets are measured by character positions.

Now, delete the contents of the range:

```
a.deleteContents()
```

The italicized word “all” is gone from the tree, but the `myEM` element is still there. To prove it, put some new text inside the element:

```
document.getElementById("myEM").innerHTML = "a band of "
```

The italic style of the EM element applies to the text, as it should.

Next, adjust the range boundaries to include the `myEM` element tags, as well:

```
a.selectNode(document.getElementById("myEM"))
```

Inspect the `Range` object’s properties again by entering `a` into the bottom text box. The container nodes are the P element that surrounds the EM element; the offset values are measured in nodes. Delete the range’s contents:

```
a.deleteContents()
```

Not only is the italicized text gone, but the myEM element is gone, too. The myP element now has but one child node, the text node inside. The following entries into the top text box of The Evaluator verify this fact:

```
document.getElementById("myP").childNodes.length
document.getElementById("myP").childNodes[0].nodeValue
```

If you try this example in early versions of NN6, however, you see that the deleteContents() method also removes the text node following the myEM element. This is buggy behavior, demonstrating that the method works best on text nodes, rather than elements.

extractContents()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

When Netscape outfits the NN6 browser with the extractContents() method, use The Evaluator (Chapter 13) to see how the method works. Begin by creating a new range object that contains the text of the myP paragraph element.

```
a = document.createRange()
a.selectNode(document.getElementById("myP"))
```

Next, extract the original range's content and preserve the copy in variable b:

```
b = a.extractContents()
```

Move the original range so that it is an insertion point at the end of the body by first expanding it to encompass the entire body and then collapse it to the end

```
a.selectNode(document.body)
a.collapse(false)
```

Now, insert the extracted fragment at the very end of the body:

```
a.insertNode(b)
```

If you scroll to the bottom of the page, you see a copy of the text.

insertNode(*nodeReference*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 19-5, which relies on `selection` and `Range` object features not implemented in the first release of NN6, demonstrates the `insertNode()` method plus some additional items from the NN6 `selection` object. The example even includes a rudimentary undo buffer for scripted changes to a text range. In the page generated by this listing, users can select any text in a paragraph and have the script automatically convert the text to all uppercase characters. The task of replacing a selection with other text requires several steps, starting with the selection, which is retrieved via the `window.getSelection()` method. After making sure the selection contains some text (that is, the selection isn't collapsed), the selection is preserved as a range object so that the starting text can be stored in a global variable (as a property of the `undoBuffer` global variable object). After that, the selection is deleted from the document tree, leaving the selection as a collapsed insertion point. A copy of that selection in the form of a range object is preserved in the `undoBuffer` object so that the undo script knows where to reinsert the original text. A new text node is created with an uppercase version of the original text, and, finally, the `insertNode()` method is invoked to stick the converted text into the collapsed range.

Undoing this operation works in reverse. Original locations and strings are copied from the `undoBuffer` object. After creating the range with the old start and end points (which represent a collapsed insertion point), the resurrected text (converted to a text node) is inserted into the collapsed range. For good housekeeping, the `undoBuffer` object is restored to its unused form.

Listing 19-5: **Inserting a Node into a Range**

```
<HTML>
<HEAD>
<TITLE>NN Selection Object Replacement</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var undoBuffer = {rng:null, txt:""}
function convertSelection() {
    var sel, grossRng, netRng, newText
    try {
        sel = window.getSelection()
```

```
        if (!sel.isCollapsed) {
            grossRng = sel.getRangeAt(0)
            undoBuffer.txt = grossRng.toString()
            sel.deleteFromDocument()
            netRng = sel.getRangeAt(0)
            undoBuffer.rng = netRng
            newText = document.createTextNode(undoBuffer.txt.toUpperCase())
            netRng.insertNode(newText)
        }
    }
    catch(err) {
        alert("Vital Range object services are not yet implemented in this
browser.")
    }
}
function undoConversion() {
    var rng, oldText
    if (undoBuffer.rng) {
        rng = document.createRange()
        rng.setStart(undoBuffer.rng.startParent, undoBuffer.rng.startOffset)
        rng.setEnd(undoBuffer.rng.endParent, undoBuffer.rng.endOffset)
        oldText = document.createTextNode(undoBuffer.txt)
        rng.insertNode(oldText)
        undoBuffer.rng = null
        undoBuffer.txt = ""
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1 ID="H1_1">NN6 Selection Object Replacement</H1>
<HR>
<P ID="P_1" onMouseUp="convertSelection()">This paragraph
contains text that you can select. Selections are deleted and
replaced by all uppercase versions of the selected text.</P>
<BUTTON onClick="undoConversion()">Undo Last</BUTTON>
<BUTTON onClick="location.reload(true)">Start Over</BUTTON>
</BODY>
</HTML>
```

isValidFragment("*HTMLText*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

You can try the validity of any strings that you like in The Evaluator (Chapter 13). You will discover, however, that the object model can make a document fragment out of just about any string. For instance, if you attempt to create a document fragment out of some random text and an end tag, the document fragment will consist of a text node and an element node of the type indicated by the end tag.

selectNode(*nodeReference*)
selectNodeContents(*nodeReference*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to see the behavior of both the `selectNode()` and `selectNodeContents()` methods work. Begin by creating a new range object.

```
a = document.createRange()
```

Set the range boundaries to include the `myP` element node:

```
a.selectNode(document.getElementById("myP"))
```

Enter `a` into the bottom text box to view the properties of the range. Notice that because the range has selected the entire paragraph node, the container of the range's start and end points is the BODY element of the page (the parent element of the `myP` element).

Now change the range so that it encompasses only the contents of the `myP` element:

```
a.selectNodeContents(document.getElementById("myP"))
```

Click the List Properties button to view the current properties of the range. The container of the range's boundary points is the P element that holds the element's contents.

`setEnd(nodeReference, offset)`
`setStart(nodeReference, offset)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with both the `setStart()` and `setEnd()` methods. Begin by creating a new range object.

```
a = document.createRange()
```

For the first range, set the start and end points to encompass the second node (the `myEM` element) inside the `myP` element:

```
a.setStart(document.getElementById("myP"), 1)
a.setEnd(document.getElementById("myP"), 2)
```

The text encompassed by the range consists of the word “all” plus the trailing space that is contained by the `myEM` element. Prove this by entering the following statement into the top text box:

```
a.toString()
```

If you then click the Results box to the right of the word “all,” you see that the results contain the trailing space. Yet, if you examine the properties of the range (enter `a` into the bottom text box), you see that the range is defined as actually starting before the `myEM` element and ending after it.

Next, adjust the start point of the range to a character position inside the first text node of the `myP` element:

```
a.setStart(document.getElementById("myP").firstChild, 11)
```

Click the List Properties button to see that the `startContainer` property of the range is the text node, and that the `startOffset` measures the character position. All end boundary properties, however, have not changed. Enter `a.toString()` in the top box again to see that the range now encompasses text from two of the nodes inside the `myP` element.

You can continue to experiment by setting the start and end points to other element and text nodes on the page. After each adjustment, verify the properties of the `a` range object and the text it encompasses (via `a.toString()`).

setEndAfter(*nodeReference*)
setEndBefore(*nodeReference*)
setStartAfter(*nodeReference*)
setStartBefore(*nodeReference*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to experiment with all four methods. Begin by creating a new rnge object.

```
a = document.createRange()
```

For the first range, set the start and end points to encompass the `myEM` element inside the `myP` element:

```
a.setStartBefore(document.getElementById("myEM"))
a.setEndAfter(document.getElementById("myEM"))
```

The text encompassed by the range consists of the word "all" plus the trailing space that is contained by the `myEM` element. Prove this by entering the following statement into the top text box:

```
a.toString()
```

Next, adjust the start point of the range to the beginning of the first text node of the `myP` element:

```
a.setStartBefore(document.getElementById("myP").firstChild)
```

Enter `a` into the bottom text box to see that the `startParent` property of the range is the `P` element node, while the `endParent` property points to the EM element.

You can continue to experiment by setting the start and end points to before and after other element and text nodes on the page. After each adjustment, verify the properties of the `a` range object and the text it encompasses (via `a.toString()`).

surroundContents(*nodeReference*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 19-6, which relies on `selection` and `Range` object features not implemented in the first release of NN6, demonstrates how the `surroundContents()` method wraps a range inside a new element. As the page loads, a global variable (`newSpan`) stores a SPAN element that is used as a prototype for elements to be used as new surrounding parent nodes. When you select text in either of the two paragraphs, the selection is converted to a range. The `surroundContents()` method then wraps the range with the `newSpan` element. Because that SPAN element has a class name of `hilite`, the element and its contents pick up the style sheet properties as defined for that class selector.

Listing 19-6: **Using the Range.surroundContents() Method**

```
<HTML>
<HEAD>
<TITLE>Range.surroundContents() Method</TITLE>
<STYLE TYPE="text/css">
.hilite {background-color:yellow; color:red; font-weight:bold}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
var newSpan = document.createElement("SPAN")
newSpan.className = "hilite"

function highlightSelection() {
    var sel, rng
    try {
        sel = window.getSelection()
        if (!sel.isCollapsed) {
            rng = sel.getRangeAt(0)
            rng.surroundContents(newSpan.cloneNode(false))
        }
    }
    catch(err) {
        alert("Vital Range object services are not yet implemented in this
browser.")
```

Continued

Listing 19-6 *(continued)*

```
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Range.surroundContents() Method</H1>
<HR>
<P onMouseUp="highlightSelection()">These paragraphs
contain text that you can select. Selections are surrounded
by SPAN elements that share a stylesheet class selector
for special font and display characteristics.</P>

<P onMouseUp="highlightSelection()">Lorem ipsum dolor
sit amet, consectetaur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna
aliqua. Ut enim adminim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.</P>
</BODY>
</HTML>
```

toString()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) to see the results of the `toString()` method. Enter the following sequence of statements into the top text box:

```
a = document.createRange()
a.selectNode(document.getElementById("myP"))
a.toString()
```

If you type only `a` into the top text box, you see the text contents of the range, but don't be fooled. Internal workings of The Evaluator attempt to evaluate any expression entered into that text field. Assigning a range object to a text box forces an internal application of the `toString()` method (just as the `Date` object does when you create a new object instance in The Evaluator).

selection Object

Properties

type

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-7 contains a page that demonstrates several features of the `selection` object. When you make a selection with the Deselect radio button selected, you see the value of the `selection.type` property (in the statusbar) before and after the selection is deselected. After the selection goes away, the `type` property returns `None`.

Listing 19-7: Using the document.selection Object

```
<HTML>
<HEAD>
<TITLE>selection Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function processSelection() {
    if (document.choices.process[0].checked) {
        status = "Selection is type: " + document.selection.type
        setTimeout("emptySelection()", 2000)
    } else if (document.choices.process[1].checked) {
        var rng = document.selection.createRange()
        document.selection.clear()
    }
}
function emptySelection() {
    document.selection.empty()
    status = "Selection is type: " + document.selection.type
}
</SCRIPT>
</HEAD>
<BODY>
<H1>IE selection Object</H1>
<HR>
```

Continued

Listing 19-7 *(continued)*

```
<FORM NAME="choices">
<INPUT TYPE="radio" NAME="process" CHECKED>De-select after two seconds<BR>
<INPUT TYPE="radio" NAME="process">Delete selected text.
</FORM>
<P onMouseUp="processSelection()">Lorem ipsum dolor sit amet, consectetaur
adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna
aliqua. Ut enim adminim veniam, quis nostrud exercitation ullamco laboris nisi
ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit
involuptate velit esse cillum dolore eu fugiat nulla pariatur.
</BODY>
</HTML>
```

Methods

clear()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-7 earlier in this chapter to see the `selection.clear()` method at work.

createRange()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listings 15-36 and 15-45 to see the `selection.createRange()` method turn user selections into text ranges.

empty()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-7 earlier in this chapter to view the `selection.empty()` method at work.

Text and TextNode Objects

Properties

data

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

In the Chapter 15 example for the `nodeValue` property used in a text replacement script, you can substitute the `data` property for `nodeValue` to accomplish the same result.

Methods

appendData("*text*")
deleteData(*offset*, *count*)
insertData(*offset*, "*text*")
replaceData(*offset*, *count*, "*text*")
substringData(*offset*, *count*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

The page created by Listing 19-8 is a working laboratory that you can use to experiment with the five data-related methods in NN6+. The text node that invokes the methods is a simple sentence in a P element. Each method has its own clickable button, followed by two or three text boxes into which you enter values for method parameters. Don't be put off by the length of the listing. Each method's operation is confined to its own function and is fairly simple.

Each of the data-related methods throws exceptions of different kinds. To help handle these errors gracefully, the method calls are wrapped inside a `try/catch` construction. All caught exceptions are routed to the `handleError()` function where details of the error are inspected and friendly alert messages are displayed to the user. See Chapter 39 for details on the `try/catch` approach to error handling in W3C DOM-capable browsers.

Listing 19-8: Text object Data Method Laboratory

```
<HTML>
<HEAD>
<TITLE>Data Methods of a W3C Text Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doAppend(form) {
    var node = document.getElementById("myP").firstChild
    var newString = form.appendStr.value
    try {
        node.appendData(newString)
    }
    catch(err) {
```

```
        handleError(err)
    }
}
function doDelete(form) {
    var node = document.getElementById("myP").firstChild
    var offset = form.deleteOffset.value
    var count = form.deleteCount.value
    try {
        node.deleteData(offset, count)
    }
    catch(err) {
        handleError(err)
    }
}
function doInsert(form) {
    var node = document.getElementById("myP").firstChild
    var offset = form.insertOffset.value
    var newString = form.insertStr.value
    try {
        node.insertData(offset, newString)
    }
    catch(err) {
        handleError(err)
    }

}

function doReplace(form) {
    var node = document.getElementById("myP").firstChild
    var offset = form.replaceOffset.value
    var count = form.replaceCount.value
    var newString = form.replaceStr.value
    try {
        node.replaceData(offset, count, newString)
    }
    catch(err) {
        handleError(err)
    }
}
function showSubstring(form) {
    var node = document.getElementById("myP").firstChild
    var offset = form.substrOffset.value
    var count = form.substrCount.value
    try {
        alert(node.substringData(offset, count))
    }
    catch(err) {
        handleError(err)
    }
}
```

Continued

Listing 19-8 *(continued)*

```
// error handler for these methods
function handleError(err) {
    switch (err.name) {
        case "NS_ERROR_DOM_INDEX_SIZE_ERR":
            alert("The offset number is outside the allowable range.")
            break
        case "NS_ERROR_DOM_NOT_NUMBER_ERR":
            alert("Make sure each numeric entry is a valid number.")
            break
        default:
            alert("Double-check your text box entries.")
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Data Methods of a W3C Text Object</H1>
<HR>
<P ID="myP" STYLE="font-weight:bold; text-align:center">
So I called myself Pip, and became to be called Pip.</P>
<FORM NAME="choices">
<P><INPUT TYPE="button" onClick="doAppend(this.form)" VALUE="appendData()">
String:<INPUT TYPE="text" NAME="appendStr" SIZE=30></P>

<P><INPUT TYPE="button" onClick="doDelete(this.form)" VALUE="deleteData()">
Offset:<INPUT TYPE="text" NAME="deleteOffset" SIZE=3>
Count:<INPUT TYPE="text" NAME="deleteCount" SIZE=3></P>

<P><INPUT TYPE="button" onClick="doInsert(this.form)" VALUE="insertData()">
Offset:<INPUT TYPE="text" NAME="insertOffset" SIZE=3>
String:<INPUT TYPE="text" NAME="insertStr" SIZE=30></P>

<P><INPUT TYPE="button" onClick="doReplace(this.form)" VALUE="replaceData()">
Offset:<INPUT TYPE="text" NAME="replaceOffset" SIZE=3>
Count:<INPUT TYPE="text" NAME="replaceCount" SIZE=3>
String:<INPUT TYPE="text" NAME="replaceStr" SIZE=30></P>

<P><INPUT TYPE="button" onClick="showSubstring(this.form)"
VALUE="substringData()">
Offset:<INPUT TYPE="text" NAME="substrOffset" SIZE=3>
Count:<INPUT TYPE="text" NAME="substrCount" SIZE=3></P>

</FORM>
</BODY>
</HTML>
```

splitText(*offset*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	✓

Example

Use The Evaluator (Chapter 13) to see the `splitText()` method in action. Begin by verifying that the `myEM` element has but one child node, and that its `nodeValue` is the string "all":

```
document.getElementById("myEM").childNodes.length
document.getElementById("myEM").firstChild.nodeValue
```

Next, split the text node into two pieces after the first character:

```
document.getElementById("myEM").firstChild.splitText(1)
```

Two text nodes are now inside the element:

```
document.getElementById("myEM").childNodes.length
```

Each text node contains its respective portion of the original text:

```
document.getElementById("myEM").firstChild.nodeValue
document.getElementById("myEM").lastChild.nodeValue
```

If you are using NN6, now bring the text nodes back together:

```
document.getElementById("myEM").normalize()
document.getElementById("myEM").childNodes.length
```

At no time during these statement executions does the rendered text change.

TextRange Object

Properties

boundingHeight
boundingLeft
boundingTop
boundingWidth

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-9 provides a simple playground to explore the four bounding properties (and two offset properties) of a `TextRange` object. As you select text in the big paragraph, the values of all six properties are displayed in the table. Values are also updated if you resize the window via an `onResize` event handler.

Notice, for example, if you simply click in the paragraph without dragging a selection, the `boundingWidth` property shows up as zero. This action is the equivalent of a `TextRange` acting as an insertion point.

Listing 19-9: Exploring the Bounding TextRange Properties

```
<HTML>
<HEAD>
<TITLE>TextRange Object Dimension Properties</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
.propName {font-family: Courier, monospace}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function setAndShowRangeData() {
    var range = document.selection.createRange()
    B1.innerText = range.boundingHeight
    B2.innerText = range.boundingWidth
    B3.innerText = range.boundingTop
    B4.innerText = range.boundingLeft
    B5.innerText = range.offsetTop
```

```
    B6.innerText = range.offsetLeft
}
</SCRIPT>
</HEAD>

<BODY onResize="setAndShowRangeData()">
<H1>TextRange Object Dimension Properties</H1>
<HR>
<P>Select text in the paragraph below and observe the "bounding"
property values for the TextRange object created for that selection.</P>
<TABLE ID="results" BORDER=1 CELLSPACING=2 CELLPADDING=2>
<TR><TH>Property</TH><TH>Pixel Value</TH></TR>
<TR>
    <TD CLASS="propName">boundingHeight</TD>
    <TD CLASS="count" ID="B1"> </TD>
</TR>
<TR>
    <TD CLASS="propName">boundingWidth</TD>
    <TD CLASS="count" ID="B2"> </TD>
</TR>
<TR>
    <TD CLASS="propName">boundingTop</TD>
    <TD CLASS="count" ID="B3"> </TD>
</TR>
<TR>
    <TD CLASS="propName">boundingLeft</TD>
    <TD CLASS="count" ID="B4"> </TD>
</TR>
<TR>
    <TD CLASS="propName">offsetTop</TD>
    <TD CLASS="count" ID="B5"> </TD>
</TR>
<TR>
    <TD CLASS="propName">offsetLeft</TD>
    <TD CLASS="count" ID="B6"> </TD>
</TR>
</TABLE>
<HR>
<P onMouseUp="setAndShowRangeData()">
Lorem ipsum dolor sit amet, consectetaur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua. Ut enim adminim veniam,
quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo
consequat. Duis aute irure dolor in reprehenderit involuptate velit esse
cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat
non proident, sunt in culpa qui officia deseruntmollit anim id est laborum
Et harumd und lookum like Greek to me, dereud facilis est er expedit.
</P>
</BODY>
</HTML>
```

htmlText

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to investigate values returned by the `htmlText` property. Use the top text box to enter the following statements and see the values in the Results box.

Begin by creating a `TextRange` object for the entire body and store the range in local variable `a`:

```
a = document.body.createTextRange()
```

Next, use the `findText()` method to set the start and end points of the text range around the word “all,” which is an EM element inside the `myP` paragraph:

```
a.findText("all")
```

The method returns `true` (see the `findText()` method) if the text is found and the text range adjusts to surround it. To prove that the text of the text range is what you think it is, examine the `text` property of the range:

```
a.text
```

Because the text range encompasses all of the text of the element, the `htmlText` property contains the tags for the element as well:

```
a.htmlText
```

If you want to experiment by finding other chunks of text and looking at both the `text` and `htmlText` properties, first restore the text range to encompass the entire body with the following statement:

```
a.expand("textEdit")
```

You can read about the `expand()` method later in this chapter. In other tests, use `findText()` to set the range to “for all” and just “for al.” Then, see how the `htmlText` property exposes the EM element’s tags.

text

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-11 later in this chapter for the `findText()` method to see the `text` property used to perform the replace action of a search-and-replace function.

Methods

collapse([*startBoolean*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listings 19-11 and 15-14 to see the `collapse()` method at work.

compareEndPoints("*type*", *rangeRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

The page rendered by Listing 19-10 lets you experiment with text range comparisons. The bottom paragraph contains a SPAN element that has a `TextRange` object assigned to its text after the page loads (in the `init()` function). That fixed range becomes a solid reference point for you to use while you select text in the paragraph. After you make a selection, all four versions of the `compareEndPoints()` method run to compare the start and end points of the fixed range against your selection. One column of the results table shows the raw value returned by the `compareEndPoints()` method, while the third column puts the results into plain language.

To see how this page works, begin by selecting the first word of the fixed text range (double-click the word). You can see that the starting positions of both ranges are the same, because the returned value is `0`. Because all of the invocations of the `compareEndPoints()` method are on the fixed text range, all comparisons are from the point of view of that range. Thus, the first row of the table for the `StartToEnd` parameter indicates that the start point of the fixed range comes before the end point of the selection, yielding a return value of `-1`.

Other selections to make include:

- ✦ Text that starts before the fixed range and ends inside the range
- ✦ Text that starts inside the fixed range and ends beyond the range
- ✦ Text that starts and ends precisely at the fixed range boundaries
- ✦ Text that starts and ends before the fixed range
- ✦ Text that starts after the fixed range

Study the returned values and the plain language results and see how they align with the selection you make.

Listing 19-10: **Lab for compareEndPoints() Method**

```
<HTML>
<HEAD>
<TITLE>TextRange.compareEndPoints() Method</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
.propName {font-family:Courier, monospace}
#fixedRangeElem {color:red; font-weight:bold}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
var fixedRange

function setAndShowRangeData() {
    var selectedRange = document.selection.createRange()
    var result1 = fixedRange.compareEndPoints("StartToEnd", selectedRange)
    var result2 = fixedRange.compareEndPoints("StartToStart", selectedRange)
    var result3 = fixedRange.compareEndPoints("EndToStart", selectedRange)
    var result4 = fixedRange.compareEndPoints("EndToEnd", selectedRange)

    B1.innerText = result1
    compare1.innerText = getDescription(result1)
```

```
    B2.innerText = result2
    compare2.innerText = getDescription(result2)
    B3.innerText = result3
    compare3.innerText = getDescription(result3)
    B4.innerText = result4
    compare4.innerText = getDescription(result4)
}

function getDescription(comparisonValue) {
    switch (comparisonValue) {
        case -1 :
            return "comes before"
            break
        case 0 :
            return "is the same as"
            break
        case 1 :
            return "comes after"
            break
        default :
            return "vs."
    }
}

function init() {
    fixedRange = document.body.createTextRange()
    fixedRange.moveToElementText(fixedRangeElem)
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()">
<H1>TextRange.compareEndPoints() Method</H1>
<HR>
<P>Select text in the paragraph in various places relative to
the fixed text range (shown in red). See the relations between
the fixed and selected ranges with respect to their start
and end points.</P>
<TABLE ID="results" BORDER=1 CELLSPACING=2 CELLPADDING=2>
<TR><TH>Property</TH><TH>Returned Value</TH><TH>Fixed Range vs. Selection</TR>
<TR>
    <TD CLASS="propName">StartToEnd</TD>
    <TD CLASS="count" ID="B1"> </TD>
    <TD CLASS="count" ID="C1">Start of Fixed
    <SPAN ID="compare1">vs.</SPAN> End of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">StartToStart</TD>
    <TD CLASS="count" ID="B2"> </TD>
```

Continued

Listing 19-10 *(continued)*

```
    <TD CLASS="count" ID="C2">Start of Fixed
    <SPAN ID="compare2">vs.</SPAN> Start of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">EndToStart</TD>
    <TD CLASS="count" ID="B3"> </TD>
    <TD CLASS="count" ID="C3">End of Fixed
    <SPAN ID="compare3">vs.</SPAN> Start of Selection</TD>
</TR>
<TR>
    <TD CLASS="propName">EndToEnd</TD>
    <TD CLASS="count" ID="B4"> </TD>
    <TD CLASS="count" ID="C4">End of Fixed
    <SPAN ID="compare4">vs.</SPAN> End of Selection</TD>
</TR>
</TABLE>
<HR>
<P onMouseUp="setAndShowRangeData()">
Lorem ipsum dolor sit, <SPAN ID="fixedRangeElem">consectetaur adipisicing
elit</SPAN>,
sed do eiusmod tempor incididunt ut labore et dolore aliqua. Ut enim adminim
veniam,
quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo
consequat.</P>
</BODY>
</HTML>
```

duplicate()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see how the `duplicate()` method works. Begin by creating a new `TextRange` object that contains the text of the `myP` paragraph element.

```
a = document.body.createTextRange()
a.moveToElementText(myP)
```

Next, clone the original range and preserve the copy in variable `b`:

```
b = a.duplicate()
```

The method returns no value, so don't be alarmed by the "undefined" that appears in the Results box. Move the original range so that it is an insertion point at the end of the body by first expanding it to encompass the entire body, and then collapse it to the end:

```
a.expand("textedit")
a.collapse(false)
```

Now, insert the copy at the very end of the body:

```
a.text = b.text
```

If you scroll to the bottom of the page, you'll see a copy of the text.

execCommand("*commandName*"[, *UIFlag*[, *value*]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see how to copy a text range's text into the client computer's Clipboard. Begin by setting the text range to the `myP` element:

```
a = document.body.createTextRange()
a.moveToElementText(myP)
```

Now use `execCommand()` to copy the range into the Clipboard:

```
a.execCommand("Copy")
```

To prove that the text is in the Clipboard, click the bottom text field and choose Paste from the Edit menu (or type `Ctrl+V`).

expand("*unit*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can find examples of the `expand()` method in Listing 15-14.

findText("*searchString*"[, *searchScope*, *flags*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-11 implements two varieties of text search and replace operation, while showing you how to include extra parameters for case-sensitive and whole word searches. Both approaches begin by creating a `TextRange` for the entire body, but they immediately shift the starting point to the beginning of the DIV element that contains the text to search.

One search and replace function prompts the user to accept or decline replacement for each instance of a found string. The `select()` and `scrollIntoView()` methods are invoked to help the user see what is about to be replaced. Notice that even when the user declines to accept the replacement, the text range is collapsed to the end of the found range so that the next search can begin after the previously found text. Without the `collapse()` method, the search can get caught in an infinite loop as it keeps finding the same text over and over (with no replacement made). Because no counting is required, this search and replace operation is implemented inside a `while` repeat loop.

The other search and replace function goes ahead and replaces every match and then displays the number of replacements made. After the loop exits (because there are no more matches), the loop counter is used to display the number of replacements made.

Listing 19-11: Two Search and Replace Approaches (with Undo)

```
<HTML>
<HEAD>
<TITLE>TextRange.findText() Method</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
// global range var for use with Undo
var rng

// return findText() third parameter arguments
function getArgs(form) {
    var isCaseSensitive = (form.caseSensitive.checked) ? 4 : 0
    var isWholeWord = (form.wholeWord.checked) ? 2 : 0
    return isCaseSensitive ^ isWholeWord
}

// prompted search and replace
function sAndR(form) {
    var srchString = form.searchString.value
    var replString = form.replaceString.value
    if (srchString) {
        var args = getArgs(form)
        rng = document.body.createTextRange()
        rng.moveToElementText(rights)
        clearUndoBuffer()
        while (rng.findText(srchString, 10000, args)) {
            rng.select()
            rng.scrollIntoView()
            if (confirm("Replace?")) {
                rng.text = replString
                pushUndoNew(rng, srchString, replString)
            }
            rng.collapse(false)
        }
    }
}

// unprompted search and replace with counter
function sAndRCount(form) {
    var srchString = form.searchString.value
    var replString = form.replaceString.value
    var i
    if (srchString) {
        var args = getArgs(form)
        rng = document.body.createTextRange()
        rng.moveToElementText(rights)
        for (i = 0; rng.findText(srchString, 10000, args); i++) {
            rng.text = replString
            pushUndoNew(rng, srchString, replString)
            rng.collapse(false)
        }
        if (i > 1) {
            clearUndoBuffer()
        }
    }
```

Continued

Listing 19-11 *(continued)*

```
    document.all.counter.innerText = i
}
// BEGIN UNDO BUFFER CODE
// buffer global variables
var newRanges = new Array()
var origSearchString

// store original search string and bookmarks of each replaced range
function pushUndoNew(rng, srchString, replString) {
    origSearchString = srchString
    rng.moveStart("character", -replString.length)
    newRanges[newRanges.length] = rng.getBookmark()
}

// empty array and search string global
function clearUndoBuffer() {
    document.all.counter.innerText = "0"
    origSearchString = ""
    newRanges.length = 0
}

// perform the undo
function undoReplace() {
    if (newRanges.length && origSearchString) {
        for (var i = 0; i < newRanges.length; i++) {
            rng.moveToBookmark(newRanges[i])
            rng.text = origSearchString
        }
        document.all.counter.innerText = i
        clearUndoBuffer()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>TextRange.findText() Method</H1>
<HR>
<FORM>
<P>Enter a string to search for in the following text:
<INPUT TYPE="text" NAME="searchString" SIZE=20 VALUE="Law">  
<INPUT TYPE="checkbox" NAME="caseSensitive">Case-sensitive  
<INPUT TYPE="checkbox" NAME="wholeWord">Whole words only</P>
<P>Enter a string with which to replace found text:
<INPUT TYPE="text" NAME="replaceString" SIZE=20 VALUE="legislation"></P>
<P><INPUT TYPE="button" VALUE="Search and Replace (with prompt)"
onClick="sAndR(this.form)"></P>
<P><INPUT TYPE="button" VALUE="Search, Replace, and Count (no prompt)"
onClick="sAndRCount(this.form)">
```

```
<SPAN ID="counter">0</SPAN> items found and replaced.</P>
<P><INPUT TYPE="button" VALUE="Undo Search and Replace"
onClick="undoReplace()"></P>
</FORM>

<DIV ID="rights">
<A NAME="article1">
<H2>ARTICLE I</H2>
</A>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
[The rest of the text is snipped for printing here, but it is on the CD-ROM
version.]
</DIV>
</BODY>
</HTML>
```

Having a search and replace function available in a document is only one-half of the battle The other half is offering the facilities to undo the changes. To that end, Listing 19-11 includes an undo buffer that accurately undoes only the changes made in the initial replacement actions.

The undo buffer stores its data in two global variables. The first, `origSearchString`, is simply the string used to perform the original search. This variable is the string that has to be put back in the places where it had been replaced. The second global variable is an array that stores `TextRange` bookmarks (see `getBookmark()` later in this chapter). These references are string values that don't mean much to humans, but the browser can use them to recreate a range with its desired start and end point. Values for both the global search string and bookmark specifications are stored in calls to the `pushUndoNew()` method each time text is replaced.

A perhaps unexpected action of setting the `text` property of a text range is that the start and end points collapse to the end of the new text. Because the stored bookmark must include the replaced text as part of its specification, the start point of the current range must be adjusted back to the beginning of the replacement text before the bookmark can be saved. Thus, the `pushUndoNew()` function receives the replacement text string so that the `moveStart()` method can be adjusted by the number of characters matching the length of the replacement string.

After all of the bookmarks are stored in the array, the undo action can do its job in a rather simple `for` loop inside the `undoReplace()` function. After verifying that the undo buffer has data stored in it, the function loops through the array of bookmarks and replaces the bookmarked text with the old string. The benefit of using the bookmarks rather than using the replacement function again is that only those ranges originally affected by the search-and-replace operation are touched in the undo operation. For example, in this document if you replace a case-sensitive "states" with "States" two replacements are performed. At that point, however, the document has four instances of "States," two of which existed before. Redoing the replacement function by inverting the search and replace strings would convert all four back to the lowercase version — not the desired effect.

getBookmark()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-11 earlier in this chapter shows how the `getBookmark()` method is used to preserve specifications for text ranges so that they can be called upon again to be used to undo changes made to the text range. The `getBookmark()` method is used to save the snapshots, while the `moveToBookmark()` method is used during the undo process.

inRange(*otherRangeRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see the `inRange()` method in action. The following statements generate two distinct text ranges, one for the `myP` paragraph element and the other for the `myEM` element nested within.

```
a = document.body.createTextRange()
a.moveToElementText(myP)
b = document.body.createTextRange()
b.moveToElementText(myEM)
```

Because the `myP` text range is larger than the other, invoke the `inRange()` method on it, fully expecting the return value of `true`

```
a.inRange(b)
```

But if you switch the references, you see that the larger text range is not “in” the smaller one:

```
b.inRange(a)
```

isEqual(*otherRangeRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to try the `isEqual()` method. Begin by creating two separate `TextRange` objects, one for the `myP` element and one for `myEM`.

```
a = document.body.createTextRange()
a.moveToElement(myP)
b = document.body.createTextRange()
b.moveToElement(myEM)
```

Because these two ranges encompass different sets of text, they are not equal, as the results show from the following statement:

```
a.isEqual(b)
```

But if you now adjust the first range boundaries to surround the `myEM` element, both ranges are the same values:

```
a.moveToElement(myEM)
a.isEqual(b)
```

move("*unit*"[, *count*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `move()` method. To see how the method returns just the number of units it moves the pointer, begin by creating a text range and set it to enclose the `myP` element:

```
a = document.body.createTextRange()
a.moveToElementText(myP)
```

Now enter the following statement to collapse and move the range backward by 20 words.

```
a.move("word", -20)
```

Continue to click the Evaluate button and watch the returned value in the Results box. The value shows `20` while it can still move backward by 20 words. But eventually the last movement will be some other value closer to zero. And after the range is at the beginning of the BODY element, the range can move no more in that direction, so the result is zero.

moveEnd("*unit*"[, *count*])
moveStart("*unit*"[, *count*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `moveEnd()` and `moveStart()` methods. Begin by creating a text range and set it to enclose the `myEM` element:

```
a = document.body.createTextRange()
a.moveToElementText(myEM)
```

To help you see how movements of the pointers affect the text enclosed by the range, type `a` into the bottom text box and view all the properties of the text range. Note especially the `htmlText` and `text` properties.

Now enter the following statement to move the end of the range forward by one word.

```
a.moveEnd("word")
```

Click on the List Properties button to see that the text of the range now includes the word following the EM element. Try each of the following statements in the top text box and examine both the integer results and (by clicking the List Properties button) the properties of the range after each statement:

```
a.moveStart("word", -1)
a.moveEnd("sentence")
```

Notice that for a sentence, a default unit of 1 expands to the end of the current sentence. And if you move the start point backward by one sentence, you'll see that the lack of a period-ending sentence prior to the `myP` element causes strange results.

Finally, force the start point backward in increments of 20 words and watch the results as the starting point nears and reaches the start of the BODY:

```
a.moveStart("word", -20)
```

Eventually the last movement will be some other value closer to zero. And as soon as the range is at the beginning of the BODY element, the range can move no more in that direction, so the result is zero.

moveToBookmark("*bookmarkString*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 19-11 earlier in this chapter shows how to use the `moveToBookmark()` method to restore a text range so that changes that created the state saved by the bookmark can be undone. The `getBookmark()` method is used to save the snapshots, while the `moveToBookmark()` method is used during the undo process.

moveToElementText(*elemObjRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

A majority of examples for other `TextRange` object methods in this chapter use the `moveToElementText()` method. Listings 19-10 and 19-11 earlier in this chapter show the method within an application context.

moveToPoint(*x*, *y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator to see the `moveToPoint()` method in action. Begin by creating a text range for the entire BODY element:

```
a = document.body.createTextRange()
```

Now, invoke the `moveToPoint()` method to a location 100, 100, which turns out to be in the rectangle space of the Results textarea:

```
a.moveToPoint(100,100)
```

If you type `a` into the bottom text box and view the properties, both the `htmlText` and `text` properties are empty because the insertion point represents no visible text content. But if you gradually move, for example, the start point backward one character at a time, you will see the `htmlText` and `text` properties begin to fill in with the body text that comes before the TEXTAREA element, namely the “Results:” label and the `<BR>` tag between it and the TEXTAREA element. Enter the following statement into the top text box and click the Evaluate button several times.

```
a.moveStart("character", -1)
```

Enter `a` into the bottom text box after each evaluation to list the properties of the range.

parentElement()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `parentElement()` method. Begin by setting the text range to the `myEM` element:

```
a = document.body.createTextRange()
a.moveToElementText(myEM)
```

To inspect the object returned by the `parentElement()` method, enter the following statement in the lower text box:

```
a.parentElement()
```

If you scroll down to the `outerHTML` property, you see that the parent of the text range is the `myEM` element, tag and all.

Next, extend the end point of the text range by one word:

```
a.moveEnd("word")
```

Because part of the text range now contains text of the `myP` object, the `outerHTML` property of `a.parentElement()` shows the entire `myP` element and tags.

pasteHTML("*HTMLText*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `pasteHTML()` method. The goal of the following sequence is to change the `<EM>` tag to a `<SPAN>` tag whose `STYLE` attribute sets the color of the original text that was in the EM element.

Begin by creating the text range and setting the boundaries to the `myEM` element:

```
a = document.body.createTextRange()
a.moveToElementText(myEM)
```

While you can pass the HTML string directly as a parameter to `pasteHTML()`,storing the HTML string in its own temporary variable may be more convenient (and more easily testable), such as:

```
b = "<SPAN STYLE='color:red'>" + a.text + "</SPAN>"
```

Notice that we concatenate the text of the current text range, because it has not yet been modified. Now we can paste the new HTML string into the current text range

```
a.pasteHTML(b)
```

At this point the EM element is gone from the object model, and the SPAN element is in its place. Prove it to yourself by looking at the HTML for the `myP` element:

```
myP.innerHTML
```

As noted earlier, the `pasteHTML()` method is not the only way to insert or replace HTML in a document. This method makes excellent sense when the user selects some text in the document to be replaced, because you can use the `document.selection.createRange()` method to get the text range for the selection. But if you're not using text ranges for other related operations, consider the other generic object properties and methods available to you.

select()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 19-11 earlier in this chapter for an example of the `select()` method in use.

setEndPoint("*type*", *otherRangeRef*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator to experiment with the `setEndPoint()` method. Begin by creating two independent text ranges, one for the `myP` element and one for `myEM`:

```
a = document.body.createTextRange()
a.moveToElementText(myP)
b = document.body.createTextRange()
b.moveToElementText(myEM)
```

Before moving any end points, compare the HTML for each of those ranges:

```
a.htmlText
b.htmlText
```

Now, move the start point of the `a` text range to the end point of the `b` text range:

```
a.setEndPoint("StartToEnd", b)
```

If you now view the HTML for the a range,

```
a.htmlText
```

you see that the `<P>` tag of the original `a` text range is nowhere to be found. This demonstration is a good lesson to use the `setEndPoint()` method primarily if you are concerned only with visible body text being inside ranges, rather than an element with its tags.

TextRectangle Object

Properties

bottom
left
right
top

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Listing 19-12 lets you click one of four nested elements to see how the `TextRectangle` is treated. When you click one of the elements, that element's `TextRectangle` dimension properties are used to set the size of a positioned element that highlights the space of the rectangle. Be careful not to confuse the visible rectangle object that you see on the page with the abstract `TextRectangle` object that is associated with each of the clicked elements.

An important part of the listing is the way the action of sizing and showing the positioned element is broken out as a separate function (`setHiliter()`) from the one that is the `onClick` event handler function (`handleClick()`). This is done so that the `onResize` event handler can trigger a script that gets the current rectangle for the last element clicked, and the positioned element can be sized and moved to maintain the highlight of the same text. As an experiment, try removing the `onResize` event handler from the `<BODY>` tag and watch what happens to the highlighted rectangle after you resize the browser window: the rectangle that represents the `TextRectangle` remains unchanged and loses track of the abstract `TextRectangle` associated with the actual element object.

Listing 19-12: **Using the TextRectangle Object Properties**

```
<HTML>
<HEAD>
<TITLE>TextRectangle Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// preserve reference to last clicked elem so resize can re-use it
var lastElem
// TextRectangle left tends to be out of registration by a couple of pixels
var rectLeftCorrection = 2

// process mouse click
function handleClick() {
    var elem = event.srcElement
    if (elem.className && elem.className == "sample") {
        // set hiliter element only on a subset of elements
        lastElem = elem
        setHiliter()
    } else {
        // otherwise, hide the hiliter
        hideHiliter()
    }
}
function setHiliter() {
    if (lastElem) {
        var textRect = lastElem.getBoundingClientRect()
        hiliter.style.pixelTop = textRect.top + document.body.scrollTop
        hiliter.style.pixelLeft = textRect.left + document.body.scrollLeft -
            rectLeftCorrection
        hiliter.style.pixelHeight = textRect.bottom - textRect.top
        hiliter.style.pixelWidth = textRect.right - textRect.left
        hiliter.style.visibility = "visible"
    }
}
function hideHiliter() {
    hiliter.style.visibility = "hidden"
    lastElem = null
```

```
}
</SCRIPT>
</HEAD>
<BODY onClick="handleClick()" onResize="setHiliter()">
<H1>TextRectangle Object</H1>
<HR>
<P>Click on any of the four colored elements in the paragraph below and watch
the highlight rectangle adjust itself to the element's TextRectangle object.

<P CLASS="sample">Lorem ipsum dolor sit amet, <SPAN CLASS="sample"
STYLE="color:red">consectetaur adipisicing elit</SPAN>, sed do eiusmod tempor
<SPAN CLASS="sample" STYLE="color:green">incididunt ut labore et dolore <SPAN
CLASS="sample" STYLE="color:blue">magna aliqua</SPAN>. Ut enim adminim veniam,
quis nostrud exercitation ullamco</SPAN> laboris nisi ut aliquip ex ea commodo
consequat. Duis aute irure dolor in reprehenderit involuptate velit esse cillum
dolore eu fugiat nulla pariatur.</P>
<DIV ID="hiliter" STYLE="position:absolute; background-color:salmon; z-index:-1;
visibility:hidden"></DIV>
</BODY>
</HTML>
```

Chapter 22 Examples

The following sections contain examples from Chapter 22, “Image, Area, and Map Objects.”

Image and IMG Element Objects

Properties

align

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 22-1 enables you to choose from the different `align` property values as they influence the layout of an image whose HTML is embedded inline with some other text. Resize the window to see different perspectives on word-wrapping on a page and their effects on the alignment choices. Not all browsers provide distinctive alignments for each choice, so experiment in multiple supported browsers.

Listing 22-1: Testing an Image's align Property

```
<HTML>
<HEAD>
<TITLE>IMG align Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">

function setAlignment(sel) {
    document.myIMG.align = sel.options[sel.selectedIndex].text
}
</SCRIPT>
</HEAD>
<BODY>
<H1>IMG align Property</H1>
<HR>
<FORM>
Choose the image alignment:
<SELECT onChange="setAlignment(this)">
    <OPTION>absbottom
    <OPTION>absmiddle
    <OPTION>baseline
    <OPTION SELECTED >bottom
    <OPTION >left
    <OPTION>middle
    <OPTION>right
    <OPTION>texttop
    <OPTION>top
</SELECT>
</FORM>
<HR>
<P>Lorem ipsum dolor sit amet, consectetaur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna
aliqua. <IMG NAME="myIMG" SRC="desk1.gif" HEIGHT=90 WIDTH=120>
Ut enim adminim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.</P>
</BODY>
</HTML>
```

alt

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to assign a string to the `alt` property of the `document.myIMG` image on the page. First, assign a nonexistent image to the `src` property to remove the existing image:

```
document.myIMG.src = "fred.gif"
```

Scroll down to the image, and you can see a space for the image. Now, assign a string to the `alt` property:

```
document.myIMG.src = "Fred\'s face"
```

The extra backslash is required to escape the apostrophe inside the string. Scroll down to see the new `alt` text in the image space.

border

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Feel free to experiment with the `document.myIMG.border` property for the image in The Evaluator (Chapter 13) by assigning different integer values to the property.

complete

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

To experiment with the `image.complete` property, quit and relaunch your browser before loading Listing 22-2 (in case the images are in memory cache). As each image loads, click the "Is it loaded yet?" button to see the status of the `complete` property for the `image` object. The value is `false` until the loading finishes; then, the value becomes `true`. The arch image is the bigger of the two image files. You may have to quit and relaunch your browser between trials to clear the arch image from the cache (or empty the browser's memory cache). If you experience difficulty with this property in your scripts, try adding an `onLoad` event handler (even if it is empty, as in Listing 22-2) to your `<IMG>` tag.

Listing 22-2: Scripting image.complete

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript1.1">
function loadIt(theImage,form) {
    form.result.value = ""
    document.images[0].src = theImage
}
function checkLoad(form) {
    form.result.value = document.images[0].complete
}
</SCRIPT>
</HEAD>
<BODY>
<IMG SRC="cpu2.gif" WIDTH=120 HEIGHT=90 onLoad="">
<FORM>
<INPUT TYPE="button" VALUE="Load keyboard"
onClick="loadIt('cpu2.gif',this.form)">
<INPUT TYPE="button" VALUE="Load arch"
onClick="loadIt('arch.gif',this.form)"><P>
<INPUT TYPE="button" VALUE="Is it loaded yet?" onClick="checkLoad(this.form)">
<INPUT TYPE="text" NAME="result">
</FORM>
</BODY>
</HTML>
```

dynsrc

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

To swap between still and video sources, simply empty the opposite property. Listing 22-3 shows a simplified example that swaps between one fixed image and one video image. This listing exhibits most of the bugs associated with changing between static image and video sources described in the text.

Listing 22-3: Changing Between Still and Motion Images

```
<HTML>
<HEAD>
<TITLE>IMG dynsrc Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">

var trainImg = new Image(160,120)
trainImg.src = "amtrak.jpg"
trainImg.dynsrc = "amtrak.mpg"

function setLoop() {
    var selector = document.forms[0].looper
    document.myIMG.loop = selector.options[selector.selectedIndex].value
}

function setImage(type) {
    if (type == "jpg") {
        document.myIMG.dynsrc = ""
        document.myIMG.src = trainImg.src
    } else {
        document.myIMG.src = ""
        document.myIMG.start = "fileopen"
        setLoop()
        document.myIMG.dynsrc = trainImg.dynsrc
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>IMG dynsrc Property</H1>
<HR>
<FORM>
Choose image type:
<INPUT TYPE="radio" NAME="imgGroup" CHECKED onClick="setImage('jpg')">Still
<INPUT TYPE="radio" NAME="imgGroup" onClick="setImage('mpg')">Video
<P>Play video how many times after loading:
<SELECT NAME="looper" onChange="setLoop()">
    <OPTION VALUE=1 SELECTED>Once
    <OPTION VALUE=2>Twice
    <OPTION VALUE=-1>Continuously
```

Continued

Listing 22-3 *(continued)*

```
</SELECT></P>
</FORM>
<HR>
<IMG NAME="myIMG" SRC="amtrak.jpg" HEIGHT=120 WIDTH=160>
</BODY>
</HTML>
```

If you don't explicitly set the `start` property to `fileopen` (as shown in Listing 22-3), users of IE for the Macintosh have to double-click (IE4) or click (IE5) the movie image to make it run.

fileCreatedDate
fileModifiedDate
fileSize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

These properties are similar to the same-named properties of the `document` object. You can see these properties in action in Listing 18-4. Make a copy of that listing, and supply an image before modifying the references from the `document` object to the image object to see how these properties work with the IMG element object.

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `height` and `width` properties. Begin retrieving the default values by entering the following two statements into the top text box:

```
document.myIMG.height
document.myIMG.width
```

Increase the height of the image from its default 90 to 180:

```
document.myIMG.height = 180
```

If you scroll down to the image, you see that the image has scaled in proportion. Next, exaggerate the width:

```
document.myIMG.width = 400
```

View the resulting image.

hspace
vspace

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `hspace` and `vspace` properties. Begin by noticing that the image near the bottom of the page has no margins specified for it and is flush left with the page. Now assign a horizontal margin spacing of 30 pixels:

```
document.myIMG.hspace = 30
```

The image has shifted to the right by 30 pixels. An invisible margin also exists to the right of the image.

isMap

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The image in The Evaluator page is not defined as an image map. Thus, if you type the following statement into the top text box, the property returns `false`:

```
document.myIMG.isMap
```

loop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 22-3 for the `dynsrc` property to see the `loop` property in action.

lowsrc
lowSrc

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

See Listing 22-5 for the image object's `onLoad` event handler to see how the source-related properties affect event processing.

name

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	(✓)		✓	✓	✓

Example

You can use The Evaluator to examine the value returned by the `name` property of the image on that page. Enter the following statement into the top text box:

```
document.myIMG.name
```

Of course, this is redundant because the name is part of the reference to the object.

nameProp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

You can use The Evaluator to compare the results of the `src` and `nameProp` properties in IE5+/Windows. Enter each of the following statements into the top text box:

```
document.myIMG.src
document.myIMG.nameProp
```

protocol

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can use The Evaluator to examine the `protocol` property of the image on the page. Enter the following statement into the top text box:

```
document.myIMG.protocol
```

src

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓	(✓)		✓	✓	✓

Example

In the following example (Listing 22-4), you see a few applications of image objects. Of prime importance is a comparison of how precached and regular images feel to the user. As a bonus, you see an example of how to set a timer to automatically change the images displayed in an image object. This feature is a popular request among sites that display advertising banners.

As the page loads, a global variable is handed an array of image objects. Entries of the array are assigned string names as index values (`"desk1"`, `"desk2"`, and so on). The intention is that these names ultimately will be used as addresses to the array entries. Each image object in the array has a URL assigned to it, which precaches the image.

The page (see Figure 22-1) includes two IMG elements: one that displays noncached images and one that displays cached images. Under each image is a SELECT element that you can use to select one of four possible image files for each element. The `onChange` event handler for each SELECT list invokes a different function to change the noncached (`loadIndividual()`) or cached (`loadCached()`) images. Both of these functions take as their single parameter a reference to the form that contains the SELECT elements.

To cycle through images at five-second intervals, the `checkTimer()` function looks to see if the timer check box is checked. If so, the `selectedIndex` property of the cached image SELECT control is copied and incremented (or reset to zero if the index is at the maximum value). The SELECT element is adjusted, so you can now invoke the `loadCached()` function to read the currently selected item and set the image accordingly.

For some extra style points, the `<BODY>` tag includes an `onUnload` event handler that invokes the `resetSelects()` function. This general-purpose function loops through all forms on the page and all elements within each form. For every SELECT element, the `selectedIndex` property is reset to zero. Thus, if a user reloads the page, or returns to the page via the Back button, the images start in their original sequence. An `onLoad` event handler makes sure that the images are in sync with the SELECT choices and the `checkTimer()` function is invoked with a five-second delay. Unless the timer check box is checked, however, the cached images don't cycle.

Listing 22-4: A Scripted Image Object and Rotating Images

```
<HTML>
<HEAD>
<TITLE>Image Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// global declaration for 'desk' images array
var imageDB
// pre-cache the 'desk' images
if (document.images) {
    // list array index names for convenience
    var deskImages = new Array("desk1", "desk2", "desk3", "desk4")
    // build image array and pre-cache them
    imageDB = new Array(4)
    for (var i = 0; i < imageDB.length ; i++) {
        imageDB[deskImages[i]] = new Image(120,90)
        imageDB[deskImages[i]].src = deskImages[i] + ".gif"
    }
}
// change image of 'individual' image
function loadIndividual(form) {
    if (document.images) {
        var gifName =
form.individual.options[form.individual.selectedIndex].value
        document.thumbnail1.src = gifName + ".gif"
    }
}
// change image of 'cached' image
function loadCached(form) {
    if (document.images) {
        var gifIndex = form.cached.options[form.cached.selectedIndex].value
        document.thumbnail2.src = imageDB[gifIndex].src
    }
}
// if switched on, cycle 'cached' image to next in queue
function checkTimer() {
    if (document.images && document.Timer.timerBox.checked) {
        var gifIndex = document.selections.cached.selectedIndex
        if (++gifIndex > imageDB.length - 1) {
            gifIndex = 0
```

Continued

Listing 22-4: A Scripted Image Object and Rotating Images

```
        }
        document.selections.cached.selectedIndex = gifIndex
        loadCached(document.selections)
        var timeoutID = setTimeout("checkTimer()",5000)
    }
}
// reset form controls to defaults on unload
function resetSelects() {
    for (var i = 0; i < document.forms.length; i++) {
        for (var j = 0; j < document.forms[i].elements.length; j++) {
            if (document.forms[i].elements[j].type == "select-one") {
                document.forms[i].elements[j].selectedIndex = 0
            }
        }
    }
}
// get things rolling
function init() {
    loadIndividual(document.selections)
    loadCached(document.selections)
    setTimeout("checkTimer()",5000)
}
</SCRIPT>
</HEAD>

<BODY onLoad="init()" onUnload="resetSelects ()">
<H1>Image Object</H1>
<HR>
<CENTER>
<TABLE BORDER=3 CELLPADDING=3>
<TR><TH></TH><TH>Individually Loaded</TH><TH>Pre-cached</TH></TR>
<TR><TD ALIGN=RIGHT><B>Image:</B></TD>
<TD><IMG SRC="cpu1.gif" NAME="thumbnail1" HEIGHT=90 WIDTH=120></TD>
<TD><IMG SRC="desk1.gif" NAME="thumbnail2" HEIGHT=90 WIDTH=120></TD>
</TR>
<TR><TD ALIGN=RIGHT><B>Select image:</B></TD>
<FORM NAME="selections">
<TD>
<SELECT NAME="individual" onChange="loadIndividual(this.form)">
<OPTION VALUE="cpu1">Wires
<OPTION VALUE="cpu2">Keyboard
<OPTION VALUE="cpu3">Desks
<OPTION VALUE="cpu4">Cables
</SELECT>
</TD>
<TD>
<SELECT NAME="cached" onChange="loadCached(this.form)">
<OPTION VALUE="desk1">Bands
```

```
<OPTION VALUE="desk2">Clips
<OPTION VALUE="desk3">Lamp
<OPTION VALUE="desk4">Erasers
</SELECT></TD>
</FORM>
</TR></TABLE>
<FORM NAME="Timer">
<INPUT TYPE="checkbox" NAME="timerBox" onClick="checkTimer()">Auto-cycle through
pre-cached images
</FORM>
</CENTER>
</BODY>
</HTML>
```

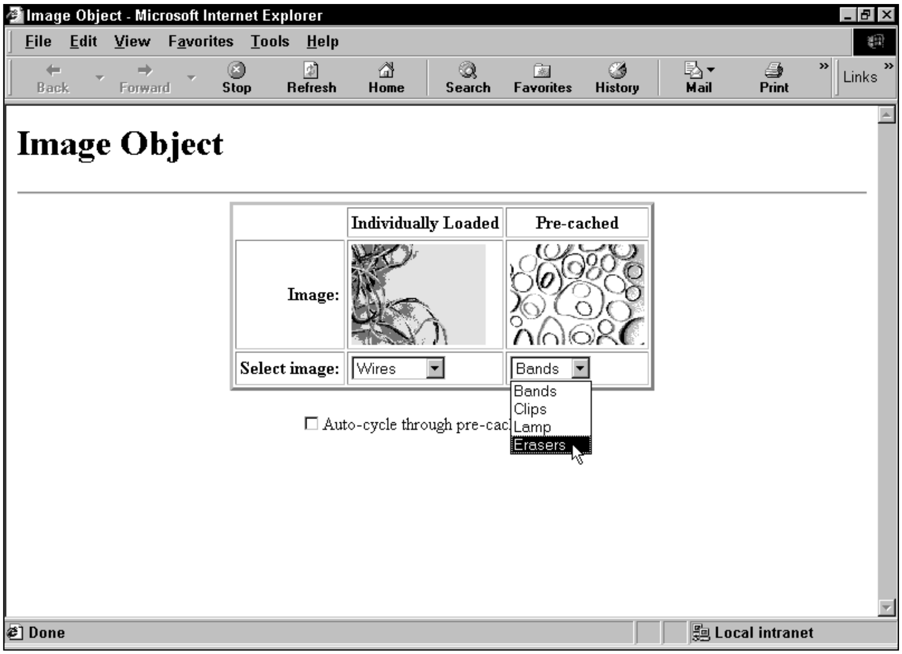

Figure 22-1: The image object demonstration page *(Images (c) Aris Multimedia Entertainment, Inc. 1994)*

start

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 22-3 earlier in this chapter for an example of how you can use the `start` property with a page that loads a movie clip into an IMG element object.

x
y

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

If you want to scroll the document so that the link is a few pixels below the top of the window, use a statement such as this:

```
window.scrollTo(document.images[0].x, (document.images[0].y - 3))
```

Event handlers

onAbort
onError

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Listing 22-5 includes an `onAbort` event handler. If the images already exist in the cache, you must quit and relaunch the browser to try to stop the image from loading. In that example, I provide a reload option for the entire page. How you handle the exception depends a great deal on your page design. Do your best to smooth over any difficulties that users may encounter.

onLoad

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Quit and restart your browser to get the most from Listing 22-5. As the document first loads, the LOWSRC image file (the picture of pencil erasers) loads ahead of the computer keyboard image. When the erasers are loaded, the `onLoad` event handler writes "done" to the text field even though the main image is not loaded yet. You can experiment further by loading the arch image. This image takes longer to load, so the LOWSRC image (set on the fly, in this case) loads way ahead of it.

Listing 22-5: **The Image onLoad Event Handler**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function loadIt(theImage,form) {
    if (document.images) {
        form.result.value = ""
        document.images[0].lowsrc = "desk1.gif"
        document.images[0].src = theImage
    }
}
function checkLoad(form) {
    if (document.images) {
        form.result.value = document.images[0].complete
    }
}
function signal() {
    if(confirm("You have stopped the image from loading. Do you want to try
again?")) {
```

Continued

Listing 22-5 *(continued)*

```
        location.reload()
    }
}
</SCRIPT>
</HEAD>
<BODY>
<IMG SRC="cpu2.gif" LOWSRC="desk4.gif" WIDTH=120 HEIGHT=90
onLoad="if (document.forms[0].result) document.forms[0].result.value='done'"
onAbort="signal()">
<FORM>
<INPUT TYPE="button" VALUE="Load keyboard"
onClick="loadIt('cpu2.gif',this.form)">
<INPUT TYPE="button" VALUE="Load arch"
onClick="loadIt('arch.gif',this.form)"><P>
<INPUT TYPE="button" VALUE="Is it loaded yet?" onClick="checkLoad(this.form)">
<INPUT TYPE="text" NAME="result">
</FORM>
</BODY>
</HTML>
```

AREA Element Object

Properties

`coords`
`shape`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See Listing 22-7 for a demonstration of the `coords` and `shape` properties in the context of scripting MAP element objects.

MAP Element Object

Property

areas

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 22-7 demonstrates how to use scripting to replace the AREA element objects inside a MAP element. The scenario is that the page loads with one image of a computer keyboard. This image is linked to the `keyboardMap` client-side image map, which specifies details for three hot spots on the image. If you then switch the image displayed in that IMG element, scripts change the `useMap` property of the IMG element object to point to a second MAP that has specifications more suited to the desk lamp in the second image. Roll the mouse pointer atop the images, and view the URLs associated with each area in the statusbar (for this example, the URLs do not lead to other pages).

Another button on the page, however, invokes the `makeAreas()` function (not working in IE5/Mac), which creates four new AREA element objects and (through DOM-specific pathways) adds those new area specifications to the image. If you roll the mouse atop the image after the function executes, you can see that the URLs now reflect those of the new areas. Also note the addition of a fourth area.

Listing 22-7: Modifying AREA Elements on the Fly

```
<HTML>
<HEAD>
<TITLE>MAP Element Object</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// generate area elements on the fly
function makeAreas() {
    document.myIMG.src = "desk3.gif"
    // build area element objects
    var area1 = document.createElement("AREA")
    area1.href = "Script-Made-Shade.html"
    area1.shape = "polygon"
```

Continued

Listing 22-7 *(continued)*

```
    area1.coords = "52,28,108,35,119,29,119,8,63,0,52,28"
    var area2 = document.createElement("AREA")
    area2.href = "Script-Made-Base.html"
    area2.shape = "rect"
    area2.coords = "75,65,117,87"
    var area3 = document.createElement("AREA")
    area3.href = "Script-Made-Chain.html"
    area3.shape = "polygon"
    area3.coords = "68,51,73,51,69,32,68,51"
    var area4 = document.createElement("AREA")
    area4.href = "Script-Made-Emptyness.html"
    area4.shape = "rect"
    area4.coords = "0,0,50,120"
    // stuff new elements into MAP child nodes
    if (document.all) {
        // works for IE4+
        document.all.lampMap.areas.length = 0
        document.all.lampMap.areas[0] = area1
        document.all.lampMap.areas[1] = area2
        document.all.lampMap.areas[2] = area3
        document.all.lampMap.areas[3] = area4
    } else if (document.getElementById) {
        // NN6 adheres to node model
        var mapObj = document.getElementById("lamp_map")
        while (mapObj.childNodes.length) {
            mapObj.removeChild(mapObj.firstChild)
        }
        mapObj.appendChild(area1)
        mapObj.appendChild(area2)
        mapObj.appendChild(area3)
        mapObj.appendChild(area4)
        // workaround NN6 display bug
        document.myIMG.style.display = "inline"
    }

function changeToKeyboard() {
    document.myIMG.src = "cpu2.gif"
    document.myIMG.useMap = "#keyboardMap"
}

function changeToLamp() {
    document.myIMG.src = "desk3.gif"
    document.myIMG.useMap = "#lampMap"
}
</SCRIPT>
</HEAD>
<BODY>
<H1>MAP Element Object</H1>
```

```
<HR>
<IMG NAME="myIMG" SRC="cpu2.gif" WIDTH=120 HEIGHT=90 USEMAP="#keyboardMap">
<FORM>
<P><INPUT TYPE="button" VALUE="Load Lamp Image" onClick="changeToLamp()">
<INPUT TYPE="button" VALUE="Write Map on the Fly" onClick="makeAreas()"></P>
<P>
<INPUT TYPE="button" VALUE="Load Keyboard Image"
onClick="changeToKeyboard()"></P>
</FORM>
<MAP NAME="keyboardMap">
<AREA HREF="AlpaKeys.htm" SHAPE="rect" COORDS="0,0,26,42">
<AREA HREF="ArrowKeys.htm" SHAPE="polygon"
COORDS="48,89,57,77,69,82,77,70,89,78,84,89,48,89">
<AREA HREF="PageKeys.htm" SHAPE="circle" COORDS="104,51,14">
</MAP>
<MAP NAME="lampMap">
<AREA HREF="Shade.htm" SHAPE="polygon"
COORDS="52,28,108,35,119,29,119,8,63,0,52,28">
<AREA HREF="Base.htm" SHAPE="rect" COORDS="75,65,117,87">
<AREA HREF="Chain.htm" SHAPE="polygon" COORDS="68,51,73,51,69,32,68,51">
</MAP>
</BODY>
</HTML>
```

Chapter 23 Examples

The following section contains examples from Chapter 23, “The Form and Related Objects.”

FORM Object

Properties

action

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following statement assigns a `mailto:` URL to the first form of a page:

```
document.forms[0].action = "mailto:jdoe@giantco.com"
```

elements

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The document in Listing 23-2 demonstrates a practical use of the `elements` property. A form contains four fields and some other elements mixed in between (see Figure 23-2). The first part of the function that acts on these items repeats through all the elements in the form to find out which ones are text box objects and which text box objects are empty. Notice how I use the `type` property to separate text box objects from the rest, even when radio buttons appear amid the fields. If one field has nothing in it, I alert the user and use that same index value to place the insertion point at the field with the field's `focus()` method.

Listing 23-2: Using the form.elements Array

```
<HTML>
<HEAD>
<TITLE>Elements Array</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function verifyIt() {
    var form = document.forms[0]
    for (i = 0; i < form.elements.length; i++) {
        if (form.elements[i].type == "text" && form.elements[i].value == ""){
            alert("Please fill out all fields.")
            form.elements[i].focus()
            break
        }
        // more tests
    }
    // more statements
}
</SCRIPT>
</HEAD>
```

```
<BODY>
<FORM>
Enter your first name:<INPUT TYPE="text" NAME="firstName"><P>
Enter your last name:<INPUT TYPE="text" NAME="lastName"><P>
<INPUT TYPE="radio" NAME="gender">Male
<INPUT TYPE="radio" NAME="gender">Female <P>
Enter your address:<INPUT TYPE="text" NAME="address"><P>
Enter your city:<INPUT TYPE="text" NAME="city"><P>
<INPUT TYPE="checkbox" NAME="retired">I am retired
</FORM>
<FORM>
<INPUT TYPE="button" NAME="act" VALUE="Verify" onClick="verifyIt()">
</FORM>
</BODY>
</HTML>
```

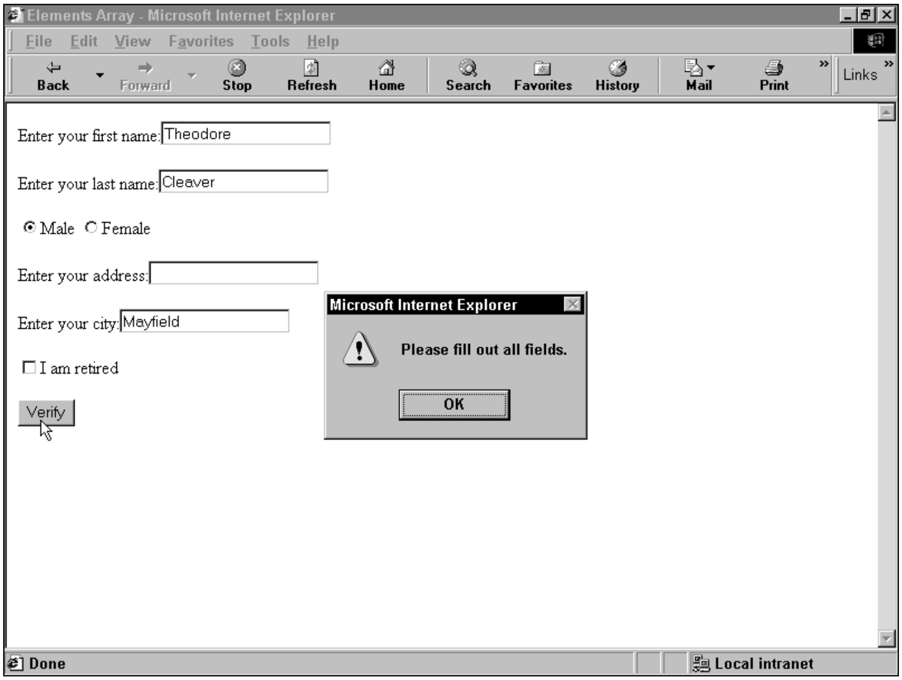

Figure 23-2: The elements array helps find text fields for validation.

encoding
enctype

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

If you need to modify the first form in a document so that the content is sent in non-URL-encoded text at the user's request, the statement is:

```
document.forms[0].encoding = "text/plain"
```

length

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Use The Evaluator (Chapter 13) to determine the number of form controls in the first form of the page. Enter the following statement into the top text box:

```
document.forms[0].length
```

method

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

If you need to modify the first form in a document so that the content is sent via the `POST` method, the statement is:

```
document.forms[0].method = "POST"
```

target

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

If you want to direct the response from the first form's CGI to a new window (rather than the target specified in the form's tag), use this statement:

```
document.forms[0].target = "_blank"
```

Methods

reset()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

In Listing 23-3, I assign the act of resetting the form to the `HREF` attribute of a link object (that is attached to a graphic called `reset.jpg`). I use the `javascript:` URL to invoke the `reset()` method for the form directly (in other words, without doing it via function). Note that the form's action in this example is to a nonexistent URL. If you click the Submit icon, you receive an "unable to locate" error from the browser.

Listing 23-3: **form.reset() and form.submit() Methods**

```
<HTML>
<HEAD>
<TITLE>Registration Form</TITLE>
</HEAD>
<BODY>
<FORM NAME="entries" METHOD=POST ACTION="http://www.u.edu/pub/cgi-bin/register">
Enter your first name:<INPUT TYPE="text" NAME="firstName"><P>
```

Continued

Listing 23-3 *(continued)*

```
Enter your last name:<INPUT TYPE="text" NAME="lastName"><P>
Enter your address:<INPUT TYPE="text" NAME="address"><P>
Enter your city:<INPUT TYPE="text" NAME="city"><P>
<INPUT TYPE="radio" NAME="gender" CHECKED>Male
<INPUT TYPE="radio" NAME="gender">Female <P>
<INPUT TYPE="checkbox" NAME="retired">I am retired
</FORM>
<P>
<A HREF="javascript:document.forms[0].submit()"><IMG SRC="submit.jpg" HEIGHT=25
WIDTH=100 BORDER=0></A>
<A HREF="javascript:document.forms[0].reset()"><IMG SRC="reset.jpg" HEIGHT=25
WIDTH=100 BORDER=0></A>
</BODY>
</HTML>
```

submit()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Consult Listing 23-3 for an example of using the `submit()` method from outside of a form.

Event handlers

onReset

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Listing 23-4 demonstrates one way to prevent accidental form resets or submissions. Using standard Reset and Submit buttons as interface elements, the `<FORM>` object definition includes both event handlers. Each event handler calls its own function that offers a choice for users. Notice how each event handler includes the word `return` and takes advantage of the Boolean values that come back from the `confirm()` method dialog boxes in both functions.

Listing 23-4: The onReset and onSubmit Event Handlers

```
<HTML>
<HEAD>
<TITLE>Submit and Reset Confirmation</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function allowReset() {
    return window.confirm("Go ahead and clear the form?")
}
function allowSend() {
    return window.confirm("Go ahead and mail this info?")
}
</SCRIPT>
</HEAD>
<BODY>
<FORM METHOD=POST ENCTYPE="text/plain" ACTION="mailto:trash4@dannyg.com"
onReset="return allowReset()" onSubmit="return allowSend()">
Enter your first name:<INPUT TYPE="text" NAME="firstName"><P>
Enter your last name:<INPUT TYPE="text" NAME="lastName"><P>
Enter your address:<INPUT TYPE="text" NAME="address"><P>
Enter your city:<INPUT TYPE="text" NAME="city"><P>
<INPUT TYPE="radio" NAME="gender" CHECKED>Male
<INPUT TYPE="radio" NAME="gender">Female <P>
<INPUT TYPE="checkbox" NAME="retired">I am retired<P>
<INPUT TYPE="reset">
<INPUT TYPE="submit">
</FORM>
</BODY>
</HTML>
```

onSubmit

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listing 23-4 for an example of trapping a submission via the `onSubmit` event handler.

LABEL Element Object

Property

htmlFor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement uses W3C DOM-compatible syntax (IE5+ and NN6) to assign a form control reference to the `htmlFor` property of a label:

```
document.getElementById("myLabel").htmlFor = document.getElementById("myField")
```

Chapter 24 Examples

The following sections contain examples from Chapter 24, “Button Objects.”

The BUTTON Element Object and the Button, Submit, and Reset Input Objects

Properties

form

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following function fragment receives a reference to a button element as the parameter. The button reference is needed to decide which branch to follow; then the form is submitted.

```
function setAction(btn) {
    if (btn.name == "normal") {
        btn.form.action = "cgi-bin/normal.pl"
    } else if (btn.name == "special") {
        btn.form.action = "cgi-bin/specialHandling.pl"
    }
    btn.form.submit()
}
```

Notice how this function doesn’t have to worry about the form reference, because its job is to work with whatever form encloses the button that triggers this function. Down in the form, two buttons invoke the same function. Only their names ultimately determine the precise processing of the button click:

```
<FORM>
...
<INPUT TYPE="button" NAME="normal" VALUE="Regular Handling"
onClick="setAction(this)">
<INPUT TYPE="button" NAME="special" VALUE="Special Handling"
onClick="setAction(this)">
</FORM>
```

name

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See the example for the `form` property earlier in this chapter for a practical application of the `name` property.

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

In the following excerpt, the statement toggles the label of a button from “Play” to “Stop” except in NN/Mac through NN4:

```
var btn = document.forms[0].controlButton
btn.value = (btn.value == "Play") ? "Stop" : "Play"
```

Methods

click()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following statement demonstrates how to script a click action on a button form control named `sender`:

```
document.forms[0].sender.click()
```

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 24-1 demonstrates not only the `onClick` event handler of a button but also how you may need to extract a particular button's `name` or `value` properties from a general-purpose function that services multiple buttons. In this case, each button passes its own object as a parameter to the `displayTeam()` function. The function then displays the results in an alert dialog box. A real-world application would probably use a more complex `if...else` decision tree to perform more sophisticated actions based on the button clicked (or use a `switch` construction on the `btn.value` expression for NN4+ and IE4+).

Listing 24-1: Three Buttons Sharing One Function

```
<HTML>
<HEAD>
<TITLE>Button Click</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function displayTeam(btn) {
    if (btn.value == "Abbott") {alert("Abbott & Costello")}
    if (btn.value == "Rowan") {alert("Rowan & Martin")}
    if (btn.value == "Martin") {alert("Martin & Lewis")}
}
</SCRIPT>
</HEAD>

<BODY>
Click on your favorite half of a popular comedy team:<P>
<FORM>
<INPUT TYPE="button" VALUE="Abbott" onClick="displayTeam(this)">
<INPUT TYPE="button" VALUE="Rowan" onClick="displayTeam(this)">
<INPUT TYPE="button" VALUE="Martin" onClick="displayTeam(this)">
</FORM>
</BODY>
</HTML>
```

Checkbox Input Object

Properties

checked

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The simple example in Listing 24-2 passes a form object reference to the JavaScript function. The function, in turn, reads the `checked` value of the form's checkbox object (`checkThis.checked`) and uses its Boolean value as the test result for the `if...else` construction.

Listing 24-2: The checked Property as a Conditional

```
<HTML>
<HEAD>
<TITLE>Checkbox Inspector</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function inspectBox(form) {
    if (form.checkThis.checked) {
        alert("The box is checked.")
    } else {
        alert("The box is not checked at the moment.")
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<INPUT TYPE="checkbox" NAME="checkThis">Check here<P>
<INPUT TYPE="button" NAME="boxChecker" VALUE="Inspect Box"
onClick="inspectBox(this.form)">
</FORM>
</BODY>
</HTML>
```

defaultChecked

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The function in Listing 24-3 (this fragment is not in the CD-ROM listings) is designed to compare the current setting of a checkbox against its default value. The `if` construction compares the current status of the box against its default status. Both are Boolean values, so they can be compared against each other. If the current and default settings don't match, the function goes on to handle the case in which the current setting is other than the default.

Listing 24-3: Examining the defaultChecked Property

```
function compareBrowser(thisBox) {
    if (thisBox.checked != thisBox.defaultChecked) {
        // statements about using a different set of HTML pages
    }
}
```

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The scenario for the skeleton HTML page in Listing 24-4 is a form with a checkbox whose selection determines which of two actions to follow for submission to the server. After the user clicks the Submit button, a JavaScript function examines the checkbox's `checked` property. If the property is `true` (the button is checked), the script sets the `action` property for the entire form to the content of the value property — thus influencing where the form goes on the server side. If you try this listing on your computer, the result you see varies widely with the browser version you use. For most browsers, you see some indication (an error alert or other screen notation) that a file with the name `primaryURL` or `alternateURL` doesn't exist. Unfortunately, IE5.5/Windows does not display the name of the file that can't be opened. Try the example in another browser if you have one. The names and the error message come from the submission process for this demonstration.

Listing 24-4: **Adjusting a CGI Submission Action**

```
<HTML>
<HEAD>
<TITLE>Checkbox Submission</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setAction(form) {
    if (form.checkThis.checked) {
        form.action = form.checkThis.value
    } else {
        form.action = "file://primaryURL"
    }
    return true
}
</SCRIPT>
</HEAD>
<BODY>
<FORM METHOD="POST" ACTION="">
<INPUT TYPE="checkbox" NAME="checkThis" VALUE="file://alternateURL">Use
alternate<P>
<INPUT TYPE="submit" NAME="boxChecker" onClick="return setAction(this.form)">
</FORM>
</BODY>
</HTML>
```

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The page in Listing 24-5 shows how to trap the click event in one checkbox to influence the visibility and display of other form controls. After you turn on the Monitor checkbox, a list of radio buttons for monitor sizes appears. Similarly, engaging the Communications checkbox makes two radio buttons visible. Your choice of radio button brings up one of two further choices within the same table cell.

Notice how the `toggle()` function was written as a generalizable function. This function can accept a reference to any checkbox object and any related span. If five more groups like this were added to the table, no additional functions would be needed.

In the `swap()` function, an application of a nested `if...else` shortcut construction is used to convert the Boolean values of the `checked` property to the strings needed for the `display` style property. The nesting is used to allow a single statement to take care of two conditions: the group of buttons to be controlled and the `checked` property of the button invoking the function. This function is not generalizable, because it contains explicit references to objects in the document. The `swap()` function can be made generalizable, but due to the special relationships between pairs of span elements (meaning one has to be hidden while the other displayed in its place), the function would require more parameters to fill in the blanks where explicit references are needed.

Note

A rendering bug in NN6 causes the form controls in the lower right frame to lose their settings when the elements have their `display` style property set to `none`. The problem is related to the inclusion of P or similar block elements inside a table cell that contains controls. Therefore, if you uncheck and recheck the Communications checkbox in the example page, the previously displayed subgroup shows up even though no radio buttons are selected. You can script around this bug by preserving radio button settings in a global variable as you hide the group, and restoring the settings when you show the group again.

Syntax used to address elements here is the W3C DOM-compatible form, so this listing runs as is with IE5+ and NN6+. You can modify the listing to run in IE4 by adapting references to the `document.all` format.

Listing 24-5: **A Checkbox and an onClick event Handler**

```
<HTML>
<HEAD>
<TITLE>Checkbox Event Handler</TITLE>
<STYLE TYPE="text/css">
#monGroup {visibility:hidden}
#comGroup {visibility:hidden}
```

Continued

Listing 24-5 *(continued)*

```
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
// toggle visibility of a main group spans
function toggle(chkbox, group) {
    var visSetting = (chkbox.checked) ? "visible" : "hidden"
    document.getElementById(group).style.visibility = visSetting
}
// swap display of communications sub group spans
function swap(radBtn, group) {
    var modemsVisSetting = (group == "modems") ?
        ((radBtn.checked) ? "" : "none") : "none"
    var netwksVisSetting = (group == "netwks") ?
        ((radBtn.checked) ? "" : "none") : "none"
    document.getElementById("modems").style.display = modemsVisSetting
    document.getElementById("netwks").style.display = netwksVisSetting
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<H3>Check all accessories for your computer:</H3>
<TABLE BORDER=2 CELLPADDING=5>
<TR>
    <TD>
    <INPUT TYPE="checkbox" NAME="monitor"
onClick="toggle(this, 'monGroup')">Monitor
    </TD>
    <TD>
    <SPAN ID="monGroup">
        <INPUT TYPE="radio" NAME="monitorType">15"
        <INPUT TYPE="radio" NAME="monitorType">17"
        <INPUT TYPE="radio" NAME="monitorType">21"
        <INPUT TYPE="radio" NAME="monitorType">>21"
    </SPAN>
    </TD>
</TR>
<TR>
    <TD>
    <INPUT TYPE="checkbox" NAME="comms"
        onClick="toggle(this, 'comGroup')">Communications
    </TD>
    <TD>
    <SPAN ID="comGroup">
        <P><INPUT TYPE="radio" NAME="commType"
            onClick="swap(this, 'modems')">Modem
        <INPUT TYPE="radio" NAME="commType"
            onClick="swap(this, 'netwks')">Network</P>
```

```
            <P><SPAN ID="modems" STYLE="display:none">
                <INPUT TYPE="radio" NAME="modemType"><56kbps
                <INPUT TYPE="radio" NAME="modemType">56kbps
                <INPUT TYPE="radio" NAME="modemType">ISDN (any speed)
                <INPUT TYPE="radio" NAME="modemType">Cable
            </SPAN>
            <SPAN ID="netwks" STYLE="display:none">
                <INPUT TYPE="radio" NAME="netwkType">Ethernet 10Mbps (10-Base T)
                <INPUT TYPE="radio" NAME="netwkType">Ethernet 100Mbps (10/100)
                <INPUT TYPE="radio" NAME="netwkType">T1 or greater
            </SPAN> </P>
    </SPAN>
    </TD>
</TR>

</TABLE>
</FORM>
</BODY>
</HTML>
```

Radio Input Object

Properties

checked

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 24-6 uses a repeat loop in a function to look through all buttons in the Stooges group in search of the checked button. After the loop finds the one whose checked property is `true`, it returns the value of the index. In one instance, that index value is used to extract the `value` property for display in the alert dialog box; in the other instance, the value helps determine which button in the group is next in line to have its checked property set to `true`.

Listing 24-6: **Finding the Selected Button in a Radio Group**

```
<HTML>
<HEAD>
<TITLE>Extracting Highlighted Radio Button</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function getSelectedButton(buttonGroup){
    for (var i = 0; i < buttonGroup.length; i++) {
        if (buttonGroup[i].checked) {
            return i
        }
    }
    return 0
}
function fullName(form) {
    var i = getSelectedButton(form.stooges)
    alert("You chose " + form.stooges[i].value + ".")
}
function cycle(form) {
    var i = getSelectedButton(form.stooges)
    if (i+1 == form.stooges.length) {
        form.stooges[0].checked = true
    } else {
        form.stooges[i+1].checked = true
    }
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<B>Select your favorite Stooge:</B>
<P><INPUT TYPE="radio" NAME="stooges" VALUE="Moe Howard" CHECKED>Moe
<INPUT TYPE="radio" NAME="stooges" VALUE="Larry Fine" >Larry
<INPUT TYPE="radio" NAME="stooges" VALUE="Curly Howard" >Curly
<INPUT TYPE="radio" NAME="stooges" VALUE="Shemp Howard" >Shemp</P>
<P><INPUT TYPE="button" NAME="Viewer" VALUE="View Full Name..."
onClick="fullName(this.form)"></P>
<P><INPUT TYPE="button" NAME="Cycler" VALUE="Cycle Buttons"
onClick="cycle(this.form)"> </P>
</FORM>
</BODY>
</HTML>
```

defaultChecked

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

In the script fragment of Listing 24-7 (not among the CD-ROM files), a function is passed a reference to a form containing the Stooges radio buttons. The goal is to see, in as general a way as possible (supplying the radio group name where needed), if the user changed the default setting. Looping through each of the radio buttons, you look for the one whose `CHECKED` attribute is set in the `<INPUT>` definition. With that index value (`i`) in hand, you then look to see if that entry is still checked. If not (notice the `!` negation operator), you display an alert dialog box about the change.

Listing 24-7: **Has a Radio Button Changed?**

```
function groupChanged(form) {
    for (var i = 0; i < form.stooges.length; i++) {
        if (form.stooges[i].defaultChecked) {
            if (!form.stooges[i].checked) {
                alert("This radio group has been changed.")
            }
        }
    }
}
```

length

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See the loop construction within the function of Listing 24-7 for one way to apply the `length` property.

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 24-6 earlier in this chapter demonstrates how a function extracts the `value` property of a radio button to display otherwise hidden information stored with a button. In this case, it lets the alert dialog box show the full name of the selected Stooge.

Event handlers

onClick

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Every time a user clicks one of the radio buttons in Listing 24-8, he or she sets a global variable to `true` or `false`, depending on whether the person is a Shemp lover. This action is independent of the action that is taking place if the user clicks on the View Full Name button. An `onUnload` event handler in the `<BODY>` definition triggers a function that displays a message to Shemp lovers just before the page clears (click the browser's Reload button to leave the current page prior to reloading). Here I use an initialize function triggered by `onLoad` so that the current radio button selection sets the global value upon a reload.

Listing 24-8: An onClick event Handler for Radio Buttons

```
<HTML>
<HEAD>
<TITLE>Radio Button onClick Handler</TITLE>
<SCRIPT LANGUAGE="JavaScript">
```

```
var ShempOPhile = false
function initValue() {
    ShempOPhile = document.forms[0].stooges[3].checked
}
 function fullName(form) {
    for (var i = 0; i < form.stooges.length; i++) {
        if (form.stooges[i].checked) {
            break
        }
    }
    alert("You chose " + form.stooges[i].value + ".")
}
function setShemp(setting) {
    ShempOPhile = setting
}
function exitMsg() {
    if (ShempOPhile) {
        alert("You like SHEMP?")
    }
}
</SCRIPT>
</HEAD>

<BODY onLoad="initValue()" onUnload="exitMsg()">
<FORM>
<B>Select your favorite Stooge:</B><P>
<INPUT TYPE="radio" NAME="stooges" VALUE="Moe Howard" CHECKED
onClick="setShemp(false)">Moe
<INPUT TYPE="radio" NAME="stooges" VALUE="Larry Fine"
onClick="setShemp(false)">Larry
<INPUT TYPE="radio" NAME="stooges" VALUE="Curly Howard"
onClick="setShemp(false)">Curly
<INPUT TYPE="radio" NAME="stooges" VALUE="Shemp Howard"
onClick="setShemp(true)">Shemp<P>
<INPUT TYPE="button" NAME="Viewer" VALUE="View Full Name..."
onClick="fullName(this.form)">
</FORM>
</BODY>
</HTML>
```

See also Listing 24-5 for further examples of scripting `onClick` event handlers for radio buttons — this time to hide and show related items in a form.

Chapter 25 Examples

The following sections contain examples from Chapter 25, “Text-Related Form Objects.”

Text Input Object

Properties

defaultValue

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Important: Listings 25-1, 25-2, and 25-3 feature a form with only one text INPUT element. The rules of HTML forms say that such a form submits itself if the user presses the Enter key whenever the field has focus. Such a submission to a form whose action is undefined causes the page to reload, thus stopping any scripts that are running at the time. FORM elements for of these example listings contain an `onSubmit` event handler that both blocks the submission and attempts to trigger the text box `onChange` event handler to run the demonstration script. In some browsers, such as IE5/Mac, you may have to press the Tab key or click outside of the text box to trigger the `onChange` event handler after you enter a new value.

Listing 25-1 has a simple form with a single field that has a default value set in its tag. A function (`resetField()`) restores the contents of the page’s lone field to the value assigned to it in the `<INPUT>` definition. For a single-field page such as this, defining a `TYPE="reset"` button or calling `form.reset()` works the same way because such buttons reestablish default values of all elements of a form. But if you want to reset only a subset of fields in a form, follow the example button and function in Listing 25-1.

Listing 25-1: Resetting a Text Object to Default Value

```
<HTML>
<HEAD>
<TITLE>Text Object DefaultValue</TITLE>
```

```
<SCRIPT LANGUAGE="JavaScript">
function upperMe(field) {
    field.value = field.value.toUpperCase()
}
function resetField(form) {
    form.converter.value = form.converter.defaultValue
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="window.focus(); return false">
Enter lowercase letters for conversion to uppercase: <INPUT TYPE="text"
NAME="converter" VALUE="sample" onChange="upperMe(this)">
<INPUT TYPE="button" VALUE="Reset Field"
onClick="resetField(this.form)">
</FORM>
</BODY>
</HTML>
```

form

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following function fragment receives a reference to a text element as the parameter. The text element reference is needed to decide which branch to follow; then the form is submitted.

```
function setAction(fld) {
    if (fld.value.indexOf("@") != -1) {
        fld.form.action = "mailto:" + fld.value
    } else {
        fld.form.action = "cgi-bin/normal.pl"
    }
    fld.form.submit()
}
```

Notice how this function doesn't have to worry about the form reference, because its job is to work with whatever form encloses the text field that triggers this function.

maxLength

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to experiment with the `maxLength` property. The top text field has no default value, but you can temporarily set it to only a few characters and see how it affects entering new values:

```
document.forms[0].input.maxLength = 3
```

Try typing into the field to see the results of the change. To restore the default value, reload the page.

name

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Consult Listing 25-2 later in this chapter, where I use the text object's name, `convertor`, as part of the reference when assigning a value to the field. To extract the name of a text object, you can use the property reference. Therefore, assuming that your script doesn't know the name of the first object in the first form of a document, the statement is

```
var objectName = document.forms[0].elements[0].name
```

readOnly

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to set the bottom text box to be read-only. Begin by typing anything you want in the bottom text box. Then enter the following statement into the top text box:

```
document.forms[0].inspector.readOnly = true
```

While existing text in the box is selectable (and therefore can be copied into the clipboard), it cannot be modified or removed.

size

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Resize the bottom text box of The Evaluator (Chapter 13) by entering the following statements into the top text box:

```
document.forms[0].inspector.size = 20
document.forms[0].inspector.size = 400
```

Reload the page to return the size back to normal (or set the value to `80`).

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

As a demonstration of how to retrieve and assign values to a text object, Listing 25-2 shows how the action in an `onChange` event handler is triggered. Enter any lowercase letters into the field and click out of the field. I pass a reference to the entire form object as a parameter to the event handler. The function extracts the value, converts it to uppercase (using one of the JavaScript string object methods), and assigns it back to the same field in that form.

Listing 25-2: **Getting and Setting a Text Object's Value**

```
<HTML>
<HEAD>
<TITLE>Text Object Value</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function upperMe(form) {
    inputStr = form.converter.value
    form.converter.value = inputStr.toUpperCase()
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="window.focus(); return false">
Enter lowercase letters for conversion to uppercase: <INPUT TYPE="text"
NAME="converter" VALUE="sample" onChange="upperMe(this.form)">
</FORM>
</BODY>
</HTML>
```

I also show two other ways to accomplish the same task, each one more efficient than the previous example. Both utilize the shortcut object reference to get at the heart of the text object. Listing 25-3 passes the text object — contained in the `this` reference — to the function handler. Because that text object contains a complete reference to it (out of sight, but there just the same), you can access the `value` property of that object and assign a string to that object's `value` property in a simple assignment statement.

Listing 25-3: **Passing a Text Object (as this) to the Function**

```
<HTML>
<HEAD>
<TITLE>Text Object Value</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function upperMe(field) {
    field.value = field.value.toUpperCase()
}
</SCRIPT>
</HEAD>

<BODY>
<FORM onSubmit="window.focus(); return false">
Enter lowercase letters for conversion to uppercase: <INPUT TYPE="text"
NAME="converter" VALUE="sample" onChange="upperMe(this)">
</FORM>
```

```
</BODY>
</HTML>
```

Yet another way is to deal with the field values directly in an embedded event handler—instead of calling an external function (which is easier to maintain because all scripts are grouped together in the Head). With the function removed from the document, the event handler attribute of the `<INPUT>` tag changes to do all the work:

```
<INPUT TYPE="text" NAME="converter" VALUE="sample"
 onChange="this.value = this.value.toUpperCase()">
```

The right-hand side of the assignment expression extracts the current contents of the field and (with the help of the `toUpperCase()` method of the string object) converts the original string to all uppercase letters. The result of this operation is assigned to the `value` property of the field.

The application of the this keyword in the previous examples may be confusing at first, but these examples represent the range of ways in which you can use such references effectively. Using this by itself as a parameter to an object's event handler refers only to that single object—a text object in Listing 25-3. If you want to pass along a broader scope of objects that contain the current object, use the `this` keyword along with the outer object layer that you want. In Listing 25-2, I sent a reference to the entire form along by specifying `this.form`—meaning the form that contains "this" object, which is being defined in the line of HTML code.

At the other end of the scale, you can use similar-looking syntax to specify a particular property of the `this` object. Thus, in the last example, I zeroed in on just the `value` property of the current object being defined—`this.value`. Although the formats of `this.form` and `this.value` appear the same, the fact that one is a reference to an object and the other just a value can influence the way your functions work. When you pass a reference to an object, the function can read and modify properties of that object (as well as invoke its functions); but when the parameter passed to a function is just a property value, you cannot modify that value without building a complete reference to the object and its value.

Methods

blur()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following statement invokes the `blur()` method on a text box named `vanishText`:

```
document.forms[0].vanishText.blur()
```

focus()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listing 25-4 for an example of an application of the `focus()` method in concert with the `select()` method.

select()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

A click of the Verify button in Listing 25-4 performs a validation on the contents of the text box, making sure the entry consists of all numbers. All work is controlled by the `checkNumeric()` function, which receives a reference to the field needing inspection as a parameter. Because of the way the delayed call to the `doSelection()` function has to be configured, various parts of what will become a valid reference to the form are extracted from the field's and form's properties. If the validation (performed in the `isNumber()` function) fails, the `setSelection()` method is invoked after an artificial delay of zero milliseconds. As goofy as this sounds, this method is all that IE needs to recover from the display and closure of the alert dialog box. Because the first parameter of the `setTimeout()` method must be a string, the example assembles a string invocation of the `setSelection()` function via string versions of the form and field names. All that the `setSelection()` function does is focus and select the field whose reference is passed as a parameter. This function is now generalizable to work with multiple text boxes in a more complex form.

Listing 25-4: Selecting a Field

```
<HTML>
<HEAD>
<TITLE>Text Object Select/Focus</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// general purpose function to see if a suspected numeric input is a number
function isNumber(inputStr) {
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.charAt(i)
        if (oneChar < "0" || oneChar > "9") {
            alert("Please make sure entries are integers only.")
            return false
        }
    }
    return true
}
function checkNumeric(fld) {
    var inputStr = fld.value
    var fldName = fld.name
    var formName = fld.form.name
    if (isNumber(inputStr)) {
        // statements if true
    } else {
        setTimeout("doSelection(document." + formName + ". " + fldName + ")", 0)
    }
}

function doSelection(fld) {
    fld.focus()
    fld.select()
}
</SCRIPT>
</HEAD>

<BODY>
<FORM NAME="entryForm" onSubmit="return false">
Enter any positive integer: <INPUT TYPE="text" NAME="numeric"><P>
<INPUT TYPE="button" VALUE="Verify" onClick="checkNumeric(this.form.numeric)">
</FORM>
</BODY>
</HTML>
```

Event handlers

onBlur
onFocus
onSelect

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

To demonstrate one of these event handlers, Listing 25-5 shows how you may use the window's statusbar as a prompt message area after a user activates any field of a form. When the user tabs to or clicks on a field, the prompt message associated with that field appears in the statusbar.

Listing 25-5: The onFocus event Handler

```
<HTML>
<HEAD>
<TITLE>Elements Array</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function prompt(msg) {
    window.status = "Please enter your " + msg + "."
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
Enter your first name:<INPUT TYPE="text" NAME="firstName"
onFocus="prompt('first name')"><P>
Enter your last name:<INPUT TYPE="text" NAME="lastName"
onFocus="prompt('last name')"><P>
Enter your address:<INPUT TYPE="text" NAME="address"
onFocus="prompt('address')"><P>
Enter your city:<INPUT TYPE="text" NAME="city" onFocus="prompt('city')"><P>
</FORM>
</BODY>
</HTML>
```

onChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Whenever a user makes a change to the text in a field in Listing 25-6 and then either tabs or clicks out of the field, the change event is sent to that field, triggering the `onChange` event handler.

Because the form in Listing 25-6 has only one field, the example demonstrates a technique you can use that prevents a form from being "submitted" if the user accidentally presses the Enter key. The technique is as simple as defeating the submission via the `onSubmit` event handler of the form. At the same time, the `onSubmit` event handler invokes the `checkIt()` function, so that pressing the Enter key (as well as pressing Tab or clicking outside the field) triggers the function.

Listing 25-6: Data Validation via an onChange event Handler

```
<HTML>
<HEAD>
<TITLE>Text Object Select/Focus</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// general purpose function to see if a suspected numeric input is a number
function isNumber(inputStr) {
    for (var i = 0; i < inputStr.length; i++) {
        var oneChar = inputStr.substring(i, i + 1)
        if (oneChar < "0" || oneChar > "9") {
            alert("Please make sure entries are numbers only.")
            return false
        }
    }
    return true
}
function checkIt(form) {
    inputStr = form.numeric.value
    if (isNumber(inputStr)) {
        // statements if true
    } else {
        form.numeric.focus()
        form.numeric.select()
```

Continued

Listing 25-6 *(continued)*

```
    }
}
</SCRIPT>
</HEAD>

<BODY onSubmit="checkIt(this); return false">
<FORM>
Enter any positive integer: <INPUT TYPE="text" NAME="numeric"
onChange="checkIt(this.form)"><P>
</FORM>
</BODY>
</HTML>
```

TEXTAREA Element Object

Properties

`cols`
`rows`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator to play with the `cols` and `rows` property settings for the Results textarea on that page. Shrink the width of the textarea by entering the following statement into the top text box:

```
document.forms[0].output.cols = 30
```

And make the textarea one row deeper:

```
document.forms[0].output.rows++
```

Methods

createTextRange()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See the example for the `TextRange.move()` method in Chapter 19 to see how to control the text insertion pointer inside a TEXTAREA element.

Chapter 26 Examples

The following sections contain examples from Chapter 26, "Select, Option, and FileUpload Objects."

SELECT Element Object

Properties

length

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listing 26-1 for an illustration of the way you use the `length` property to help determine how often to cycle through the repeat loop in search of selected items. Because the loop counter, `i`, must start at `0`, the counting continues until the loop counter is one less than the actual length value (which starts its count with `1`).

multiple

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement toggles between single and multiple selections on a SELECT element object whose `SIZE` attribute is set to a value greater than `1`:

```
document.forms[0].mySelect.multiple = !document.forms[0].mySelect.multiple
```

options[*index*]

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

See Listings 26-1 through 26-3 in the printed chapter for examples of how the `options` array references information about the options inside a SELECT element.

options[*index*].defaultSelected

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following statement preserves a Boolean value if the first option of the SELECT list is the default selected item:

```
var zeroIsDefault = document.forms[0].listName.options[0].defaultSelected
```

options[*index*].index

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

The following statement assigns the index integer of the first option of a SELECT element named `listName` to a variable named `itemIndex`.

```
var itemIndex = document.forms[0].listName.options[0].index
```

options[*index*].selected

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

To accumulate a list of all items selected by the user, the `seeList()` function in Listing 26-4 systematically examines the `options[index].selected` property of each item in the list. The text of each item whose `selected` property is `true` is appended to the list. I add the "`\n  `" inline carriage returns and spaces to make the list in the alert dialog box look nice and indented. If you assign other values to the `VALUE` attributes of each option, the script can extract the `options[index].value` property to collect those values instead.

Listing 26-4: Cycling through a Multiple-Selection List

```
<HTML>
<HEAD>
<TITLE>Accessories List</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function seeList(form) {
    var result = ""
    for (var i = 0; i < form.accList.length; i++) {
        if (form.accList.options[i].selected) {
```

Continued

Listing 26-4 *(continued)*

```
            result += "\n  " + form.accList.options[i].text
        }
}
    alert("You have selected:" + result)
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P>Control/Command-click on all accessories you use:
<SELECT NAME="accList" SIZE=9 MULTIPLE>
    <OPTION SELECTED>Color Monitor
    <OPTION>Modem
    <OPTION>Scanner
    <OPTION>Laser Printer
    <OPTION>Tape Backup
    <OPTION>MO Drive
    <OPTION>Video Camera
</SELECT> </P>
<P><INPUT TYPE="button" VALUE="View Summary..."
onClick="seeList(this.form)"></P>
</FORM>
</BODY>
</HTML>
```

options[*index*].text

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

To demonstrate the `text` property of an option, Listing 26-5 applies the text from a selected option to the `document.bgColor` property of a document in the current window. The color names are part of the collection built into all scriptable browsers; fortunately, the values are case-insensitive so that you can capitalize the color names displayed and assign them to the property.

Listing 26-5: Using the options[index].text Property

```
<HTML>
<HEAD>
<TITLE>Color Changer 1</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function seeColor(form) {
    var newColor = (form.colorsList.options[form.colorsList.selectedIndex].text)
    document.bgColor = newColor
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P>Choose a background color:
<SELECT NAME="colorsList">
    <OPTION SELECTED>Gray
    <OPTION>Lime
    <OPTION>Ivory
    <OPTION>Red
</SELECT></P>
<P><INPUT TYPE="button" VALUE="Change It" onClick="seeColor(this.form)"></P>
</FORM>
</BODY>
</HTML>
```

options[*index*].value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 26-6 requires the option text that the user sees to be in familiar, multiple-word form. But to set the color using the browser's built-in color palette, you must use the one-word form. Those one-word values are stored in the `VALUE` attributes of each `<OPTION>` definition. The function then reads the `value` property, assigning it to the `bgColor` of the current document. If you prefer to use the hexadecimal triplet form of color specifications, those values are assigned to the `VALUE` attributes (`<OPTION VALUE="#e9967a">Dark Salmon`).

Listing 26-6: Using the options[index].value Property

```
<HTML>
<HEAD>
<TITLE>Color Changer 2</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function seeColor(form) {
    var newColor = (form.colorsList.options[form.colorsList.selectedIndex].value)
    document.bgColor = newColor
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P>Choose a background color:
<SELECT NAME="colorsList">
    <OPTION SELECTED VALUE="cornflowerblue">Cornflower Blue
    <OPTION VALUE="darksalmon">Dark Salmon
    <OPTION VALUE="lightgoldenrodyellow">Light Goldenrod Yellow
    <OPTION VALUE="seagreen">Sea Green
</SELECT></P>
<P><INPUT TYPE="button" VALUE="Change It" onClick="seeColor(this.form)"></P>
</FORM>
</BODY>
</HTML>
```

selectedIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

In the `inspect()` function of Listing 26-7, notice that the value inside the `options` property index brackets is a reference to the object's `selectedIndex` property. Because this property always returns an integer value, it fulfills the needs of the index value for the `options` property. Therefore, if you select Green in the pop-up menu, `form.colorsList.selectedIndex` returns a value of `1`; that reduces the rest of the reference to `form.colorsList.options[1].text`, which equals "Green."

Listing 26-7: Using the selectedIndex Property

```
<HTML>
<HEAD>
<TITLE>Select Inspector</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function inspect(form) {
    alert(form.colorsList.options[form.colorsList.selectedIndex].text)
}
</SCRIPT>
</HEAD>

<BODY>
<FORM>
<P><SELECT NAME="colorsList">
    <OPTION SELECTED>Red
    <OPTION VALUE="Plants"><I>Green</I>
    <OPTION>Blue
</SELECT></P>
<P><INPUT TYPE="button" VALUE="Show Selection" onClick="inspect(this.form)"></P>
</FORM>
</BODY>
</HTML>
```

size

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement sets the number of visible items to 5:

```
document.forms[0].mySelect.size = 5
```

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The function in Listing 26-6 that accesses the chosen value the long way can be simplified for newer browsers only with the following construction:

```
function seeColor(form) {
    document.bgColor = form.colorsList.value
}
```

Methods

item(*index*)
namedItem("*optionID*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

The following statement assigns an OPTION element reference to a variable:

```
var oneOption = document.forms[0].mySelect.namedItem("option3_2")
```

Event handlers

onChange

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 26-8 is a version of Listing 26-6 that invokes all action as the result of a user making a selection from the pop-up menu. The `onChange` event handler in the `<SELECT>` tag replaces the action button. For this application — when you desire a direct response to user input — an appropriate method is to have the action triggered from the pop-up menu rather than by a separate action button.

Notice two other important changes. First, the SELECT element now contains a blank first option. When a user visits the page, nothing is selected yet, so you should present a blank option to encourage the user to make a selection. The function also makes sure that the user selects one of the color-valued items before it attempts to change the background color.

Second, the BODY element contains an onUnload event handler that resets the form. The purpose behind this is that if the user navigates to another page and uses the Back button to return to the page, the script-adjusted background color does not persist. I recommend you return the SELECT element to its original setting. Unfortunately, the reset does not stick to the form in IE4 and IE5 for Windows (although this problem appears to be repaired in IE5.5). Another way to approach this issue is to use the onLoad event handler to invoke seeColor(), passing as a parameter a reference to the SELECT element. Thus, if the SELECT element choice persists, the background color is adjusted accordingly after the page loads.

Listing 26-8: **Triggering a Color Change from a Pop-Up Menu**

```
<HTML>
<HEAD>
<TITLE>Color Changer 2</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function seeColor(list) {
    var newColor = (list.options[list.selectedIndex].value)
    if (newColor) {
        document.bgColor = newColor
    }
}
</SCRIPT>
</HEAD>

<BODY onUnload="document.forms[0].reset()">
<FORM>
<P>Choose a background color:
<SELECT NAME="colorsList" onChange="seeColor(this)">
    <OPTION SELECTED VALUE="">
    <OPTION VALUE="cornflowerblue">Cornflower Blue
    <OPTION VALUE="darksalmon">Dark Salmon
    <OPTION VALUE="lightgoldenrodyellow">Light Goldenrod Yellow
    <OPTION VALUE="seagreen">Sea Green
</SELECT></P>
</FORM>
</BODY>
</HTML>
```

OPTION Element Object

Properties

label

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	

Example

The following statement modifies the text that appears as the selected text in a pop-up list:

```
document.forms[0].mySelect.options[3].label = "Widget 9000"
```

If this option is the currently selected one, the text on the pop-up list at rest changes to the new label.

OPTGROUP Element Object

Properties

label

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				✓	

Example

I present Listing 26-9 in the hope that Microsoft and Netscape will eventually eradicate the bugs that afflict their current implementations of the `label` property. When the feature works as intended, Listing 26-9 demonstrates how a script can alter the text of option group labels. This page is an enhanced version of the background color setters used in other examples of this chapter. Be aware that

IE5/Mac does not alter the last OPTGROUP element's label, and NN6 achieves only a partial change to the text displayed in the SELECT element.

Listing 26-9: Modifying OPTGROUP Element Labels

```
<HTML>
<HEAD>
<TITLE>Color Changer 3</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var regularLabels = ["Reds","Greens","Blues"]
var naturalLabels = ["Apples","Leaves","Sea"]
function setRegularLabels(list) {
    var optGrps = list.getElementsByTagName("OPTGROUP")
    for (var i = 0; i < optGrps.length; i++) {
        optGrps[i].label = regularLabels[i]
    }
}
function setNaturalLabels(list) {
    var optGrps = list.getElementsByTagName("OPTGROUP")
    for (var i = 0; i < optGrps.length; i++) {
       optGrps[i].label = naturalLabels[i]
    }
}
function seeColor(list) {
    var newColor = (list.options[list.selectedIndex].value)
    if (newColor) {
        document.bgColor = newColor
    }
}
</SCRIPT>
</HEAD>

<BODY onUnload="document.forms[0].reset()">
<FORM>
<P>Choose a background color:
<SELECT name="colorsList" onChange="seeColor(this)">
    <OPTGROUP ID="optGrp1" label="Reds">
        <OPTION value="#ff9999">Light Red
        <OPTION value="#ff3366">Medium Red
        <OPTION value="#ff0000">Bright Red
        <OPTION value="#660000">Dark Red
    </OPTGROUP>
    <OPTGROUP ID="optGrp2" label="Greens">
        <OPTION value="#ccff66">Light Green
        <OPTION value="#99ff33">Medium Green
        <OPTION value="#00ff00">Bright Green
        <OPTION value="#006600">Dark Green
    </OPTGROUP>
```

Continued

Listing 26-9 *(continued)*

```
    <OPTGROUP ID="optGrp3" label="Blues">
        <OPTION value="#ccffff">Light Blue
        <OPTION value="#66ccff">Medium Blue
        <OPTION value="#0000ff">Bright Blue
        <OPTION value="#000066">Dark Blue
    </OPTGROUP>
</SELECT></P>
<P>
<INPUT TYPE="radio" NAME="labels" CHECKED
onClick="setRegularLabels(this.form.colorsList)">Regular Label Names
<INPUT TYPE="radio" NAME="labels"
onClick="setNaturalLabels(this.form.colorsList)">Label Names from Nature</P>
</FORM>
</BODY>
</HTML>
```

Chapter 27 Examples

The following sections contain examples from Chapter 27, "Table and List Objects."

TABLE Element Object

Properties

align

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see the `align` property at work. The default value (`left`) is in force when the page loads. But you can shift the table to right-align with the body by entering the following statement into the top text box for IE5+ and NN6+:

```
document.getElementById("myTable").align = "right"
```

background

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Treat the `background` property of a table like you do the `src` property of an IMG element object. If you precache an image, you can assign the `src` property of the precached `image` object to the `background` property of the table for quick image changing. Such an assignment statement looks like the following:

```
document.all.myTable.background = imgArray["myTableAlternate"].src
```

bgColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to assign a color to the table. After looking at the table to see its initial state, enter the following IE5+/NN6+ statement into the top text box:

```
document.getElementById("myTable").bgColor = "lightgreen"
```

When you look at the table again, you see that only some of the cells turned to green. This is because colors also are assigned to table elements nested inside the outermost table element, and the color specification closest to the actual element wins the context.

border

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

To remove all traces of an outside border of a table (and, in some combinations of attributes of other table elements, borders between cells), use the following statement (in IE5+/NN6+ syntax):

```
document.getElementById("myTable").border = 0
```

borderColor
borderColorDark
borderColorLight

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Assuming that you have set the initial light and dark color attributes of a table, the following function swaps the light and dark colors to shift the light source to the opposite corner:

```
function swapColors(tableRef) {
    var oldLight = tableRef.borderColorLight
    tableRef.borderColorLight = tableRef.borderColorDark
    tableRef.borderColorDark = oldLight
}
```

While you can easily invoke this function over and over by ending it with a `setTimeout()` method that calls this function after a fraction of a second, the results are very distracting to the person trying to read your page. Please don't do it.

caption

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following example, for use with The Evaluator (Chapter 13) in NN6+, demonstrates the sequence of assigning a new CAPTION element object to a table. While the table in The Evaluator already has a CAPTION element, the following statements replace it with an entirely new one. Enter each of the following statements into the top text box, starting with the one that saves a long reference into a variable for multiple use at the end:

```
t = document.getElementById("myTable")
a = document.createElement("CAPTION")
b = document.createTextNode("A Brand New Caption")
a.appendChild(b)
t.replaceChild(a, t.caption)
```

A view of the table shows that the new caption has replaced the old one because a table can have only one CAPTION element.

cellPadding
cellSpacing

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to adjust the `cellPadding` and `cellSpacing` properties of the demonstrator table. First, adjust the padding (IE5+/NN6 syntax):

```
document.getElementById("myTable").cellPadding = 50
```

Now, adjust the cell spacing:

```
document.getElementById("myTable").cellSpacing = 15
```

Notice how `cellSpacing` affected the thickness of inter-cell borders.

cells

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator with IE5+ for Windows to have JavaScript calculate the number of columns in the demonstrator table with the help of the `cells` and `rows` properties. Enter the following statement into the top text box:

```
document.all.myTable.cells.length/document.all.myTable.rows.length
```

The result is the number of columns in the table.

dataPageSize

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

If you want to change the number of visible rows of linked data in the table to 15, use the following statement:

```
document.all.myTable.dataPageSize = 15
```

frame

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 27-4 presents a page that cycles through all possible settings for the `frame` property. The `frame` property value is displayed in the table's caption. (Early versions of NN6 might fail to refresh part of the page after adjusting the `frame` property.)

Listing 27-4: Cycling Through Table frame Property Values

```
<HTML>
<HEAD>
<TITLE>TABLE.frame Property</TITLE>

<SCRIPT LANGUAGE="JavaScript">
var timeoutID
var frameValues = ["box", "above", "rhs", "below", "lhs", "hsides", "vsides",
                   "border", "void"]
function rotateBorder(i) {
    document.getElementById("myTABLE").frame = frameValues[i]
    document.getElementById("myCAPTION").innerHTML = frameValues[i]
    i = (++i == frameValues.length) ? 0 : i
    timeoutID = setTimeout("rotateBorder(" + i + ")", 2000)
}
function stopRotate() {
    clearTimeout(timeoutID)
    document.getElementById("myTABLE").frame = "box"
    document.getElementById("myCAPTION").innerHTML = "box"
}
</SCRIPT>
</HEAD>

<BODY>
<H1>TABLE.frame Property</H1>
<HR>
<FORM NAME="controls">
<FIELDSET>
<LEGEND>Cycle Table Edge Visibility</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" VALUE="Cycle" onClick="rotateBorder(0)"></TD>
<TD><INPUT TYPE="button" VALUE="Stop" onClick="stopRotate()"></TD>
</TR>
</TABLE>
</FIELDSET>
</TABLE>
</FIELDSET>
</FORM>
<HR>
<TABLE ID="myTABLE" CELLPADDING=5 BORDER=3 ALIGN="center">
<CAPTION ID="myCAPTION">Default</CAPTION>
<THEAD ID="myTHEAD">
<TR>
    <TH>River<TH>Outflow<TH>Miles<TH>Kilometers
</TR>
```

Continued

Listing 27-4 *(continued)*

```
</THEAD>
<TBODY>
<TR>
    <TD>Nile<TD>Mediterranean<TD>4160<TD>6700
</TR>
<TR>
    <TD>Congo<TD>Atlantic Ocean<TD>2900<TD>4670
</TR>
<TR>
    <TD>Niger<TD>Atlantic Ocean<TD>2600<TD>4180
</TR>
<TR>
    <TD>Zambezi<TD>Indian Ocean<TD>1700<TD>2740
</TR>
</TABLE>
</BODY>
</HTML>
```

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to adjust the width of the demonstrator table. Begin by increasing the width to the full width of the page:

```
document.getElementById("myTable").width = "100%"
```

To restore the table to its minimum width, assign a very small value to the property:

```
document.getElementById("myTable").width = 50
```

If you have IE4+, you can perform similar experiments with the `height` property of the table.

rows

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator to examine the number of rows in the demonstrator table. Enter the following statement into the top text box:

```
document.getElementById("myTable").rows.length
```

In contrast, notice how the `rows` property sees only the rows within the demonstrator table's TBODY element:

```
document.getElementById("myTbody").rows.length
```

rules

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Listing 27-5 presents a page that cycles through all possible settings for the `rows` property. The `rows` property value is displayed in the table's caption. When you run this script, notice the nice border display for this table's combination of COLGROUP and table row segment elements. Early versions of NN6 may not render the altered table correctly, and scripted changes won't appear on the page.

Listing 27-5: Cycling Through Table rows Property Values

```
<HTML>
<HEAD>
<TITLE>TABLE.rules Property</TITLE>
```

Continued

Listing 27-5 *(continued)*

```
<SCRIPT LANGUAGE="JavaScript">
var timeoutID
var rulesValues = ["all", "cols", "groups", "none", "rows"]
function rotateBorder(i) {
    document.getElementById("myTABLE").rules = rulesValues[i]
    document.getElementById("myCAPTION").innerHTML = rulesValues[i]
    i = (++i == rulesValues.length) ? 0 : i
    timeoutID = setTimeout("rotateBorder(" + i + ")", 2000)
}
function stopRotate() {
    clearTimeout(timeoutID)
    document.getElementById("myTABLE").rules = "all"
    document.getElementById("myCAPTION").innerHTML = "all"
}
</SCRIPT>
</HEAD>

<BODY>
<H1>TABLE.rules Property</H1>
<HR>
<FORM NAME="controls">
<FIELDSET>
<LEGEND>Cycle Table Rule Visibility</LEGEND>
<TABLE WIDTH="100%" CELLSPACING=20><TR>
<TD><INPUT TYPE="button" VALUE="Cycle" onClick="rotateBorder(0)"></TD>
<TD><INPUT TYPE="button" VALUE="Stop" onClick="stopRotate()"></TD>
</TR>
</TABLE>
</FIELDSET>
</TABLE>
</FIELDSET>
</FORM>
<HR>
<TABLE ID="myTABLE" CELLPADDING=5 BORDER=3 ALIGN="center">
<CAPTION ID="myCAPTION">Default</CAPTION>
<COLGROUP SPAN=1>
<COLGROUP SPAN=3>
<THEAD ID="myTHEAD">
<TR>
    <TH>River<TH>Outflow<TH>Miles<TH>Kilometers
</TR>
</THEAD>
<TBODY>
<TR>
    <TD>Nile<TD>Mediterranean<TD>4160<TD>6700
</TR>
<TR>
    <TD>Congo<TD>Atlantic Ocean<TD>2900<TD>4670
```

```
</TR>
<TR>
    <TD>Niger<TD>Atlantic Ocean<TD>2600<TD>4180
</TR>
<TR>
    <TD>Zambezi<TD>Indian Ocean<TD>1700<TD>2740
</TR>
</TABLE>
</BODY>
</HTML>
```

tBodies

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to access the `tBodies` array and reveal the number of rows in the one TBODY segment of the demonstrator table. Enter the following statement into the top text box:

```
document.getElementById("myTable").tBodies[0].rows.length
```

Methods

moveRow(*sourceRowIndex*, *destinationRowIndex*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

If you want to shift the bottom row of a table to the top, you can use the shortcut reference to the last item's index value (`-1`) for the first parameter:

```
var movedRow = document.all.someTable.moveRow(-1, 0)
```

TBODY, TFOOT, and THEAD Element Objects

Properties

vAlign

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to modify the vertical alignment of the content of the TBODY element in the demonstrator table. Enter the following statement in the top text box to shift the content to the bottom of the cells:

```
document.getElementById("myTBody").vAlign = "bottom"
```

Notice that the cells of the THEAD element are untouched by the action imposed on the TBODY element.

COL and COLGROUP Element Objects

Properties

span

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement assigns a `span` of `3` to a newly created COLGROUP element stored in the variable `colGroupA`:

```
colGroupA.span = 3
```

TR Element Object

Properties

cells

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to retrieve the number of TD elements in the second row of the demonstrator table. Enter the following statement into the top text box (W3C DOM syntax shown here):

```
document.getElementById("myTable").rows[1].cells.length
```

height

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) in IE4+ to expand the height of the second row of the demonstrator table. Enter the following statement into the top text box:

```
document.all.myTable.rows[1].height = 300
```

If you attempt to set the value very low, the rendered height goes no smaller than the default height.

rowIndex
sectionRowIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to explore the `rowIndex` and `sectionRowIndex` property values for the second physical row in the demonstrator table. Enter each of the following statements into the top text box (W3C DOM syntax shown here):

```
document.getElementById("myTable").rows[1].rowIndex
document.getElementById("myTable").rows[1].sectionRowIndex
```

The result of the first statement is `1` because the second row is the second row of the entire table. But the `sectionRowIndex` property returns `0` because this row is the first row of the TBODY element in this particular table.

TD and TH Element Objects

Properties

cellIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

You can rewrite the cell addition portion of Listing 27-2 to utilize the `cellIndex` property. The process entails modifying the `insertTableRow()` function so that it uses a `do...while` construction to keep adding cells to match the number of data slots. The function looks like the following (changes shown in boldface):

```
function insertTableRow(form, where) {
    var now = new Date()
    var nowData = [now.getHours(), now.getMinutes(), now.getSeconds(),
        now.getMilliseconds()]
    clearBGColors()
    var newCell
    var newRow = theTableBody.insertRow(where)
    var i = 0
    do {
        newCell = newRow.insertCell(i)
        newCell.innerHTML = nowData[i++]
        newCell.style.backgroundColor = "salmon"
    } while (newCell.cellIndex < nowData.length)
    updateRowCounters(form)
}
```

This version is merely for demonstration purposes and is not as efficient as the sequence shown in Listing 27-2. But the `cellIndex` property version can give you some implementation ideas for the property. It also shows how dynamic the property is, even for brand new cells.

colSpan
rowSpan

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to witness how modifying either of these properties in an existing table can destroy the table. Enter the following statement into the top text box:

```
document.getElementById("myTable").rows[1].cells[0].colSpan = 3
```

Now that the first cell of the second row occupies the space of three columns, the browser has no choice but to shift the two other defined cells for that row out beyond the original boundary of the table. Experiment with the `rowSpan` property the same way. To restore the original settings, assign `1` to each property.

height
width

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see the results of setting the `height` and `width` properties of an existing table cell. Enter each of the following statements into the top text box and study the results in the demonstrator table (W3C DOM syntax used here):

```
document.getElementById("myTable").rows[1].cell[1].height = 100
document.getElementById("myTable").rows[2].cell[0].width = 300
```

You can restore both cells to their original sizes by assigning very small values, such as `1` or `0`, to the properties. The browser prevents the cells from rendering any smaller than is necessary to show the content.

noWrap

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statement creates a new cell in a row and sets its `noWrap` property to prevent text from word-wrapping inside the cell:

```
newCell = newRow.insertCell(-1)
newCell.noWrap = true
```

You need to set this property only if the cell must behave differently than the default, word-wrapping style.

OL Element Object

Properties

start

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statements generate a new OL element and assign a value to the `start` property:

```
var newOL = document.createElement("OL")
newOL.start = 5
```

type

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statements generate a new OL element and assign a value to the `type` property so that the sequence letters are uppercase Roman numerals:

```
var newOL = document.createElement("OL")
newOL.type = "I"
```

UL Element Object

Properties

type

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statements generate a new UL element and assign a value to the `type` property so that the bullet characters are empty circles:

```
var newUL = document.createElement("UL")
newUL.type = "circle"
```

LI Element Object

Properties

type

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

See the examples for the `OL.type` and `UL.type` properties earlier in this chapter.

value

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

The following statements generate a new LI element and assign a value to the `start` property:

```
var newLI = document.createElement("LI")
newLI.start = 5
```

Chapter 28 Examples

The following sections contain examples from Chapter 28, "The Navigator and Other Environment Objects."

clientInformation Object (IE4+) and navigator Object (All)

Properties

appCodeName
appName
appVersion
userAgent

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 28-1 provides a number of reusable functions that your scripts can employ to determine a variety of information about the currently running browser. This is not intended in any way to be an all-inclusive browser-sniffing routine; instead, I offer samples of how to extract information from the key navigator properties to determine various browser conditions.

All functions in Listing 28-1 return a Boolean value inline with the pseudo-question presented in the function's name. For example, the `isWindows()` function returns `true` if the browser is any type of Windows browser; otherwise, it returns `false`. (In Internet Explorer 3, the values are `0` for `false` and `-1` for `true`, but those values are perfectly usable in `if` conditional phrases). If this kind of browser detection occurs frequently in your pages, consider moving these functions into an external `.js` source library for inclusion in your pages (see Chapter 13).

When you load this page, it presents fields that display the results of each function depending on the type of browser and client operating system you use.

Listing 28-1: **Functions to Examine Browsers**

```
<HTML>
<HEAD>
<TITLE>UserAgent Property Library</TITLE>
<SCRIPT LANGUAGE="JavaScript">
// basic brand determination
function isNav() {
    return (navigator.appName == "Netscape")
}

function isIE() {
    return (navigator.appName == "Microsoft Internet Explorer")
}

// operating system platforms
function isWindows() {
    return (navigator.appVersion.indexOf("Win") != -1)
}

function isWin95NT() {
    return (isWindows() && (navigator.appVersion.indexOf("Win16") == -1 &&
        navigator.appVersion.indexOf("Windows 3.1") == -1))
}

function isMac() {
    return (navigator.appVersion.indexOf("Mac") != -1)
}

function isMacPPC() {
    return (isMac() && (navigator.appVersion.indexOf("PPC") != -1 ||
       navigator.appVersion.indexOf("PowerPC") != -1))
}

function isUnix() {
    return (navigator.appVersion.indexOf("X11") != -1)
}

// browser versions
function isGeneration2() {
    return (parseInt(navigator.appVersion) == 2)
}
```

```
function isGeneration3() {
    return (parseInt(navigator.appVersion) == 3)
}

function isGeneration3Min() {
    return (parseInt(navigator.appVersion.charAt(0)) >= 3)
}
function isNav4_7() {
    return (isNav() && parseFloat(navigator.appVersion) == 4.7)
}

function isMSIE4Min() {
    return (isIE() && navigator.appVersion.indexOf("MSIE") != -1)
}

function isMSIE5_5() {
    return (navigator.appVersion.indexOf("MSIE 5.5") != -1)
}

function isNN6Min() {
    return (isNav() && parseInt(navigator.appVersion) >= 5)
}

// element referencing syntax
function isDocAll() {
    return (document.all) ? true : false
}

function isDocW3C() {
    return (document.getElementById) ? true : false
}

// fill in the blanks
function checkBrowser() {
    var form = document.forms[0]
    form.brandNN.value = isNav()
    form.brandIE.value = isIE()
    form.win.value = isWindows()
    form.win32.value = isWin95NT()
    form.mac.value = isMac()
    form.ppc.value = isMacPPC()
    form.unix.value = isUnix()
    form.ver3Only.value = isGeneration3()
    form.ver3Up.value = isGeneration3Min()
    form.Nav4_7.value = isNav4_7()
    form.Nav6Up.value = isNN6Min()
    form.MSIE4.value = isMSIE4Min()
    form.MSIE5_5.value = isMSIE5_5()
    form.doc_all.value = isDocAll()
```

Continued

Listing 28-1 *(continued)*

```
    form.doc_w3c.value = isDocW3C()
}
</SCRIPT>
</HEAD>

<BODY onLoad="checkBrowser()">
<H1>About This Browser</H1>
<FORM>
<H2>Brand</H2>
Netscape Navigator:<INPUT TYPE="text" NAME="brandNN" SIZE=5>
Internet Explorer:<INPUT TYPE="text" NAME="brandIE" SIZE=5>
<HR>
<H2>Browser Version</H2>
3.0x Only (any brand):<INPUT TYPE="text" NAME="ver3Only" SIZE=5><P>
3 or Later (any brand): <INPUT TYPE="text" NAME="ver3Up" SIZE=5><P>
Navigator 4.7: <INPUT TYPE="text" NAME="Nav4_7" SIZE=5><P>
Navigator 6+: <INPUT TYPE="text" NAME="Nav6Up" SIZE=5><P>
MSIE 4+: <INPUT TYPE="text" NAME="MSIE4" SIZE=5><P>
MSIE 5.5:<INPUT TYPE="text" NAME="MSIE5_5" SIZE=5><P>
<HR>
<H2>OS Platform</H2>
Windows: <INPUT TYPE="text" NAME="win" SIZE=5>
Windows 95/98/2000/NT: <INPUT TYPE="text" NAME="win32" SIZE=5><P>
Macintosh: <INPUT TYPE="text" NAME="mac" SIZE=5>
Mac PowerPC: <INPUT TYPE="text" NAME="ppc" SIZE=5><P>
Unix: <INPUT TYPE="text" NAME="unix" SIZE=5><P>
<HR>
<H2>Element Referencing Style</H2>
Use <TT>document.all</TT>: <INPUT TYPE="text" NAME="doc_all" SIZE=5><P>
Use <TT>document.getElementById()</TT>: <INPUT TYPE="text" NAME="doc_w3c"
SIZE=5><P>
</FORM>
</BODY>
</HTML>
```

Sometimes you may need to use more than one of these functions together. For example, if you want to create a special situation for the `window.open()` bug that afflicts UNIX and Macintosh versions of Navigator 2, then you have to put your Boolean operator logic powers to work to construct a fuller examination of the browser:

```
function isWindowBuggy() {
    return (isGeneration2() && (isMac() || isUnix()))
}
```

You can see many more examples of browser sniffing, including more details about handling AOL browsers, in an article by Eric Krock at: `http://developer.netscape.com:80/docs/examples/javascript/browser_type.html`.

appMinorVersion

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to examine the two related version properties of your IE browser(s). Type the following two statements into the top text box and observe the results:

```
navigator.appVersion
navigator.minorAppVersion
```

There is a good chance that the values returned are not related to the browser version number shown after `MSIE` in the `appVersion` value.

cookieEnabled

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator to see the value of the `navigator.cookieEnabled` property on your browsers. Enter the following statement into the top text box:

```
navigator.cookieEnabled
```

Feel free to change the cookie preferences setting temporarily to see the new value of the property. You do not have to relaunch the browser for the new setting to take effect.

cpuClass

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see how IE reports the `cpuClass` of your PC. Enter the following statement into the top text box:

```
navigator.cpuClass
```

mimeTypes

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			(✓)	(✓)	(✓)

Example

For examples of the `mimeTypes` property and details about using the mimeType object, see the discussion of this object later in the chapter. A number of simple examples showing how to use this property to see whether the `navigator` object has a particular MIME type do not go far enough in determining whether a plug-in is installed and enabled to play the incoming data.

onLine

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see the online state of your IE browsers. Enter the following statement into the top text box:

```
navigator.onLine
```

Verify your browsing mode by checking the Work Offline choice in the File menu. If it is checked, the `onLine` property should return `false`.

oscpu

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) with NN6 to see what your client machine reports to you by entering the following statement into the top text box:

```
navigator.oscpu
```

platform

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see what your computer reports as its operating system. Enter the following statement into the top text box:

```
navigator.platform
```

product
productSub
vendor
vendorSub

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) on your copy of NN6 to see the values returned for these four properties. Enter each of the following statements into the top text box of the page and see the values for each in the Results box:

```
navigator.product
navigator.productSub
navigator.vendor
navigator.vendorSub
```

Also check the value of the `navigator.userAgent` property to see how many of these four property values are revealed in the `userAgent` property.

systemLanguage
userLanguage

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) with your IE4+ browser to compare the values of the three language-related properties running on your computer. Enter each of the following statements into the top text box:

```
navigator.browserLanguage
navigator.systemLanguage
navigator.userLanguage
```

Don't be surprised if all three properties return the same value.

Methods

preference(*name* [, *val*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

The page in Listing 28-2 displays checkboxes for several preference settings plus one text box to show a preference setting value for the size of the browser's disk cache. To run this script without signing the scripts, turn on codebase principals as directed in Chapter 46. (The listing file on the CD-ROM does not employ signed scripts.)

One function reads all the preferences and sets the form control values accordingly. Another function sets a preference when you click its checkbox. Because of the interaction among three of the cookie settings, it is easier to have the script rerun the `showPreferences()` function after each setting rather than you trying to manually control the properties of the three checkboxes. Rerunning that function also helps verify that you set the preference.

Listing 28-2: **Reading and Writing Browser Preferences**

```
<HTML>
<HEAD>
<TITLE>Reading/Writing Browser Preferences</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function setPreference(pref, value) {
    netscape.security.PrivilegeManager.enablePrivilege(
       "UniversalPreferencesWrite")
    navigator.preference(pref, value)
    netscape.security.PrivilegeManager.revertPrivilege(
       "UniversalPreferencesWrite")
    showPreferences()
}

function showPreferences() {
    var form = document.forms[0]
    netscape.security.PrivilegeManager.enablePrivilege(
        "UniversalPreferencesRead")
    form.imgLoad.checked = navigator.preference("general.always_load_images")
    form.cacheSize.value = navigator.preference("browser.cache.disk_cache_size")
    form.ssEnable.checked = navigator.preference("browser.enable_style_sheets")
    form.autoIEnable.checked = navigator.preference("autoupdate.enabled")
    var cookieSetting = navigator.preference("network.cookie.cookieBehavior")
    for (var i = 0; i < 3; i++) {
        form.elements["cookie" + i].checked = (i == cookieSetting) ? true :
false
    }
```

Continued

Listing 28-2 *(continued)*

```
    form.cookieWarn.checked =
navigator.preference("network.cookie.warnAboutCookies")
    netscape.security.PrivilegeManager.revertPrivilege(
        "UniversalPreferencesRead")
}
</SCRIPT>
</HEAD>

<BODY onLoad="showPreferences()">
<H1>Browser Preferences Settings Sampler</H1>
<HR>
<FORM>
<INPUT TYPE="checkbox" NAME="imgLoad"
onClick="setPreference('general.always_load_images',this.checked)">
Automatically Load Images<BR>
<INPUT TYPE="checkbox" NAME="ssEnable"
onClick="setPreference('browser.enable_style_sheets',this.checked)">
Style Sheets Enabled<BR>
<INPUT TYPE="checkbox" NAME="autoIEnable"
onClick="setPreference('autoupdate.enabled',this.checked)">
AutoInstall Enabled<BR>
<INPUT TYPE="checkbox" NAME="cookie0"
onClick="setPreference('network.cookie.cookieBehavior',0)">
Accept All Cookies<BR>
<INPUT TYPE="checkbox" NAME="cookie1"
onClick="setPreference('network.cookie.cookieBehavior',1)">
Accept Only Cookies Sent Back to Server<BR>
<INPUT TYPE="checkbox" NAME="cookie2"
onClick="setPreference('network.cookie.cookieBehavior',2)">
Disable Cookies<BR>
<INPUT TYPE="checkbox" NAME="cookieWarn"
onClick="setPreference('network.cookie.warnAboutCookies',this.checked)">
Warn Before Accepting Cookies<BR>
Disk cache is <INPUT TYPE="text" NAME="cacheSize" SIZE=10> KB <BR>
</FORM>
</BODY>
</HTML>
```

screen Object

Properties

availLeft
availTop

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					

Example

If you are a Windows user, you can experiment with these NN4+ properties via The Evaluator (Chapter 13). With the taskbar at the bottom of the screen, enter these two statements into the top text box:

```
screen.availLeft
screen.availTop
```

Next, drag the taskbar to the top of the screen and try both statements again. Now, drag the taskbar to the left edge of the screen and try the statements once more.

userProfile Object

Methods

addReadRequest("*attributeName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 28-4 for an example of the `addReadRequest()` method in action. You can also invoke it from the top text box in The Evaluator. For example, enter the following statement to queue one request:

```
navigator.userProfile.addReadRequest("vCard.LastName")
```

To continue the process, see examples for `doReadRequest()` and `getAttribute()` later in this chapter.

doReadRequest(*reasonCode*, *identification*[, *domain*[, *path*[, *expiration*]]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 28-4 for an example of the `doReadRequest()` method in action. If you entered the `addReadRequest()` example for The Evaluator earlier in this chapter, you can now bring up the permissions dialog box (if you have a user profile for your version of Windows) by entering the following statement into the top text box:

```
navigator.userProfile.doReadRequest(1, "Just me!")
```

getAttribute("*attributeName*")

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

See Listing 28-4 for an example of the `getAttribute()` method in action. Also, if you followed The Evaluator examples for this object, you can now extract the desired information (provided it is in your user profile). Enter the following statement into the top text box:

```
navigator.userProfile.getAttribute("vCard.LastName")
```

Chapter 29 Examples

The following sections contain examples from Chapter 29, "Event Objects."

NN4 event Object

Properties

data

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

The page in Listing 29-12 contains little more than a TEXTAREA in which the URLs of dragged items are listed. To run this script without signing the scripts, turn on codebase principals, as directed in Chapter 46.

To experiment with this listing, load the page and drag any desktop icons that represent files, applications, or folders to the window. Select multiple items and drag them all at once. Because the `onDragDrop` event handler evaluates to `return false`, the files are not loaded into the window. If you want merely to look at the URL and allow only some to process, you would generate an `if...else` construction to return `true` or `false` to the event handler as needed. A value of `return true` allows the normal processing of the `DragDrop` event to take place after your event handler function has completed its processing.

Listing 29-12: Obtaining URLs of a DragDrop Event's data Property

```
<HTML>
<HEAD>
<TITLE>Drag and Drop</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function handleDrag(evt) {
    netscape.security.PrivilegeManager.enablePrivilege("UniversalBrowserRead")
```

Continued

Listing 29-12 *(continued)*

```
    var URLArray = evt.data
    netscape.security.PrivilegeManager.disablePrivilege("UniversalBrowserRead")
    if (URLArray) {
        document.forms[0].output.value = URLArray.join("\n")
    } else {
        document.forms[0].output.value = "Nothing found."
    }
    return false
}
</SCRIPT>
</HEAD>
<BODY onDragDrop="return handleDrag(event)">
<B>Drag a URL to this window (NN4 only).</B>
<HR>
<FORM>
URLs:<BR>
<TEXTAREA NAME="output" COLS=70 ROWS=4></TEXTAREA><BR>
<INPUT TYPE="reset">
</FORM>
</BODY>
</HTML>
```

layerX
layerY
pageX
pageY
screenX
screenY

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

You can see the effects of the coordinate systems and associated properties with the page in Listing 29-13. Part of the page contains a three-field readout of the layer-, page-, and screen-level properties. Two clickable objects are provided so that you can see the differences between an object not in any layer and an object residing within a layer. The object not confined by a layer has its layer and page coordinates the same in the event object properties.

Additional readouts display the event object coordinates for resizing and moving a window. If you maximize the window under Windows, the Navigator browser's top-left corner is actually out of sight, four pixels up and to the left. That's why the `screenX` and `screenY` values are both `-4`.

Listing 29-13: **NN4 Event Coordinate Properties**

```
<HTML>
<HEAD>
<TITLE>X and Y Event Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkCoords(evt) {
    var form = document.forms[0]
    form.layerCoords.value = evt.layerX + "," + evt.layerY
    form.pageCoords.value = evt.pageX + "," + evt.pageY
    form.screenCoords.value = evt.screenX + "," + evt.screenY
    return false
}
function checkSize(evt) {
    document.forms[0].resizeCoords.value = evt.layerX + "," + evt.layerY
}
function checkLoc(evt) {
    document.forms[0].moveCoords.value = evt.screenX + "," + evt.screenY
}
</SCRIPT>
</HEAD>
<BODY onResize="checkSize(event)" onMove="checkLoc(event)">
<H1>X and Y Event Properties (NN4)</H1>
<HR>
<P>Click on the button and in the layer/image to see the coordinate values for
the event object.</P>
<FORM NAME="output">
<TABLE>
<TR><TD COLSPAN=2>Mouse Event Coordinates:</TD></TR>
<TR><TD ALIGN="right">layerX, layerY:</TD><TD><INPUT TYPE="text"
NAME="layerCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right">pageX, pageY:</TD><TD><INPUT TYPE="text" NAME="pageCoords"
SIZE=10></TD></TR>
<TR><TD ALIGN="right">screenX, screenY:</TD><TD><INPUT TYPE="text"
NAME="screenCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right"><INPUT TYPE="button" VALUE="Click Here"
onMouseDown="checkCoords(event)"></TD></TR>
<TR><TD COLSPAN=2><HR></TD></TR>
<TR><TD COLSPAN=2>Window Resize Coordinates:</TD></TR>
<TR><TD ALIGN="right">layerX, layerY:</TD><TD><INPUT TYPE="text"
```

Continued

Listing 29-13 *(continued)*

```
NAME="resizeCoords" SIZE=10></TD></TR>
<TR><TD COLSPAN=2><HR></TD></TR>
<TR><TD COLSPAN=2>Window Move Coordinates:</TD></TR>
<TR><TD ALIGN="right">screenX, screenY:</TD><TD><INPUT TYPE="text"
NAME="moveCoords" SIZE=10></TD></TR>
</TABLE>
</FORM>
<LAYER NAME="display" BGCOLOR="coral" TOP=140 LEFT=300  HEIGHT=250 WIDTH=330>
<A HREF="javascript:void(0)" onClick="return checkCoords(event)">
<IMG SRC="nile.gif" WIDTH=320 HEIGHT=240" BORDER=0></A>
</LAYER>
</BODY>
</HTML>
```

IE4+ event Object

Properties

clientX
clientY
offsetX
offsetY
screenX
screenY
x
y

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 29-14 provides readings of all event coordinate properties in an interactive way. An `onMouseDown` event handler triggers all event handling, and you can click the mouse anywhere on the page to see what happens. You see the tag of the element targeted by the mouse event to help you visualize how some of the coordinate properties are determined. An image is encased inside a positioned DIV element to help you see what happens to some of the properties when the event is targeted inside a positioned element.

Listing 29-14: IE4+ Event Coordinate Properties

```
<HTML>
<HEAD>
<TITLE>X and Y Event Properties (IE4+)</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkCoords() {
    var form = document.forms[0]
    form.srcElemTag.value = "<" + event.srcElement.tagName + ">"
    form.clientCoords.value = event.clientX + "," + event.clientY
    form.pageCoords.value = (event.clientX + document.body.scrollLeft) +
        "," + (event.clientY + document.body.scrollTop)
    form.offsetCoords.value = event.offsetX + "," + event.offsetY
    form.screenCoords.value = event.screenX + "," + event.screenY
    form.xyCoords.value = event.x + "," + event.y
    form.parElem.value = "<" + event.srcElement.offsetParent.tagName + ">"
    return false
}
function handleSize() {
    document.forms[0].resizeCoords.value = event.clientX + "," + event.clientY
}
</SCRIPT>
</HEAD>
<BODY onMouseDown="checkCoords()" onResize="handleSize()">
<H1>X and Y Event Properties (IE4+)</H1>
<HR>
<P>Click on the button and in the DIV/image to see the coordinate values for the
event object.</P>
<FORM NAME="output">
<TABLE>
<TR><TD COLSPAN=2>IE Mouse Event Coordinates:</TD></TR>
<TR><TD ALIGN="right">srcElement:</TD><TD><INPUT TYPE="text" NAME="srcElemTag"
SIZE=10></TD></TR>
<TR><TD ALIGN="right">clientX, clientY:</TD><TD><INPUT TYPE="text"
NAME="clientCoords" SIZE=10></TD>
<TD ALIGN="right">...With scrolling:</TD><TD><INPUT TYPE="text"
NAME="pageCoords" SIZE=10></TD></TR>
```

Continued

Listing 29-14 *(continued)*

```
<TR><TD ALIGN="right">offsetX, offsetY:</TD><TD><INPUT TYPE="text"
NAME="offsetCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right">screenX, screenY:</TD><TD><INPUT TYPE="text"
NAME="screenCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right">x, y:</TD><TD><INPUT TYPE="text" NAME="xyCoords"
SIZE=10></TD>
<TD ALIGN="right">...Relative to:</TD><TD><INPUT TYPE="text" NAME="parElem"
SIZE=10></TD></TR>
<TR><TD ALIGN="right"><INPUT TYPE="button" VALUE="Click Here"></TD></TR>
<TR><TD COLSPAN=2><HR></TD></TR>
<TR><TD COLSPAN=2>Window Resize Coordinates:</TD></TR>
<TR><TD ALIGN="right">clientX, clientY:</TD><TD><INPUT TYPE="text"
NAME="resizeCoords" SIZE=10></TD></TR>
</TABLE>
</FORM>
<DIV ID="display" STYLE="position:relative; left:100">
<IMG SRC="nile.gif" WIDTH=320 HEIGHT=240" BORDER=0>
</DIV>
</BODY>
</HTML>
```

Here are some tasks to try with the page that loads from Listing 29-14 to help you understand the relationships among the various pairs of coordinate properties:

1. Click the dot above the "i" on the "Click Here" button label. The target element is the button (INPUT) element, whose `offsetParent` is a table cell element. The `offsetY` value is very low because you are near the top of the element's own coordinate space. The client coordinates (and `x` and `y`), however, are relative to the viewable area in the window. If your browser window is maximized in Windows, the `screenX` and `clientX` values will be the same; the difference between `screenY` and `clientY` is the height of all the window chrome above the content region. With the window not scrolled at all, the client coordinates are the same with and without scrolling taken into account.
2. Jot down the various coordinate values and then scroll the page down slightly (clicking the scrollbar fires an event) and click the dot on the button again. The `clientY` value shrinks because the page has moved upward relative to the viewable area, making the measure between the top of the area smaller with respect to the button. The Windows version does the right thing with the offset properties, by continuing to return values relative to the element's own coordinate space; the Mac, unfortunately, subtracts the scrolled amount from the offset properties.

3. Click the large image. The client properties perform as expected for both Windows and Mac, as do the screen properties. For Windows, the `x` and `y` properties correctly return the event coordinates relative to the IMG element's `offsetParent`, which is the DIV element that surrounds it. Note, however, that the browser "sees" the DIV as starting 10 pixels to the left of the image. In IE5.5/Windows, you can click within those ten transparent pixels to the left of the image to click the DIV element. This padding is inserted automatically and impacts the coordinates of the `x` and `y` properties. A more reliable measure of the event inside the image is the offset properties. The same is true in the Macintosh version, as long as the page isn't scrolled, in which case the scroll, just as in Step 2, affects the values above.
4. Click the top HR element under the heading. It may take a couple of tries to actually hit the element (you've made it when the HR element shows up in the `srcElement` box). This is to reinforce the way the client properties provide coordinates within the element itself (again, accept on the Mac when the page is scrolled). Clicking at the very left end of the rule, you eventually find the 0,0 coordinate.

Finally, if you are a Windows user, here are two examples to try to see some of the unexpected behavior of coordinate properties.

1. With the page not scrolled, click anywhere along the right side of the page, away from any text so that the BODY element is `srcElement`. Because the BODY element theoretically fills the entire content region of the browser window, all coordinate pairs except for the screen coordinates should be the same. But offset properties are two pixels less than all the others. By and large, this difference won't matter in your scripts, but you should be aware of this potential discrepancy if precise positioning is important. For inexplicable reasons, the offset properties are measured in a space that is inset two pixels from the left and top of the window. This is not the case in the Macintosh version, where all value pairs are the same from the BODY perspective.
2. Click the text of the H1 or P elements (just above and below the long horizontal rule at the top of the page). In theory, the offset properties should be relative to the rectangles occupied by these elements (they're block elements, after all). But instead, they're measured in the same space as the client properties (plus the two pixels). This unexpected behavior doesn't have anything to do with the cursor being a text cursor, because if you click inside any of the text box elements, their offset properties are properly relative to their own rectangles. This problem does not afflict the Macintosh version.

You can see further examples of key event coordinate properties in action in Chapter 31's example of dragging elements around the page.

fromElement
toElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 29-15 provides an example of how the `fromElement` and `toElement` properties can reveal the life of the cursor action before and after it rolls into an element. When you roll the cursor to the center box (a table cell), its `onMouseOver` event handler displays the text from the table cell from which the cursor arrived. If the cursor comes in from one of the corners (not easy to do), a different message is displayed.

Listing 29-15: Using the toElement and fromElement Properties

```
<HTML>
<HEAD>
<TITLE>fromElement and toElement Properties</TITLE>
<STYLE TYPE="text/CSS">
.direction {background-color:#00FFFF; width:100; height:50; text-align:center}
#main {background-color:#FF6666; text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showArrival() {
    var direction = (event.fromElement.innerText) ? event.fromElement.innerText :
    "parts unknown"
    status = "Arrived from: " + direction
}
function showDeparture() {
    var direction = (event.toElement.innerText) ? event.toElement.innerText :
    "parts unknown"
    status = "Departed to: " + direction
}
</SCRIPT>
</HEAD>
<BODY>
<H1>fromElement and toElement Properties</H1>
<HR>
<P>Roll the mouse to the center box and look for arrival information
```

```
in the status bar. Roll the mouse away from the center box and look for
departure information in the status bar.</P>

<TABLE CELLSPACING=0 CELLPADDING=5>
<TR><TD></TD><TD CLASS="direction">North</TD><TD></TD></TR>
<TR><TD CLASS="direction">West</TD>
<TD ID="main" onMouseOver="showArrival()" onMouseOut="showDeparture()">Roll</TD>
<TD CLASS="direction">East</TD></TR>
<TR><TD></TD><TD CLASS="direction">South</TD><TD></TD></TR>
</TABLE>
</BODY>
</HTML>
```

This is a good example to experiment with in the browser, because it also reveals a potential limitation. The element registered as the `toElement` or `fromElement` must fire a mouse event to register itself with the browser. If not, the next element in the sequence that registers itself is the one acknowledged by these properties. For example, if you roll the mouse into the center box and then extremely quickly roll the cursor to the bottom of the page, you may bypass the South box entirely. The text that appears in the statusbar is actually the inner text of the BODY element, which is the element that caught the first mouse event to register itself as the `toElement` for the center table cell.

keyCode

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Listing 29-16 provides an additional play area to view the `keyCode` property for all three keyboard events while you type into a TEXTAREA. You can use this page later as an authoring tool to grab the precise codes for keyboard keys you may not be familiar with.

Listing 29-16: Displaying keyCode Property Values

```
<HTML>
<HEAD>
<TITLE>keyCode Property</TITLE>
```

Continued

Listing 29-16 *(continued)*

```
<STYLE TYPE="text/css">
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showCode(which) {
    document.forms[0].elements[which].value = event.keyCode
}
function clearEm() {
    for (var i = 1; i < document.forms[0].elements.length; i++) {
        document.forms[0].elements[i].value = ""
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>keyCode Property</H1>
<HR>
<P></P>
<FORM>
<P>
<TEXTAREA NAME="scratchpad" COLS="40" ROWS="5" WRAP="hard"
onKeyDown="clearEm(); showCode('down')" onKeyUp="showCode('up')"
onKeyPress="showCode('press')"></TEXTAREA>
</P>
<TABLE CELLPADDING="5">
<TR><TH>Event</TH><TH>event.keyCode</TH></TR>
<TR><TD>onKeyDown:</TD><TD><INPUT TYPE="text" NAME="down" SIZE="3"></TD></TR>
<TR><TD>onKeyPress:</TD><TD><INPUT TYPE="text" NAME="press" SIZE="3"></TD></TR>
<TR><TD>onKeyUp:</TD><TD><INPUT TYPE="text" NAME="up" SIZE="3"></TD></TR>
</TABLE>
</FORM>
</BODY>
</HTML>
```

The following are some specific tasks to try with the page to examine key codes (if you are not using a browser set for English and a Latin-based keyboard, your results may vary):

1. Enter a lowercase letter “a”. Notice how the `onKeyPress` event handler shows the code to be 97, which is the Unicode (and ASCII) value for the first of the lowercase letters of the Latin alphabet. But the other two events record just the key’s code: 65.
2. Type an uppercase “A” via the Shift key. If you watch closely, you see that the Shift key, itself, generates the code 16 for the `onKeyDown` and `onKeyUp` events.

But the character key then shows the value 65 for all three events, because the ASCII value of the uppercase letter happens to match the keyboard key code for that letter.

3. Press and release the Down Arrow key (be sure the cursor still flashes in the TEXTAREA, because that's where the keyboard events are being monitored). As a non-character key, it does not fire an `onKeyPress` event. But it does fire the other events, and assigns 40 as the code for this key.

4. Poke around with other non-character keys. Some may produce dialog boxes or menus, but their key codes are recorded nonetheless. Note that not all keys on a Macintosh keyboard register with IE/Mac.

returnValue

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

You can find several examples of the `returnValue` property at work in Chapter 15. Look at Listings 15-30, 33, 36, 37, 38, and 45. Moreover, many of the other examples in that chapter can substitute the `returnValue` property way of cancelling the default action if the scripts were to be run exclusively on IE4+.

srcElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

As a simplified demonstration of the power of the `srcElement` property, Listing 29-17 has but two event handlers defined for the BODY element, each invoking a single function. The idea is that the `onMouseDown` and `onMouseUp` events will bubble up from whatever their targets are, and the event handler functions will find out which element is the target and modify the color style of that element.

An extra flair is added to the script in that each function also checks the `className` property of the target element. If the `className` is `bold`—a class name shared by three SPAN elements in the paragraph — the style sheet rule for that class is modified so that all items share the same color. Your scripts can do even more in the way of filtering objects that arrive at the functions to perform special operations on certain objects or groups of objects.

Notice that the scripts don't have to know anything about the objects on the page to address each clicked one individually. That's because the `srcElement` property provides all of the specificity needed for acting on the target element.

Listing 29-17: **Using the srcElement property**

```
<HTML>
<HEAD>
<TITLE>srcElement Property</TITLE>
<STYLE TYPE="text/css">
.bold {font-weight:bold}
.ital {font-style:italic}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function highlight() {
    var elem = event.srcElement
    if (elem.className == "bold") {
        document.styleSheets[0].rules[0].style.color = "red"
    } else {
        elem.style.color = "#FFCC00"
    }
}
function restore() {
    var elem = event.srcElement
    if (elem.className == "bold") {
        document.styleSheets[0].rules[0].style.color = ""
    } else {
        elem.style.color = ""
    }
}
</SCRIPT>
</HEAD>
<BODY onMouseDown="highlight()" onMouseUp="restore()">
<H1>srcElement Property</H1>
<HR>
<P>One event handler...</P>
<UL>
<LI>Can
<LI>Cover
<LI>Many
<LI>Objects
</UL>
<P>
```

```
Lorem ipsum dolor sit amet, consectetaur adipisicing elit,
<SPAN CLASS="bold">sed do </SPAN>eiusmod tempor incididunt
<SPAN CLASS="ital">ut labore et </SPAN>dolore magna aliqua.
Ut enim adminim veniam, <SPAN CLASS="bold">quis nostrud
exercitation </SPAN>ullamco laboris nisi ut aliquip ex ea
<SPAN CLASS="bold">commodo consequat</SPAN>.
</P>
</BODY>
</HTML>
```

type

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see values returned by the `type` property. Enter the following object name into the bottom text box and press Enter/Return:

```
event
```

If necessary, scroll the Results box to view the `type` property, which should read `keypress`. Now click the List Properties button. The type changes to `click`. The reason for these types is that the `event` object whose properties are being shown here is the event that triggers the function to show the properties. From the text box, an `onKeyPress` event handler triggers that process; from the button, an `onClick` event handler does the job.

NN6+ event Object

charCode
keyCode

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 29-18 provides a play area to view the `charCode` and `keyCode` properties for all three keyboard events while you type into a TEXTAREA. You can use this later as an authoring tool to grab the precise codes for keyboard keys you may not be familiar with.

Listing 29-18: Displaying charCode and keyCode Property Values

```
<HTML>
<HEAD>
<TITLE>charCode and keyCode Properties</TITLE>
<STYLE TYPE="text/css">
TD {text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showCode(which, evt) {
    document.forms[0].elements[which + "Char"].value = evt.charCode
    document.forms[0].elements[which + "Key"].value = evt.keyCode
}
function clearEm() {
    for (var i = 1; i < document.forms[0].elements.length; i++) {
        document.forms[0].elements[i].value = ""
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>charCode and keyCode Properties</H1>
<HR>
<P></P>
<FORM>
<P>
<TEXTAREA NAME="scratchpad" COLS="40" ROWS="5" WRAP="hard"
onKeyDown="clearEm(); showCode('down', event)" onKeyUp="showCode('up', event)"
onKeyPress="showCode('press', event)"></TEXTAREA>
</P>
<TABLE CELLPADDING="5">
<TR><TH>Event</TH><TH>event.charCode</TH><TH>event.keyCode</TH></TR>
<TR><TD>onKeyDown:</TD><TD><INPUT TYPE="text" NAME="downChar" SIZE="3"></TD>
<TD><INPUT TYPE="text" NAME="downKey" SIZE="3"></TD></TR>
<TR><TD>onKeyPress:</TD><TD><INPUT TYPE="text" NAME="pressChar" SIZE="3"></TD>
<TD><INPUT TYPE="text" NAME="pressKey" SIZE="3"></TD></TR>
<TR><TD>onKeyUp:</TD><TD><INPUT TYPE="text" NAME="upChar" SIZE="3"></TD>
<TD><INPUT TYPE="text" NAME="upKey" SIZE="3"></TD></TR>
</TABLE>
```

```
</FORM>
</BODY>
</HTML>
```

Here are some specific tasks to try with the page to examine key codes (if you are not using a browser set for English and a Latin-based keyboard, your results may vary):

1. Enter a lowercase letter "a". Notice how the `onKeyPress` event handler shows the `charCode` to be 97, which is the Unicode (and ASCII) value for the first of the lowercase letters of the Latin alphabet. But the other two event types record just the key's code: 65.
2. Type an uppercase "A" via the Shift key. If you watch closely, you see that the Shift key, itself, generates the key code 16 for the `onKeyDown` and `onKeyUp` events. But the character key then shows the value 65 for all three events (until you release the Shift key), because the ASCII value of the uppercase letter happens to match the keyboard key code for that letter.
3. Press and release the Down Arrow key (be sure the cursor still flashes in the TEXTAREA, because that's where the keyboard events are being monitored). As a non-character key, all three events stuff a value into the `keyCode` property, but zero into `charCode`. The `keyCode` value for this key is 40.
4. Poke around with other non-character keys. Some may produce dialog boxes or menus, but their key codes are recorded nonetheless.

clientX
clientY
layerX
layerY
pageX
pageY
screenX
screenY

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

You can see the effects of the coordinate systems and associated NN6 properties with the page in Listing 29-19. You can view coordinate values for all four measuring systems, as well as some calculated value. Two clickable objects are provided so that you can see the differences between an object not in any layer and an object residing within a layer (although anything you see is clickable, including text nodes).

One of the calculated fields applies window scrolling values to the client coordinates. But, as you will see, these calculated values are the same as the more convenient page coordinates. The other calculated field shows the coordinates relative to the rectangular space of the target element. Notice in the code that if the `nodeType` of the target indicates a text node, that node's parent node (an element) is used for the calculation.

Listing 29-19: **NN6 Event Coordinate Properties**

```
<HTML>
<HEAD>
<TITLE>X and Y Event Properties (NN6+)</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function checkCoords(evt) {
    var form = document.forms["output"]
    var targText, targElem
    if (evt.target.nodeType == 3) {
        targText = "[textnode] inside <" + evt.target.parentNode.tagName + ">"
        targElem = evt.target.parentNode
    } else {
        targText = "<" + evt.target.tagName + ">"
        targElem = evt.target
    }
    form.srcElemTag.value = targText
    form.clientCoords.value = evt.clientX + "," + evt.clientY
    form.clientScrollCoords.value = (evt.clientX + window.scrollX) +
        "," + (evt.clientY + window.scrollY)
    form.layerCoords.value = evt.layerX + "," + evt.layerY
    form.pageCoords.value = evt.pageX + "," + evt.pageY
    form.inElemCoords.value =
    (evt.pageX - targElem.offsetLeft - document.body.offsetLeft) +
        "," + (evt.pageY - targElem.offsetTop - document.body.offsetTop)
    form.screenCoords.value = evt.screenX + "," + evt.screenY
    return false
}
</SCRIPT>
</HEAD>
<BODY onMouseDown="checkCoords(event)">
<H1>X and Y Event Properties (NN6+)</H1>
<HR>
```

```
<P>Click on the button and in the DIV/image to see the coordinate values for the
event object.</P>
<FORM NAME="output">
<TABLE>
<TR><TD COLSPAN=2>NN6 Mouse Event Coordinates:</TD></TR>
<TR><TD ALIGN="right">target:</TD>
    <TD COLSPAN=3><INPUT TYPE="text" NAME="srcElemTag" SIZE=25></TD></TR>
<TR><TD ALIGN="right">clientX, clientY:</TD>
    <TD><INPUT TYPE="text" NAME="clientCoords" SIZE=10></TD>
    <TD ALIGN="right">...With scrolling:</TD>
    <TD><INPUT TYPE="text" NAME="clientScrollCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right">layerX, layerY:</TD>
    <TD><INPUT TYPE="text" NAME="layerCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right">pageX, pageY:</TD>
    <TD><INPUT TYPE="text" NAME="pageCoords" SIZE=10></TD>
    <TD ALIGH="right">Within Element:</TD>
    <TD><INPUT TYPE="text" NAME="inElemCoords" SIZE=10></TR>
<TR><TD ALIGN="right">screenX, screenY:</TD>
    <TD><INPUT TYPE="text" NAME="screenCoords" SIZE=10></TD></TR>
<TR><TD ALIGN="right"><INPUT TYPE="button" VALUE="Click Here"></TD></TR>
</TABLE>
</FORM>
<DIV ID="display" STYLE="position:relative; left:100">
<IMG SRC="nile.gif" WIDTH=320 HEIGHT=240" BORDER=0>
</DIV>
</BODY>
</HTML>
```

currentTarget

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 29-20 shows the power of the `currentTarget` property in revealing the element that is processing an event during event propagation. Similar to the code in Listing 29-7, this example is made simpler because it lets the event object's properties do more of the work to reveal the identity of each element that processes the event. Event listeners assigned for various propagation modes are assigned to a variety of nodes in the document. After you click the button, each listener in the propagation chain fires in sequence. The alert dialog shows which node is processing the event. And, as in Listing 29-7, the `eventPhase` property is used to help display the propagation mode in force at the time the event is processed by each node.

Listing 29-20: currentTarget and eventPhase Properties

```
<HTML>
<HEAD>
<TITLE>currentTarget and eventPhase Properties</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function init() {
    // using old syntax to assign bubble-type event handlers
    document.onclick = processEvent
    document.body.onclick = processEvent
    // turn on click event capture for document and form
    document.addEventListener("click", processEvent, true)
    document.forms[0].addEventListener("click", processEvent, true)
    // set bubble event listener for form
    document.forms[0].addEventListener("click", processEvent, false)
}
function processEvent(evt) {
    var currTargTag, msg
    if (evt.currentTarget.nodeType == 1) {
        currTargTag = "<" + evt.currentTarget.tagName + ">"
    } else {
        currTargTag = evt.currentTarget.nodeName
    }
     msg = "Event is now at the " + currTargTag + " level "
     msg += "(" + getPhase(evt) + ")."
     alert(msg)
}
// reveal event phase of current event object
function getPhase(evt) {
    switch (evt.eventPhase) {
        case 1:
            return "CAPTURING"
            break
        case 2:
            return "AT TARGET"
            break
        case 3:
            return "BUBBLING"
            break
        default:
            return ""
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="init()">
<H1>currentTarget and eventPhase Properties</H1>
<HR>
<FORM>
```

```
<INPUT TYPE="button" VALUE="A Button" NAME="main1"
    onClick="processEvent(event)">
</FORM>
</BODY>
</HTML>
```

You can also click other places on the page. For example, if you click to the right of the button, you will be clicking the FORM element. Event propagation and processing adjusts accordingly. Similarly, if you click the header text, the only event listeners that see the event are in the document and BODY levels.

eventPhase

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

See Listing 29-20 earlier in this chapter for an example of how you can use a `switch` construction to branch function processing based on the event phase of the current event object.

relatedTarget

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 29-21 provides an example of how the `relatedTarget` property can reveal the life of the cursor action before and after it rolls into an element. When you roll the cursor to the center box (a table cell), its `onMouseOver` event handler displays the text from the table cell from which the cursor arrived (the `nodeValue` of the text node inside the table cell). If the cursor comes in from one of the corners (not easy to do), a different message is displayed.

The two functions that report the results employ a bit of filtering to make sure that they process the event object only if the event occurs on an element and if the `relatedTarget` element is anything other than a nested text node of the central table cell element. Because nodes respond to events in NN6, this extra filtering prevents processing whenever the cursor makes the transition from the central TD element to its nested text node.

Listing 29-21: **Using the relatedTarget Property**

```
<HTML>
<HEAD>
<TITLE>relatedTarget Properties</TITLE>
<STYLE TYPE="text/CSS">
.direction {background-color:#00FFFF; width:100; height:50; text-align:center}
#main {background-color:#FF6666; text-align:center}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function showArrival(evt) {
    if (evt.target.nodeType == 1) {
        if (evt.relatedTarget != evt.target.firstChild) {
            var direction = (evt.relatedTarget.firstChild) ?
            evt.relatedTarget.firstChild.nodeValue : "parts unknown"
            status = "Arrived from: " + direction
        }
    }
}
function showDeparture(evt) {
    if (evt.target.nodeType == 1) {
        if (evt.relatedTarget != evt.target.firstChild) {
            var direction = (evt.relatedTarget.firstChild) ?
            evt.relatedTarget.firstChild.nodeValue : "parts unknown"
            status = "Departed to: " + direction
        }
    }
}
</SCRIPT>
</HEAD>
<BODY>
<H1>relatedTarget Properties</H1>
<HR>
<P>Roll the mouse to the center box and look for arrival information
in the status bar. Roll the mouse away from the center box and look for
departure information in the status bar.</P>

<TABLE CELLSPACING=0 CELLPADDING=5>
<TR><TD></TD><TD CLASS="direction">North</TD><TD></TD></TR>
<TR><TD CLASS="direction">West</TD>
<TD ID="main" onMouseOver="showArrival(event)"
              onMouseOut="showDeparture(event)">Roll</TD>
```

```
<TD CLASS="direction">East</TD></TR>
<TR><TD></TD><TD CLASS="direction">South</TD><TD></TD></TR>
</TABLE>
</BODY>
</HTML>
```

target

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

As a simplified demonstration of the power of the `target` property, Listing 29-22 has but two event handlers defined for the BODY element, each invoking a single function. The idea is that the `onMouseDown` and `onMouseUp` events will bubble up from whatever their targets are, and the event handler functions will find out which element is the target and modify the color style of that element.

An extra flair is added to the script in that each function also checks the `className` property of the target element. If the `className` is `bold` — a class name shared by three SPAN elements in the paragraph — the style sheet rule for that class is modified so that all items share the same color. Your scripts can do even more in the way of filtering objects that arrive at the functions to perform special operations on certain objects or groups of objects.

Notice that the scripts don't have to know anything about the objects on the page to address each clicked one individually. That's because the `target` property provides all of the specificity needed for acting on the target element.

Listing 29-22: **Using the target Property**

```
<HTML>
<HEAD>
<TITLE>target Property</TITLE>
```

Continued

Listing 29-22 *(continued)*

```
<STYLE TYPE="text/css">
.bold {font-weight:bold}
.ital {font-style:italic}
</STYLE>
<SCRIPT LANGUAGE="JavaScript">
function highlight(evt) {
    var elem = (evt.target.nodeType == 3) ? evt.target.parentNode : evt.target
    if (elem.className == "bold") {
        document.styleSheets[0].cssRules[0].style.color = "red"
    } else {
        elem.style.color = "#FFCC00"
    }
}
function restore(evt) {
    var elem = (evt.target.nodeType == 3) ? evt.target.parentNode : evt.target
    if (elem.className == "bold") {
        document.styleSheets[0].cssRules[0].style.color = "black"
    } else {
        elem.style.color = "black"
    }
}
</SCRIPT>
</HEAD>
<BODY onMouseDown="highlight(event)" onMouseUp="restore(event)">
<H1>target Property</H1>
<HR>
<P>One event handler...</P>
<UL>
<LI>Can
<LI>Cover
<LI>Many
<LI>Objects
</UL>
<P>
Lorem ipsum dolor sit amet, consectetaur adipisicing elit,
<SPAN CLASS="bold">sed do </SPAN>eiusmod tempor incididunt
<SPAN CLASS="ital">ut labore et </SPAN>dolore magna aliqua.
Ut enim adminim veniam, <SPAN CLASS="bold">quis nostrud
exercitation </SPAN>ullamco laboris nisi ut aliquip ex ea
<SPAN CLASS="bold">commodo consequat</SPAN>.
</P>
</BODY>
</HTML>
```

timeStamp

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Listing 29-23 uses the `timeStamp` property to calculate the instantaneous typing speed when you type into a TEXTAREA. The calculations are pretty raw,and work only on intra-keystroke times without any averaging or smoothing that a more sophisticated typing tutor might perform. Calculated values are rounded to the nearest integer.

Listing 29-23: **Using the timeStamp property**

```
<HTML>
<HEAD>
<TITLE>timeStamp Property</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var stamp
function calcSpeed(evt) {
    if (stamp) {
        var gross = evt.timeStamp - stamp
        var wpm = Math.round(6000/gross)
        document.getElementById("wpm").firstChild.nodeValue = wpm + " wpm."
    }
    stamp = evt.timeStamp

}
</SCRIPT>
</HEAD>
<BODY>
<H1>timeStamp Property</H1>
<HR>
<P>Start typing, and watch your instantaneous typing speed below:</P>
<P>
<TEXTAREA COLS=60 ROWS=10 WRAP="hard" onKeyPress="calcSpeed(event)"></TEXTAREA>
</P>
<P>Typing Speed: <SPAN ID="wpm"> </SPAN></P>
</BODY>
</HTML>
```

Chapter 30 Examples

The following sections contain examples from Chapter 30, "Style sheet and Style Objects."

styleSheet Object

Properties

cssRules

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓				(✓)	(✓)

Example

Use The Evaluator (Chapter 13) to look at the `cssRules` property in NN6+ or IE5+/Mac. First, view how many rules are in the first styleSheet object of the page by entering the following statement into the top text box:

```
document.styleSheets[0].cssRules.length
```

Now use the array with an index value to access one of the rule objects to view the rule object's properties list. Enter the following statement into the bottom text box:

```
document.styleSheets[0].cssRules[1]
```

You use this syntax to modify the style details of an individual rule belonging to the styleSheet object.

cssText

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility								✓	✓

Example

Use The Evaluator (Chapter 13) to replace the style rules in one blast via the `cssText` property. Begin by examining the value returned from the property for the initially disabled style sheet by entering the following statement into the top text box:

```
document.styleSheets[0].cssText
```

Next, enable the style sheet so that its rules are applied to the document:

```
document.styleSheets[0].disabled = false
```

Finally, enter the following statement into the top text box to overwrite the style sheet with entirely new rules.

```
document.styleSheets[0].cssText = "P {color:red}"
```

Reload the page after you are finished to restore the original state.

disabled

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to toggle between the enabled and disabled state of the first styleSheet object on the page. Enter the following statement into the top text box:

```
document.styleSheets[0].disabled = (!document.styleSheets[0].disabled)
```

The inclusion of the NOT operator (`!`) forces the state to change from `true` to `false` or `false` to `true` with each click of the Evaluate button.

ownerNode

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) with NN6 to inspect the `ownerNode` of the first styleSheet object in the document. Enter the following statement into the top text box:

```
document.styleSheets[0].ownerNode.tagName
```

The returned value is the STYLE element tag name.

owningElement

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) with IE4+ to inspect the `owningElement` of the first styleSheet object in the document. Enter the following statement into the top text box:

```
document.styleSheets[0].owningElement.tagName
```

The returned value is the STYLE element tag name.

rules

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) with IE4+ to examine the `rules` property of the first styleSheet object in the page. First, find out how many rules are in the first styleSheet object by entering the following statement into the top text box:

```
document.styleSheets[0].rules.length
```

Next, examine the properties of one of the rules by entering the following statement into the bottom text box:

```
document.styleSheets[0].rules[1]
```

You now see the all the properties that IE4+ exposes for a rule object.

Methods

addRule("*selector*", "*styleSpec*"[, *index*])
removeRule(*index*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility							✓	✓	✓

Example

Use The Evaluator (Chapter 13) with IE4+ to add a style sheet rule to the first styleSheet object of the page. First, make sure the style sheet is enabled by entering the following statement into the top text box:

```
document.styleSheets[0].disabled = false
```

Next, append a style that sets the color of the TEXTAREA element:

```
document.styleSheets[0].addRule("TEXTAREA", "color:red")
```

Enter any valid object (such as `document.body`) into the bottom text box to see how the style has been applied to the TEXTAREA element on the page.

Now remove the style, using the index of the last item of the `rules` collection as the index:

```
document.styleSheets[0].removeRule(document.styleSheets[0].rules.length - 1)
```

The text in the TEXTAREA returns to its default color.

deleteRule(*index*)
insertRule("*rule*", *index*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					

Example

Use The Evaluator (Chapter 13) with NN6+ to add a style sheet rule to the first styleSheet object of the page. First, make sure the style sheet is enabled by entering the following statement into the top text box:

```
document.styleSheets[0].disabled = false
```

Next, append a style that sets the color of the TEXTAREA element:

```
document.styleSheets[0].insertRule("TEXTAREA {color:red}",
document.styleSheets[0].cssRules.length)
```

Enter any valid object (such as `document.body`) into the bottom text box to see how the style has been applied to the TEXTAREA element on the page.

Now remove the style, using the index of the last item of the rules collection as the index:

```
document.styleSheets[0].deleteRule(document.styleSheets[0].cssRules.length - 1)
```

The first release of NN6 processes most, but not all, of the internal actions in response to the `deleteRule()` method. The method returns no value, so the Results box after evaluating the `deleteRule()` example statement correctly reports `undefined`. At the same time, the method has genuinely removed the rule from the styleSheet object (as proven by inspecting the `length` property of the `document.styleSheets[0].cssRules` array). But the browser does not refresh the page display to reflect the removal of the rule.

cssRule and rule Objects

Properties

selectorText

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to examine the `selectorText` property of rules in the first styleSheet object of the page. Enter each of the following statements in the top text box:

```
document.styleSheets[0].rules[0].selectorText
document.styleSheets[0].rules[1].selectorText
```

Compare these values against the source code view for the STYLE element in the page.

style

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to modify a `style` property of one of the styleSheet rules in the page. The syntax shown here is for IE4+, but you can substitute the `cssRules` reference for the `rules` collection reference in NN6 (and IE5/Mac) if you like.

Begin by reloading the page and making sure the style sheet is enabled. Enter the following statement into the top text box:

```
document.styleSheets[0].disabled = false
```

The first rule is for the `myP` element on the page. Change the rule's `font-size` style:

```
document.styleSheets[0].rules[0].style.fontSize = "20pt"
```

Look over the `style` object properties in the discussion of the `style` object later in this chapter and have fun experimenting with different style properties. After you are finished, reload the page to restore the styles to their default states.

Chapter 31 Examples

The following sections contain examples from Chapter 31, "Positioned Objects."

NN4 Layer Object

Properties

`above`
`below`
`siblingAbove`
`siblingBelow`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Listing 31-1 enables you to experiment with just one set of these properties: `layerObject.above` and `layerObject.below`. The page is almost in the form of a laboratory/quiz that enables you to query yourself about the values of these properties for two swappable layers.

Listing 31-1: A Layer Quiz

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function checkAbove(oneLayer) {
    document.forms[0].errors.value = ""
    document.forms[0].output.value = oneLayer.above.name
}
function checkBelow(oneLayer) {
    document.forms[0].errors.value = ""
    document.forms[0].output.value = oneLayer.below.name
}
function swapLayers() {
    if (document.yeller.above) {
        document.yeller.moveAbove(document.greeny)
    } else {
        document.greeny.moveAbove(document.yeller)
    }
}
function onerror(msg) {
    document.forms[0].output.value = ""
    document.forms[0].errors.value = msg
    return true
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Layer Ordering</H1>
<HR>
<FORM>
Results:<INPUT TYPE="text" NAME="output"><P>
<INPUT TYPE="button" VALUE="Who's ABOVE the Yellow layer?"
onClick="checkAbove(document.yeller)"><BR>
<INPUT TYPE="button" VALUE="Who's BELOW the Yellow layer?"
onClick="checkBelow(document.yeller)"><P>
<INPUT TYPE="button" VALUE="Who's ABOVE the Green layer?"
onClick="checkAbove(document.greeny)"><BR>
<INPUT TYPE="button" VALUE="Who's BELOW the Green layer?"
onClick="checkBelow(document.greeny)"><P>
<INPUT TYPE="button" VALUE="Swap Layers" onCLick="swapLayers()"><P>
If there are any errors caused by missing <BR>
properties, they will appear below:<BR>
<TEXTAREA NAME="errors" COLS=30 ROWS=3 WRAP="virtual"></TEXTAREA>
</FORM>
<LAYER NAME="yeller" BGCOLOR="yellow" TOP=110 LEFT=300 WIDTH=200 HEIGHT=200>
<B>This is just a yellow layer.</B>
</LAYER>
```

Continued

Listing 31-1 *(continued)*

```
<LAYER NAME="greeny" BGCOLOR="lightgreen" TOP=150 LEFT=340 WIDTH=200 HEIGHT=200>
<B>This is just a green layer.</B>
</LAYER>
</BODY>
</HTML>
```

The page contains two layers: one colored yellow and the other light green. Legends on four buttons ask you to guess whether one layer is above or below the other. For example, if you click the button labeled "Who's ABOVE the Yellow layer?" and the green layer is above it, the name of that green layer appears in the Results field. But if layers are oriented such that the returned value is `null`, the error message (indicating that the nonexistent object doesn't have a `name` property) appears in the error field at the bottom. Another button enables you to swap the order of the layers so you can try your hand at predicting the results based on your knowledge of layers and the `above` and `below` properties.

Positioned objects in IE4+ and NN6 have no comparable properties to the four described in this section.

background

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

A simple example (Listing 31-2) defines one layer that features five buttons to change the background image of a second layer. I put the buttons in a layer because I want to make sure the buttons and background layer rectangles align themselves along their top edges on all platforms.

As the second layer loads, I merely assign a gray background color to it and write some reverse (white) text. Most of the images are of the small variety that repeat in the layer. One is a large photograph to demonstrate how images are clipped to the layer's rectangle. Along the way, I hope you also heed the lesson of readability demonstrated by the difficulty of reading text on a wild-looking background. For an example compatible with IE5+ and NN6+, see Listing 31-13.

Listing 31-2: Setting Layer Backgrounds

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
function setBg(URL) {
    document.bgExpo.background.src = URL
}
</SCRIPT>
</HEAD>
<BODY>
<H1>Layer Backgrounds</H1>
<HR>
<LAYER NAME="buttons" TOP=100>
    <FORM>
        <INPUT TYPE="button" VALUE="The Usual"
onClick="setBg('cr_kraft.gif')"><BR>
        <INPUT TYPE="button" VALUE="A Big One" onClick="setBg('arch.gif')"><BR>
        <INPUT TYPE="button" VALUE="Not So Usual"
onClick="setBg('wh86.gif')"><BR>
        <INPUT TYPE="button" VALUE="Decidedly Unusual"
onClick="setBg('sb23.gif')"><BR>
        <INPUT TYPE="button" VALUE="Quick as..."
onClick="setBg('lightnin.gif')"><BR>
    </FORM>
</LAYER>
<LAYER NAME="bgExpo" BGCOLOR="gray" TOP=100 LEFT=250 WIDTH=300 HEIGHT=260>
<B><FONT COLOR="white">Some text, which may or may not read well with the
various backgrounds.</FONT></B>
</LAYER>
</BODY>
</HTML>
```

bgColor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

You can have some fun with Listing 31-3, which uses a number of layer scripting techniques. The page presents a kind of palette of eight colors, each one created as a small layer (see Figure 31-1). Another, larger layer's `bgColor` property changes as you roll the mouse over any color in the palette.

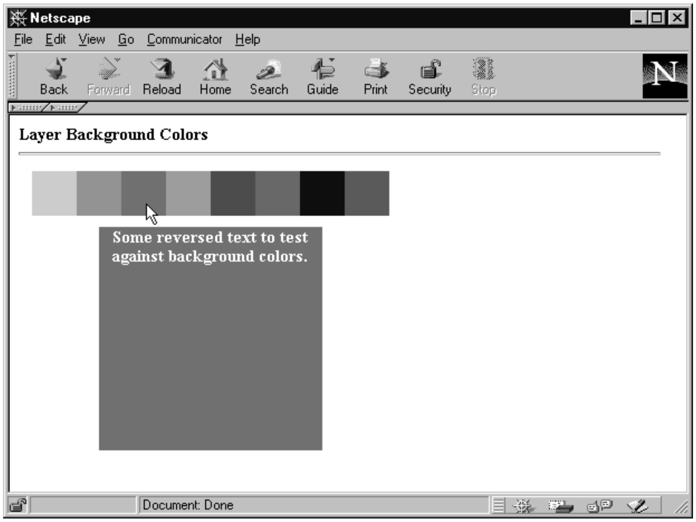

Figure 31-1: Drag the mouse across the palette to change the layer's background color.

To save HTML lines to create those eight color palette layers, I use a script to establish an array of colors and then `document.write()` the `<LAYER>` tags with appropriate attribute settings so the layers all line up in a contiguous row. By predefining a number of variable values for the size of the color layers, I can make all of them larger or smaller with the change of only a few script characters.

The `document` object handles the job of capturing the `mouseOver` events. I turn on the document's `captureEvents()` method such that it traps all `mouseOver` events and hands them to the `setColor()` function. The `setColor()` function reads the target object's `bgColor` and sets the larger layer's `bgColor` property to the same. If this page had other objects that could receive `mouseOver` events for other purposes, I would use `routeEvents()` to let those events pass on to their intended targets. For the purposes of this example, however, the events need to go no further. Listing 31-14 shows the same functionality working in IE5+ and NN6+.

Listing 31-3: **Layer Background Colors**

```
<HTML>
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
```

```
function setColor(e) {
    document.display.bgColor = e.target.bgColor
}
document.captureEvents(Event.MOUSEOVER)
document.onmouseover = setColor
</SCRIPT>
</HEAD>
<BODY>
<H1>Layer Background Colors</H1>
<HR>
<SCRIPT LANGUAGE="JavaScript">
var oneLayer
var colorTop = 100
var colorLeft = 20
var colorWidth = 40
var colorHeight = 40
var colorPalette = new
Array("aquamarine","coral","forestgreen","goldenrod","red",
                             "magenta","navy","teal")
for (var i = 0; i < colorPalette.length; i++) {
    oneLayer = "<LAYER NAME=swatch" + i + " TOP=" + colorTop
    oneLayer += " LEFT=" + ((colorWidth * i) + colorLeft)
    oneLayer += " WIDTH=" + colorWidth + " HEIGHT=" + colorHeight
    oneLayer += " BGCOLOR=" + colorPalette[i] + "></LAYER>\n"
    document.write(oneLayer)
}
</SCRIPT>
<LAYER NAME="display" BGCOLOR="gray" TOP=150 LEFT=80 WIDTH=200 HEIGHT=200>
<B><FONT COLOR="white"><CENTER>Some reversed text to test against background
colors.</CENTER></FONT></B>
</LAYER>
</BODY>
</HTML>
```

clip

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Because of the edge movement behavior of adjustments to `layerObject.clip` properties, Listing 31-4 enables you to experiment with adjustments to each of the six properties. The document loads one layer that you can adjust by entering alternative values into six text fields — one per property. Figure 31-2 shows the page.

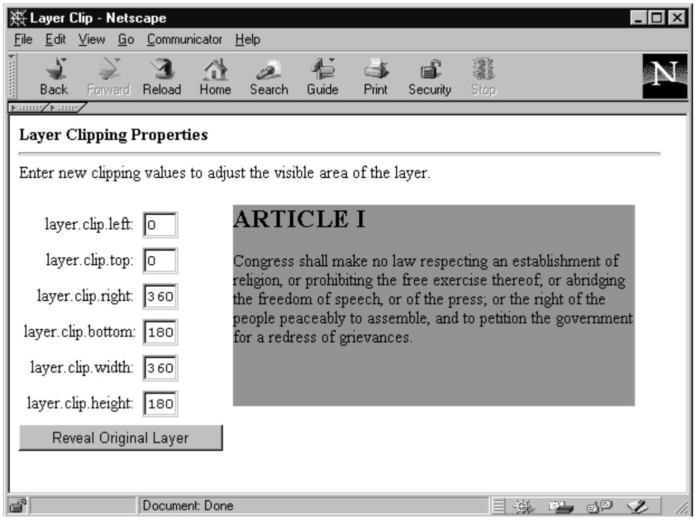

Figure 31-2: Experiment with layer.clip properties.

As you enter values, all properties are updated to show their current values (via the `showValues()` function). Pay particular attention to the apparent motion of the edge and the effect the change has on at least one other property. For example, a change to the `layerObject.clip.left` value also affects the `layerObject.clip.width` property value.

Listing 31-4: **Adjusting layer.clip Properties**

```
<HTML>
<HEAD>
<TITLE>Layer Clip</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var origLayerWidth = 0
var origLayerHeight = 0
function initializeXY() {
    origLayerWidth = document.display.clip.width
    origLayerHeight = document.display.clip.height
    showValues()
}
```

```
function setClip(field) {
    var clipVal = parseInt(field.value)
    document.display.clip[field.name] = clipVal
    showValues()
}
function showValues() {
    var form = document.layers[0].document.forms[0]
    var propName
    for (var i = 0; i < form.elements.length; i++) {
        propName = form.elements[i].name
        if (form.elements[i].type == "text") {
            form.elements[i].value = document.display.clip[propName]
        }
    }
}
var intervalID
function revealClip() {
    var midWidth = Math.round(origLayerWidth /2)
    var midHeight = Math.round(origLayerHeight /2)
    document.display.clip.left = midWidth
    document.display.clip.top = midHeight
    document.display.clip.right = midWidth
    document.display.clip.bottom = midHeight
    intervalID = setInterval("stepClip()",1)
}
function stepClip() {
    var widthDone = false
    var heightDone = false
    if (document.display.clip.left > 0) {
        document.display.clip.left += -2
        document.display.clip.right += 2
    } else {
        widthDone = true
    }
    if (document.display.clip.top > 0) {
        document.display.clip.top += -1
        document.display.clip.bottom += 1
    } else {
        heightDone = true
    }
    showValues()
    if (widthDone && heightDone) {
        clearInterval(intervalID)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="initializeXY()">
<H1>Layer Clipping Properties</H1>
```

Continued

Listing 31-4 *(continued)*

```
<HR>
Enter new clipping values to adjust the visible area of the layer.<P>
<LAYER TOP=130>
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right">layer.clip.left:</TD>
    <TD><INPUT TYPE="text" NAME="left" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.top:</TD>
    <TD><INPUT TYPE="text" NAME="top" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.right:</TD>
    <TD><INPUT TYPE="text" NAME="right" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.bottom:</TD>
    <TD><INPUT TYPE="text" NAME="bottom" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.width:</TD>
    <TD><INPUT TYPE="text" NAME="width" SIZE=3 onChange="setClip(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.height:</TD>
    <TD><INPUT TYPE="text" NAME="height" SIZE=3 onChange="setClip(this)"></TD>
</TR>
</TABLE>
<INPUT TYPE="button" VALUE="Reveal Original Layer" onClick="revealClip()">
</FORM>
</LAYER>
<LAYER NAME="display" BGCOLOR="coral" TOP=130 LEFT=200 WIDTH=360 HEIGHT=180>
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</LAYER>
</BODY>
</HTML>
```

Listing 31-4 has a lot of other scripting in it to demonstrate a couple of other clip area techniques. After the document loads, the `onLoad` event handler initializes two global variables that represent the starting height and width of the layer as determined by the `clip.height` and `clip.width` properties. Because the `<LAYER>` tag does not specify any `CLIP` attributes, the `layerObject.clip` region is ensured of being the same as the layer's dimensions at load time.

I preserve the initial values for a somewhat advanced set of functions that act in response to the Reveal Original Layer button. The goal of this button is to temporarily shrink the clipping area to nothing and then expand the clip rectangle gradually from the very center of the layer. The effect is analogous to a zoom-out visual effect.

The clip region shrinks to practically nothing by setting all four edges to the same point midway along the height and width of the layer. The script then uses `setInterval()` to control the animation in `setClip()`. To make the zoom even on both axes, I first make sure that the initial size of the layer is an even ratio: twice as wide as it is tall. Each time through the `setClip()` function, the `clip.left` and `clip.right` values are adjusted in their respective directions by two pixels and `clip.top` and `clip.bottom` are adjusted by one pixel.

To make sure the animation stops when the layer is at its original size, I check whether the `clip.top` and `clip.left` values are their original zero values. If they are, I set a Boolean variable for each side. When both variables indicate that the clip rectangle is its original size, the script cancels the `setInterval()` action.

Listing 31-15 demonstrates how to adjust clipping in IE5+ and NN6+ syntax.

`left`
`top`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

To enable you to experiment with manually setting `layerObject.top` and `layerObject.left` properties, Listing 31-5 is a modified version of the `layer.clip` example (Listing 31-4). The current example again has the one modifiable layer, but it has only four text fields in which you can enter values. Two fields are for the `layerObject.left` and `layerObject.top` properties; the other two are for the `layerObject.clip.left` and `layerObject.clip.top` properties. I present both sets of values here to help reinforce the lack of connection between layer and clip location properties in the same layer object.

You can find the corresponding syntax for IE5+ and NN6+ in Listing 31-16.

Listing 31-5 Comparison of Layer and Clip Location Properties

```
<HTML>
<HEAD>
<TITLE>Layer vs. Clip</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setClip(field) {
    var clipVal = parseInt(field.value)
    document.display.clip[field.name] = clipVal
    showValues()
}
function setLayer(field) {
    var layerVal = parseInt(field.value)
    document.display[field.name] = layerVal
    showValues()
}
function showValues() {
    var form = document.layers[0].document.forms[0]
    form.elements[0].value = document.display.left
    form.elements[1].value = document.display.top
    form.elements[2].value = document.display.clip.left
    form.elements[3].value = document.display.clip.top
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<B>Layer vs. Clip Location Properties</B>
<HR>
Enter new layer and clipping values to adjust the layer.<P>
<LAYER TOP=80>
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right">layer.left:</TD>
    <TD><INPUT TYPE="text" NAME="left" SIZE=3 onChange="setLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.top:</TD>
    <TD><INPUT TYPE="text" NAME="top" SIZE=3 onChange="setLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right">layer.clip.left:</TD>
    <TD><INPUT TYPE="text" NAME="left" SIZE=3 onChange="setClip(this)"></TD>
</TR>
```

```
<TR>
    <TD ALIGN="right">layer.clip.top:</TD>
    <TD><INPUT TYPE="text" NAME="top" SIZE=3 onChange="setClip(this)"></TD>
</TR>
</TABLE>
</FORM>
</LAYER>
<LAYER NAME="display" BGCOLOR="coral" TOP=80 LEFT=200 WIDTH=360 HEIGHT=180>
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</LAYER>
</BODY>
</HTML>
```

pageX
pageY

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Listing 31-6 defines one outer layer and one nested inner layer of different colors (see Figure 31-3). The inner layer contains some text content; the outer layer is sized initially to present a colorful border by being below the inner layer and 10 pixels wider and taller.

Two sets of fields display (and enable you to change) the `layerObject.pageX`, `layerObject.pageY`, `layerObject.left`, and `layerObject.top` properties for each of the nested layers. Each set of fields is color-coded to its corresponding layer.

When you change any value, all values are recalculated and displayed in the other fields. For example, the initial `pageX` position for the outer layer is 200 pixels; for the inner layer, the `pageX` value is 205 pixels (accounting for the 5-pixel "border" around the inner layer). If you change the outer layer's `pageX` value to 220, the outer layer moves to the right by 20 pixels, taking the inner layer along for the ride. The `layer.pageX` value for the inner layer after the move is 225 pixels.

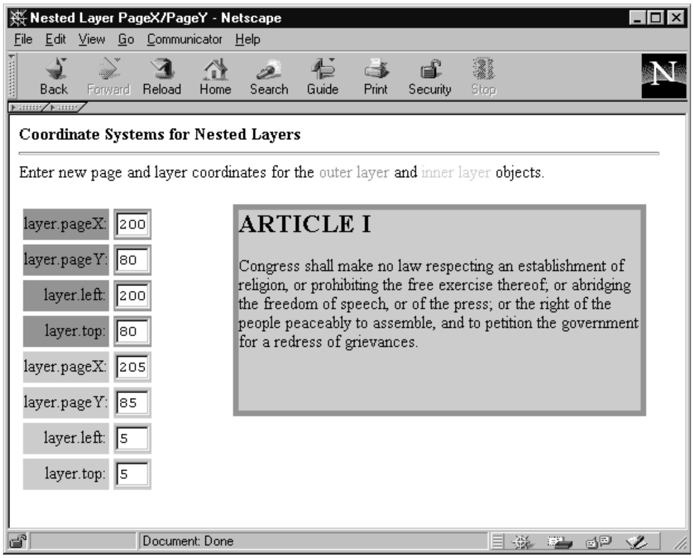

Figure 31-3: Testing the position properties of nested layers

The outer layer values for the pairs of values are always the same no matter what. But for the inner layer, the page values are significantly different from the `layer.left` and `layer.top` values because these latter values are measured relative to their containing layer — the outer layer. If you move the outer layer, the inner layer values for `layerObject.left` and `layerObject.top` don't change one iota. Listing 31-17 shows the comparable syntax for IE5+ and NN6+.

Listing 31-6: **Testing Nested Layer Coordinate Systems**

```
<HTML>
<HEAD>
<TITLE>Nested Layer PageX/PageY</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setOuterPage(field) {
    var layerVal = parseInt(field.value)
    document.outerDisplay[field.name] = layerVal
    showValues()
}
function setOuterLayer(field) {
    var layerVal = parseInt(field.value)
    document.outerDisplay[field.name] = layerVal
    showValues()
}
function setInnerPage(field) {
    var layerVal = parseInt(field.value)
```

```
    document.outerDisplay.document.innerDisplay[field.name] = layerVal
    showValues()
}
function setInnerLayer(field) {
    var layerVal = parseInt(field.value)
    document.outerDisplay.document.innerDisplay[field.name] = layerVal
    showValues()
}
function showValues() {
    var form = document.layers[0].document.forms[0]
    form.elements[0].value = document.outerDisplay.pageX
    form.elements[1].value = document.outerDisplay.pageY
    form.elements[2].value = document.outerDisplay.left
    form.elements[3].value = document.outerDisplay.top
    form.elements[4].value = document.outerDisplay.document.innerDisplay.pageX
    form.elements[5].value = document.outerDisplay.document.innerDisplay.pageY
    form.elements[6].value = document.outerDisplay.document.innerDisplay.left
    form.elements[7].value = document.outerDisplay.document.innerDisplay.top
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<B>Coordinate Systems for Nested Layers</B>
<HR>
Enter new page and layer coordinates for the <FONT COLOR="coral">outer
layer</FONT> and <FONT COLOR="aquamarine">inner layer</FONT> objects.<P>
<LAYER TOP=80>
<FORM>
<TABLE>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">layer.pageX:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="pageX" SIZE=3
        onChange="setOuterPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">layer.pageY:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="pageY" SIZE=3
        onChange="setOuterPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">layer.left:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="left" SIZE=3
        onChange="setOuterLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="coral">layer.top:</TD>
    <TD BGCOLOR="coral"><INPUT TYPE="text" NAME="top" SIZE=3
        onChange="setOuterLayer(this)"></TD>
</TR>
```

Continued

Listing 31-6 *(continued)*

```
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">layer.pageX:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="pageX" SIZE=3
        onChange="setInnerPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">layer.pageY:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="pageY" SIZE=3
        onChange="setInnerPage(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">layer.left:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="left" SIZE=3
        onChange="setInnerLayer(this)"></TD>
</TR>
<TR>
    <TD ALIGN="right" BGCOLOR="aquamarine">layer.top:</TD>
    <TD BGCOLOR="aquamarine"><INPUT TYPE="text" NAME="top" SIZE=3
        onChange="setInnerLayer(this)"></TD>
</TR>
</TABLE>
</FORM>
</LAYER>
<LAYER NAME="outerDisplay" BGCOLOR="coral" TOP=80 LEFT=200 WIDTH=370 HEIGHT=190>
<LAYER NAME="innerDisplay" BGCOLOR="aquamarine" TOP=5 LEFT=5 WIDTH=360
HEIGHT=180>
<H2>ARTICLE I</H2>
<P>
Congress shall make no law respecting an establishment of religion, or
prohibiting the free exercise thereof; or abridging the freedom of speech, or of
the press; or the right of the people peaceably to assemble, and to petition the
government for a redress of grievances.
</P>
</LAYER>
</LAYER>
</BODY>
</HTML>
```

src

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Setting the `layerObject.src` property of a layer that is a member of a layer family (that is, a family with at least one parent and one child) can be tricky business if you're not careful. Listing 31-7 presents a workspace for you to see how changing the `src` property of outer and inner layers affects the scenery.

When you first load the document, one outer layer contains one inner layer (each with a different background color). Control buttons on the page enable you to set the `layerObject.src` property of each layer independently. Changes to the inner layer content affect only that layer. Long content forces the inner layer to expand its depth, but the inner layer's view is automatically clipped by its parent layer.

Changing the outer layer content, however, removes the inner layer completely. Code in the following listing shows one way to examine for the presence of a particular layer before attempting to load new content in it. If the inner layer doesn't exist, the script creates a new layer on the fly to replace the original inner layer.

Listing 31-7: **Setting Nested Layer Source Content**

```
<HTML>
<HEAD>
<TITLE>Layer Source</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function loadOuter(doc) {
    document.outerDisplay.src = doc
}
function loadInner(doc) {
    var nested = document.outerDisplay.document.layers
    if (nested.length > 0) {
        // inner layer exists, so load content or restore
        if (doc) {
            nested[0].src = doc
        } else {
            restoreInner(nested[0])
        }
    } else {
        // prompt user about restoring inner layer
        if (confirm("The inner layer has been removed by loading an outer
document. " + "Restore the original layers?")) {
            restoreLayers(doc)
        }
    }
}
function restoreLayers(doc) {
    // reset appearance of outer layer
    document.outerDisplay.bgColor = "coral"
```

Continued

Listing 31-7 *(continued)*

```
    document.outerDisplay.resizeTo(370,190) // sets clip
    document.outerDisplay.document.write("")
    document.outerDisplay.document.close()
    // generate new inner layer
    var newInner = new Layer(360, document.layers["outerDisplay"])
    newInner.bgColor = "aquamarine"
    newInner.moveTo(5,5)
    if (doc) {
        // user clicked an inner content button
        newInner.src = doc
    } else {
        // return to pristine look
        restoreInner(newInner)
    }
    newInner.visibility = "show"
}
function restoreInner(inner) {
    inner.document.write("<HTML><BODY><P><B>Placeholder text for raw inner 
layer.</B></P>" + 0"</BODY></HTML>")
    inner.document.close()
    inner.resizeTo(360,180) // sets clip
}
</SCRIPT>
</HEAD>
<BODY>
<B>Setting the <TT>layer.src</TT> Property of Nested Layers</B>
<HR>
Click the buttons to see what happens when you load new source documents into 
the <FONT COLOR="coral">outer layer</FONT> and <FONT COLOR="aquamarine">inner 
layer</FONT> objects.<P>
<LAYER TOP=100 BGCOLOR="coral">
<FORM>
Load into outer layer:<BR>
<INPUT TYPE="button" VALUE="Article I" onClick="loadOuter('article1.htm')"><BR>
<INPUT TYPE="button" VALUE="Entire Bill of Rights" 
onClick="loadOuter('bofright.htm')"><BR>
</FORM>
</LAYER>
<LAYER TOP=220 BGCOLOR="aquamarine">
<FORM>
Load into inner layer:<BR>
<INPUT TYPE="button" VALUE="Article I" onClick="loadInner('article1.htm')"><BR>
<INPUT TYPE="button" VALUE="Entire Bill of Rights" 
onClick="loadInner('bofright.htm')"><BR>
<INPUT TYPE="button" VALUE="Restore Original" onClick="loadInner()"><BR>
</FORM>
</LAYER>
<LAYER NAME="outerDisplay" BGCOLOR="coral" TOP=100 LEFT=200 WIDTH=370 
HEIGHT=190>
```

```
    <LAYER NAME="innerDisplay" BGCOLOR="aquamarine" TOP=5 LEFT=5 WIDTH=360
HEIGHT=180>
    <P><B>Placeholder text for raw inner layer.</B></P>
    </LAYER>
</LAYER>
</BODY>
</HTML>
```

Restoring the original layers via script (as opposed to reloading the document) does not perform a perfect restoration. The key difference is that the scripts use the `layerObject.resizeTo()` method to set the layers to the height and width established by the `<LAYER>` tags that create the layers in the first place. This method, however, sets the clipping rectangle of the layer — not the layer's size. Therefore, if you use the script to restore the layers, loading the longer text file into either layer does not force the layer to expand to display all the content; the clipping region governs the view.

visibility

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Use the page in Listing 31-8 to see how the `layerObject.visibility` property settings affect a pair of nested layers. When the page first loads, the default `inherit` setting is in effect. Changes you make to the outer layer by clicking the outer layer buttons affect the inner layer, but setting the inner layer's properties to `hide` or `show` severs the visibility relationship between parent and child. Listing 31-19 shows this example with IE5+ and NN6+ syntax.

Listing 31-8: Nested Layer Visibility Relationships

```
<HTML>
<HEAD>
<TITLE>Layer Source</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setOuterVis(type) {
    document.outerDisplay.visibility = type
}
```

Continued

Listing 31-8 *(continued)*

```
function setInnerVis(type) {
    document.outerDisplay.document.innerDisplay.visibility = type
}
</SCRIPT>
</HEAD>
<BODY>
<B>Setting the <TT>layer.visibility</TT> Property of Nested Layers</B>
<HR>
Click the buttons to see what happens when you change the visibility of the
<FONT COLOR="coral">outer layer</FONT> and <FONT COLOR="aquamarine">inner
layer</FONT> objects.<P>
<LAYER TOP=100 BGCOLOR="coral">
<FORM>
Control outer layer property:<BR>
<INPUT TYPE="button" VALUE="Hide Outer Layer" onClick="setOuterVis('hide')"><BR>
<INPUT TYPE="button" VALUE="Show Outer Layer" onClick="setOuterVis('show')"><BR>
</FORM>
</LAYER>
<LAYER TOP=220 BGCOLOR="aquamarine">
<FORM>
Control inner layer property:<BR>
<INPUT TYPE="button" VALUE="Hide Inner Layer" onClick="setInnerVis('hide')"><BR>
<INPUT TYPE="button" VALUE="Show Inner Layer" onClick="setInnerVis('show')"><BR>
<INPUT TYPE="button" VALUE="Inherit Outer Layer"
onClick="setInnerVis('inherit')"><BR>
</FORM>
</LAYER>
<LAYER NAME="outerDisplay" BGCOLOR="coral" TOP=100 LEFT=200 WIDTH=370
HEIGHT=190>
    <LAYER NAME="innerDisplay" BGCOLOR="aquamarine" TOP=5 LEFT=5 WIDTH=360
HEIGHT=180>
    <P><B>Placeholder text for raw inner layer.</B></P>
    </LAYER>
</LAYER>
</BODY>
</HTML>
```

zIndex

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

The relationships among the three stacking property values can be difficult to visualize. Listing 31-9 offers a way to see the results of changing the `layerObject.zIndex` properties of three overlapping sibling layers. Figure 31-4 shows the beginning organization of layers after the page loads.

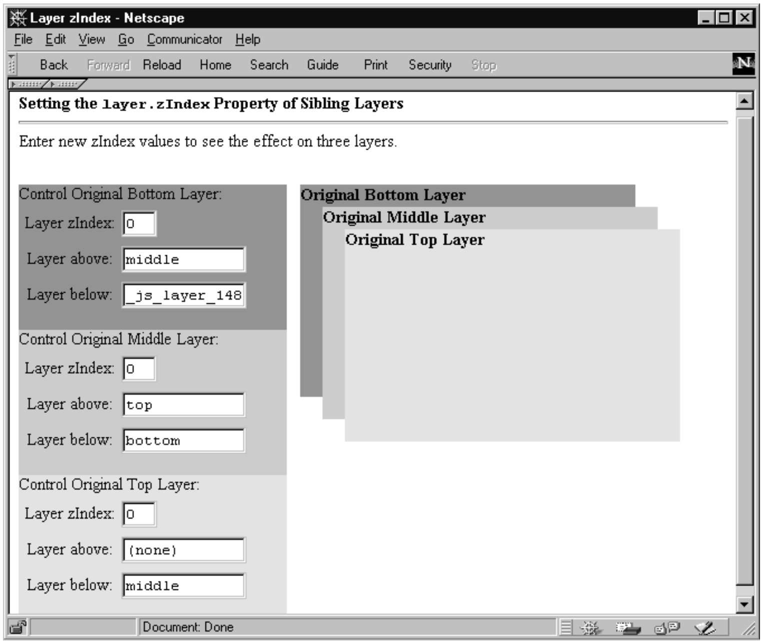

Figure 31-4: A place to play with zIndex property settings

The sequence of the `<LAYER>` tags in the document governs the original stacking order. Because the attribute is not set in the HTML, the initial values appear as zero for all three layers. But, as the page reveals, the `layerObject.above` and `layerObject.below` properties are automatically established. When a layer has no other layer object above it, the page shows `(none)`. Also, if the layer below the bottom of the stack is the main window, a strange inner layer name is assigned (something like `_js_layer_21`).

To experiment with this page, first make sure you understand the `layerObject.above` and `layerObject.below` readings for the default order of the layers. Then, assign different orders to the layers with value sequences such as 3-2-1, 1-3-2, 2-2-2, and so on. Each time you enter one new value, check the actual layers to see if their stacking order changed and how that affected the other properties of all layers.

Listing 31-20 shows how to achieve the same action with IE5+ and NN6+ syntax.

Listing 31-9: **Relationships Among zIndex, above, and below**

```
<HTML>
<HEAD>
<TITLE>Layer zIndex</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function setZ(field) {
    switch (field.name) {
        case "top" :
            document.top.zIndex = parseInt(field.value)
            break
        case "mid" :
            document.middle.zIndex = parseInt(field.value)
            break
        case "bot" :
            document.bottom.zIndex = parseInt(field.value)
    }
    showValues()
}
function showValues() {
    document.layers[0].document.forms[0].bot.value = document.bottom.zIndex
    document.layers[1].document.forms[0].mid.value = document.middle.zIndex
    document.layers[2].document.forms[0].top.value = document.top.zIndex

    document.layers[0].document.forms[0].above.value = (document.bottom.above) ?
        document.bottom.above.name : "(none)"
    document.layers[1].document.forms[0].above.value = (document.middle.above) ?
        document.middle.above.name : "(none)"
    document.layers[2].document.forms[0].above.value = (document.top.above) ?
        document.top.above.name : "(none)"

    document.layers[0].document.forms[0].below.value = (document.bottom.below) ?
        document.bottom.below.name : "(none)"
    document.layers[1].document.forms[0].below.value = (document.middle.below) ?
        document.middle.below.name : "(none)"
    document.layers[2].document.forms[0].below.value = (document.top.below) ?
        document.top.below.name : "(none)"
}
</SCRIPT>
</HEAD>
<BODY onLoad="showValues()">
<B>Setting the <TT>layer.zIndex</TT> Property of Sibling Layers</B>
<HR>
Enter new zIndex values to see the effect on three layers.<P>
<LAYER TOP=90 WIDTH=240 BGCOLOR="coral">
<FORM>
Control Original Bottom Layer:<BR>
```

```
<TABLE>
<TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="bot" SIZE=3
onChange="setZ(this)"></TD></TR>
<TR><TD ALIGN="right">Layer above:</TD><TD><INPUT TYPE="text" NAME="above"
SIZE=13></TD></TR>
<TR><TD ALIGN="right">Layer below:</TD><TD><INPUT TYPE="text" NAME="below"
SIZE=13></TD></TR>
</TABLE>
</FORM>
</LAYER>
<LAYER TOP=220 WIDTH=240 BGCOLOR="aquamarine">
<FORM>
Control Original Middle Layer:<BR>
<TABLE>
<TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="mid" SIZE=3
onChange="setZ(this)"></TD></TR>
<TR><TD ALIGN="right">Layer above:</TD><TD><INPUT TYPE="text" NAME="above"
SIZE=13></TD></TR>
<TR><TD ALIGN="right">Layer below:</TD><TD><INPUT TYPE="text" NAME="below"
SIZE=13></TD></TR>
</TABLE></FORM>
</LAYER>
<LAYER TOP=350 WIDTH=240 BGCOLOR="yellow">
<FORM>
Control Original Top Layer:<BR>
<TABLE><TR><TD ALIGN="right">Layer zIndex:</TD><TD><INPUT TYPE="text" NAME="top"
SIZE=3 onChange="setZ(this)"></TD></TR>
<TR><TD ALIGN="right">Layer above:</TD><TD><INPUT TYPE="text" NAME="above"
SIZE=13></TD></TR>
<TR><TD ALIGN="right">Layer below:</TD><TD><INPUT TYPE="text" NAME="below"
SIZE=13></TD></TR>
</TABLE>
</FORM>
</LAYER>
<LAYER NAME="bottom" BGCOLOR="coral" TOP=90 LEFT=260 WIDTH=300 HEIGHT=190>
    <P><B>Original Bottom Layer</B></P>
</LAYER>
    <LAYER NAME="middle" BGCOLOR="aquamarine" TOP=110 LEFT=280 WIDTH=300
    HEIGHT=190>
    <P><B>Original Middle Layer</B></P>
</LAYER>
<LAYER NAME="top" BGCOLOR="yellow" TOP=130 LEFT=300 WIDTH=300 HEIGHT=190>
    <P><B>Original Top Layer</B></P>
</LAYER>
</LAYER>
</BODY>
</HTML>
```

Methods

`load("URL", newLayerWidth)`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Buttons in Listing 31-10 enable you to load short and long documents into a layer. The first two buttons don't change the width (in fact, the second parameter to `layerObject.load()` is the `layerObject.clip.left` value). For the second two buttons, a narrower width than the original is specified. Click the Restore button frequently to return to a known state.

Listing 31-10: Loading Documents into Layers

```
<HTML>
<HEAD>
<TITLE>Layer Loading</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function loadDoc(URL,width) {
    if (!width) {
        width = document.myLayer.clip.width
    }
    document.myLayer.load(URL, width)
}
</SCRIPT>
</HEAD>
<BODY>
<B>Loading New Documents</B>
<HR>
<LAYER TOP=90 WIDTH=240 BGCOLOR="yellow">
<FORM>
Loading new documents:<BR>
<INPUT TYPE="button" VALUE="Small Doc/Existing Width"
onClick="loadDoc('article1.htm')"><BR>
<INPUT TYPE="button" VALUE="Large Doc/Existing Width"
onClick="loadDoc('bofright.htm')"><P>
<INPUT TYPE="button" VALUE="Small Doc/Narrower Width"
onClick="loadDoc('article1.htm',200)"><BR>
<INPUT TYPE="button" VALUE="Large Doc/Narrower Width"
onClick="loadDoc('bofright.htm',200)"><P>
<INPUT TYPE="button" VALUE="Restore" onClick="location.reload()"></FORM>
```

```
</LAYER>
<LAYER NAME="myLayer" BGCOLOR="yellow" TOP=90 LEFT=300 WIDTH=300 HEIGHT=190>
    <P><B>Text loaded in original document.</B></P>
</LAYER>
</BODY>
</HTML>
```

moveAbove(*layerObject*)
moveBelow(*layerObject*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

You can see the `layerObject.moveAbove()` method at work in Listing 31-1.

moveBy(*deltaX*,*deltaY*)
moveTo(*x*,*y*)
moveToAbsolute(*x*,*y*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

Listing 31-11 shows a demonstration of the `layerObject.moveTo()` method. It is a simple script that enables you to click and drag a layer around the screen. The script employs the coordinate values of the `mouseMove` event; after compensating for the offset within the layer at which the click occurs, the script moves the layer to track the mouse action.

I want to present this example for an additional reason: to explain an important user interface difference between Windows and Macintosh versions of NN4. In Windows versions, you can click and hold the mouse button down on an object and let the object receive all the `mouseMove` events as you drag the cursor around the screen. On the Macintosh, however, NN4 tries to compensate for the lack of a second mouse button by popping up a context-sensitive menu at the cursor position when the user holds the mouse button down for more than just a click. To prevent the pop-up menu from appearing, the `engage()` method invoked by the `onMouseDown` event handler ends with `return false`.

Notice in the following listing how the layer captures a number of mouse events. Each one plays an important role in creating a mode that is essentially like a `mouseStillDown` event (which doesn't exist in NN4's event model). The `mouseDown` event sets a Boolean flag (`engaged`) indicating that the user clicked down in the layer. At the same time, the script records how far away from the layer's top-left corner the `mouseDown` event occurred. This offset information is needed so that any setting of the layer's location takes this offset into account (otherwise, the top-left corner of the layer would jump to the cursor position and be dragged from there).

During the drag (`mouseDown` events firing with each mouse movement), the `dragIt()` function checks whether the drag mode is engaged. If so, the layer is moved to the page location calculated by subtracting the original downstroke offset from the `mouseMove` event location on the page. When the user releases the mouse button, the `mouseUp` event turns off the drag mode Boolean value.

Listing 31-21 shows a version of this example for IE5+ and NN6.

Listing 31-11: **Dragging a Layer**

```
<HTML>
<HEAD>
<TITLE>Layer Dragging</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var engaged = false
var offsetX = 0
var offsetY = 0
function dragIt(e) {
    if (engaged) {
        document.myLayer.moveTo(e.pageX - offsetX, e.pageY - offsetY)
    }
}
function engage(e) {
    engaged = true
    offsetX = e.pageX - document.myLayer.left
    offsetY = e.pageY - document.myLayer.top
    return false
}
function release() {
    engaged = false
}
</SCRIPT>
</HEAD>
<BODY>
```

```
<B>Dragging a Layer</B>
<HR>
<LAYER NAME="myLayer" BGCOLOR="lightgreen" TOP=90 LEFT=100 WIDTH=300 HEIGHT=190>
    <P><B>Drag me around the window.</B></P>
</LAYER>
<SCRIPT LANGUAGE="JavaScript">
document.myLayer.captureEvents(Event.MOUSEDOWN | Event.MOUSEUP |
Event.MOUSEMOVE)
document.myLayer.onMouseDown = engage
document.myLayer.onMouseUp = release
document.myLayer.onMouseMove = dragIt
</SCRIPT>
</BODY>
</HTML>
```

resizeBy(*deltaX*,*deltaY*)
resizeTo(*width*,*height*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓						

Example

It is important to understand the ramifications of content flow when these two methods resize a layer. Listing 31-12a (and the companion document Listing 31-12b) shows you how to set the lower-right corner of a layer to be dragged by a user for resizing the layer (much like grabbing the resize corner of a document window). Three radio buttons enable you to choose whether and when the content should be redrawn to the layer — never, after resizing, or during resizing.

Event capture is very much like that in Listing 31-11 for layer dragging. The primary difference is that drag mode is engaged only when the mouse event takes place in the region of the lower-right corner. A different kind of offset value is saved here because, for resizing, the script needs to know the mouse event offset from the right and bottom edges of the layer.

Condition statements in the `resizeIt()` and `release()` functions verify whether a specific radio button is checked to determine when (or if) the content should be redrawn. I designed this page with the knowledge that its content might be redrawn. Therefore, I built the content of the layer as a separate HTML document that loads in the `<LAYER>` tag.

Redrawing the content requires reloading the document into the layer. I use the `layerObject.load()` method because I want to send the current `layerObject.clip.width` as a parameter for the width of the clip region to accommodate the content as it loads.

An important point to know about reloading content into a layer is that all property settings for the layer's event capture are erased when the document loads. Overcoming this behavior requires setting the layer's `onLoad` event handler to set the layer's event capture mechanism. If the layer event capturing is specified as part of the statements at the end of the document, the layer ignores some important events needed for the dynamic resizing after the document reloads the first time.

As you experiment with the different ways to resize and redraw, you see that redrawing during resizing is a slow process because of the repetitive loading (from cache) needed each time. On slower client machines, it is easy for the cursor to outrun the layer region, causing the layer to not get `mouseOver` events at all. It may not be the best-looking solution, but I prefer to redraw after resizing the layer.

Listing 31-22 shows a version designed for the IE5+ and NN6 object models. Because content automatically reflows in those browsers, you do not have to load the content of the positioned element from an external document.

Listing 31-12a: **Resizing a Layer**

```
<HTML>
<HEAD>
<TITLE>Layer Resizing</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var engaged = false
var offsetX = 0
var offsetY = 0
function resizeIt(e) {
    if (engaged) {
        document.myLayer.resizeTo(e.pageX + offsetX, e.pageY + offsetY)
        if (document.forms[0].redraw[2].checked) {
            document.myLayer.load("lst31-12b.htm", document.myLayer.clip.width)
        }
    }
}
function engage(e) {
    if (e.pageX > (document.myLayer.clip.right - 10) &&
        e.pageY > (document.myLayer.clip.bottom - 10)) {
        engaged = true
        offsetX = document.myLayer.clip.right - e.pageX
        offsetY = document.myLayer.clip.bottom - e.pageY
    }
}
```

```
function release() {
    if (engaged && document.forms[0].redraw[1].checked) {
        document.myLayer.load("lst31-12b.htm", document.myLayer.clip.width)
    }
    engaged = false
}
function grabEvents() {
    document.myLayer.captureEvents(Event.MOUSEDOWN | Event.MOUSEUP |
Event.MOUSEMOVE)
}
</SCRIPT>
</HEAD>
<BODY>
<B>Resizing a Layer</B>
<HR>
<FORM>
Redraw layer content:<BR>
<INPUT TYPE="radio" NAME="redraw" CHECKED>Never
<INPUT TYPE="radio" NAME="redraw">After resize
<INPUT TYPE="radio" NAME="redraw">During resize
</FORM>
<LAYER NAME="myLayer" SRC="lst31-12b.htm" BGCOLOR="lightblue" TOP=120 LEFT=100
WIDTH=300 HEIGHT=190 onLoad="grabEvents()">
</LAYER>
<SCRIPT LANGUAGE="JavaScript">
document.myLayer.onMouseDown = engage
document.myLayer.onMouseUp = release
document.myLayer.onMouseMove = resizeIt
</SCRIPT>
</BODY>
</HTML>
```

Listing 31-12b: **Content for the Resizable Layer**

```
<HTML>
<BODY>
    <P><B>Resize me by dragging the lower-right corner.</B></P>
    <SCRIPT LANGUAGE="JavaScript">
    if (navigator.userAgent.indexOf("Mac") != -1) {
        document.write("(Mac users: Ctrl-Click me first; then Click to stop
dragging.)")
    }
    </SCRIPT>
</BODY>
</HTML>
```

Chapter 34 Examples

The following section contains examples from Chapter 34, "The String Object."

String Object

Properties

constructor

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to test the value of the `constructor` property. Enter the following statements into the top text box:

```
a = new String("abcd")
a.constructor == String
a.constructor == Number
```

Parsing methods

string.charAt(*index*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Enter each of the following statements into the top text box of The Evaluator:

```
a = "banana daiquiri"
a.charAt(0)
```

```
a.charAt(5)
a.charAt(6)
a.charAt(20)
```

Results from each of the `charAt()` methods should be `b`, `a` (the third "a" in "banana"), a space character, and an empty string, respectively.

string.charCodeAt([*index*])
String.fromCharCode(*num1* [, *num2* [, ... *numn*]])

Returns: Integer code number for a character; concatenated string value of code numbers supplied as parameters.

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Listing 34-2 provides examples of both methods on one page. Moreover, because one of the demonstrations relies on the automatic capture of selected text on the page, the scripts include code to accommodate the different handling of selection events and capture of the selected text in Navigator and Internet Explorer 4.

After you load the page, select part of the body text anywhere on the page. If you start the selection with the lowercase letter "a," the character code displays as 97. If you select no text, the result is `NaN`.

Try entering numeric values in the three fields at the bottom of the page. Values below 32 are ASCII control characters that most fonts represent as hollow squares. But try all other values to see what you get. Notice that the script passes all three values as a group to the `String.fromCharCode()` method, and the result is a combined string.

Listing 34-2: **Character Conversions**

```
<HTML>
<HEAD>
<TITLE>Character Codes</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var isNav = (navigator.appName == "Netscape")
var isNav4 = (isNav && parseInt(navigator.appVersion == 4))
function showCharCode() {
    if (isNav) {
        var theText = document.getSelection()
    } else {
        var theText = document.selection.createRange().text
    }
    if (theText) {
        document.forms[0].charCodeDisplay.value = theText.charCodeAt()
    } else {
        document.forms[0].charCodeDisplay.value = " "
    }
}
function showString(form) {
    form.result.value =
String.fromCharCode(form.entry1.value,form.entry2.value,form.entry3.value)
}
if (isNav4) {
    document.captureEvents(Event.MOUSEUP)
}
document.onmouseup = showCharCode
</SCRIPT>
</HEAD>
<BODY>
<B>Capturing Character Codes</B>
<FORM>
Select any of this text, and see the character code of the first character.<P>
Character Code:<INPUT TYPE="text" NAME="charCodeDisplay" SIZE=3><BR>
<HR>
<B>Converting Codes to Characters</B><BR>
Enter a value  0-255:<INPUT TYPE="text" NAME="entry1" SIZE=4><BR>
Enter a value  0-255:<INPUT TYPE="text" NAME="entry2" SIZE=4><BR>
Enter a value  0-255:<INPUT TYPE="text" NAME="entry3" SIZE=4><BR>
<INPUT TYPE="button" VALUE="Show String" onClick="showString(this.form)">
Result:<INPUT TYPE="text" NAME="result" SIZE=5>
</FORM>
</BODY>
</HTML>
```

string.indexOf(*searchString* [, *startIndex*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Enter each of the following statements (up to, but not including the "//" comment symbols) into the top text box of The Evaluator (you can simply replace the parameters of the `indexOf()` method for each statement after the first one). Compare your results with the results shown below.

```
a = "bananas"
a.indexOf("b")      // result = 0 (index of first letter is zero)
a.indexOf("a")      // result = 1
a.indexOf("a",1)    // result = 1 (start from second letter)
a.indexOf("a",2)    // result = 3 (start from third letter)
a.indexOf("a",4)    // result = 5 (start from fifth letter)
a.indexOf("nan")    // result = 2
a.indexOf("nas")    // result = 4
a.indexOf("s")      // result = 6
a.indexOf("z")      // result = -1 (no "z" in string)
```

string.lastIndexOf(*searchString*[, *startIndex*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Enter each of the following statements (up to, but not including the "//" comment symbols) into the top text box of The Evaluator (you can simply replace the parameters of the `lastIndexOf()` method for each statement after the first one). Compare your results with the results shown below.

```
a = "bananas"
a.lastIndexOf("b")    // result = 0 (index of first letter is zero)
a.lastIndexOf("a")    // result = 5
a.lastIndexOf("a",1)  // result = 1 (from second letter toward the front)
```

```
a.lastIndexOf("a",2)  // result = 1 (start from third letter working to front)
a.lastIndexOf("a",4)  // result = 3 (start from fifth letter)
a.lastIndexOf("nan")  // result = 2 [except for -1 Nav 2.0 bug]
a.lastIndexOf("nas")  // result = 4
a.lastIndexOf("s")    // result = 6
a.lastIndexOf("z")    // result = -1 (no "z" in string)
```

string.match(*regExpression*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

To help you understand the `string.match()` method, Listing 34-3 provides a workshop area for experimentation. Two fields occur for data entry: the first is for the long string to be examined by the method; the second is for a regular expression. Some default values are provided in case you're not yet familiar with the syntax of regular expressions (see Chapter 38). A check box lets you specify whether the search through the string for matches should be case-sensitive. After you click the "Execute match()" button, the script creates a regular expression object out of your input, performs the `string.match()` method on the big string, and reports two kinds of results to the page. The primary result is a string version of the array returned by the method; the other is a count of items returned.

Listing 34-3: **Regular Expression Match Workshop**

```
<HTML>
<HEAD>
<TITLE>Regular Expression Match</TITLE>
<SCRIPT LANGUAGE="JavaScript">
function doMatch(form) {
    var str = form.entry.value
    var delim = (form.caseSens.checked) ? "/g" : "/gi"
    var regexp = eval("/" + form.regexp.value + delim)
    var resultArray = str.match(regexp)
    if (resultArray) {
        form.result.value = resultArray.toString()
        form.count.value = resultArray.length
    } else {
        form.result.value = "<no matches>"
        form.count.value = ""
    }
}
```

```
</SCRIPT>
</HEAD>
<BODY>
<B>String Match with Regular Expressions</B>
<HR>
<FORM>
Enter a main string:<INPUT TYPE="text" NAME="entry" SIZE=60
  VALUE="Many a maN and womAN have meant to visit GerMAny."><BR>
Enter a regular expression to match:<INPUT TYPE="text" NAME="regexp" SIZE=25
  VALUE="\wa\w">
<INPUT TYPE="checkbox" NAME="caseSens">Case-sensitive<P>
<INPUT TYPE="button" VALUE="Execute match()" onClick="doMatch(this.form)">
<INPUT TYPE="reset"><P>
Result:<INPUT TYPE="text" NAME="result" SIZE=40><BR>
Count:<INPUT TYPE="text" NAME="count" SIZE=3><BR>
</FORM>
</BODY>
</HTML>
```

The default value for the main string has unusual capitalization intentionally. The capitalization lets you see more clearly where some of the matches come from. For example, the default regular expression looks for any three-character string that has the letter “a” in the middle. Six string segments match that expression. With the help of capitalization, you can see where each of the four strings containing “man” are extracted from the main string. The following table lists some other regular expressions to try with the default main string.

RegExp	*Description*
`man`	Both case-sensitive and not
`man\b`	Where “man” is at the end of a word
`\bman`	Where “man” is at the start of a word
`me*an`	Where zero or more “e” letters occur between “m” and “a”
`.a.`	Where “a” is surrounded by any one character (including space)
`\sa\s`	Where “a” is surrounded by a space on both sides
`z`	Where a “z” occurs (none in the default string)

In the scripts for Listing 34-3, if the `string.match()` method returns `null`, you are informed politely, and the count field is emptied.

string.replace(*regExpression*, *replaceString*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

The page in Listing 34-4 lets you practice with the `string.replace()` and `string.search()` methods and regular expressions in a friendly environment. The source text is a five-line excerpt from *Hamlet*. You can enter the regular expression to search for, and the replacement text as well. Note that the script completes the job of creating the regular expression object, so that you can focus on the other special characters used to define the matching string. All replacement activities act globally, because the `g` parameter is automatically appended to any expression you enter.

Default values in the fields replace the contraction 'tis with "it is" after you click the "Execute replace()" button. Notice that the backslash character in front of the apostrophe of 'tis (in the string assembled in `mainString`) makes the apostophe a non-word boundary, and thus allows the `\B't` regular expression to find a match there. As described in the section on the `string.search()` method, the button connected to that method returns the offset character number of the matching string (or `-1` if no match occurs).

You could modify the listing so that it actually replaces text in the HTML paragraph for IE4+ and NN6. The steps include wrapping the paragraph in its own element (for example, a SPAN), and invoking the `replace()` method on the `innerHTML` of that element. Assign the results to the `innerHTML` property of that element to complete the job.

Listing 34-4: **Lab for string.replace() and string.search()**

```
<HTML>
<HEAD>
<TITLE>Regular Expression Replace and Search</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var mainString = "To be, or not to be: that is the question:\n"
mainString += "Whether \'tis nobler in the mind to suffer\n"
mainString += "The slings and arrows of outrageous fortune,\n"
mainString += "Or to take arms against a sea of troubles,\n"
mainString += "And by opposing end them."
```

```
function doReplace(form) {
    var replaceStr = form.replaceEntry.value
    var delim = (form.caseSens.checked) ? "/g" : "/gi"
    var regexp = eval("/" + form.regexp.value + delim)
    form.result.value = mainString.replace(regexp, replaceStr)
}
function doSearch(form) {
    var replaceStr = form.replaceEntry.value
    var delim = (form.caseSens.checked) ? "/g" : "/gi"
    var regexp = eval("/" + form.regexp.value + delim)
    form.result.value = mainString.search(regexp)
}
</SCRIPT>
</HEAD>
<BODY>
<B>String Replace and Search with Regular Expressions</B>
<HR>
Text used for string.replace() and string.search() methods:<BR>
<B>To be, or not to be: that is the question:<BR>
Whether 'tis nobler in the mind to suffer<BR>
The slings and arrows of outrageous fortune,<BR>
Or to take arms against a sea of troubles,<BR>
And by opposing end them.</B>

<FORM>
Enter a regular expression to match:<INPUT TYPE="text" NAME="regexp" SIZE=25
VALUE="\B't">
<INPUT TYPE="checkbox" NAME="caseSens">Case-sensitive<BR>
Enter a string to replace the matching strings:<INPUT TYPE="text"
NAME="replaceEntry" SIZE=30 VALUE="it "><P>
<INPUT TYPE="button" VALUE="Execute replace()" onClick="doReplace(this.form)">
<INPUT TYPE="reset">
<INPUT TYPE="button" VALUE="Execute search()" onClick="doSearch(this.form)"><P>
Result:<BR>
<TEXTAREA NAME="result" COLS=60 ROWS=5 WRAP="virtual"></TEXTAREA>
</FORM>
</BODY>
</HTML>
```

string.search(*regExpression*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Listing 34-4, for the `string.replace()` method, also provides a laboratory to experiment with the `string.search()` method.

string.slice(*startIndex* [, *endIndex*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

With Listing 34-5, you can try several combinations of parameters with the `string.slice()` method (see Figure 34-1). A base string is provided (along with character measurements). Select from the different choices available for parameters and study the outcome of the slice.

Listing 34-5: **Slicing a String**

```
<HTML>
<HEAD>
<TITLE>String Slicing and Dicing, Part I</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var mainString = "Electroencephalograph"
function showResults() {
    var form = document.forms[0]
    var param1 = parseInt(form.param1.options[form.param1.selectedIndex].value)
    var param2 = parseInt(form.param2.options[form.param2.selectedIndex].value)
    if (!param2) {
        form.result1.value = mainString.slice(param1)
    } else {
        form.result1.value = mainString.slice(param1, param2)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="showResults()">
<B>String slice() Method</B>
<HR>
Text used for the methods:<BR>
<FONT SIZE=+1><TT><B>Electroencephalograph<BR>
----5----5----5----5-</B></TT></FONT>
<TABLE BORDER=1>
<FORM>
```

```
<TR><TH>String Method</TH><TH>Method Parameters</TH><TH>Results</TH></TR>
<TR>
<TD>string.slice()</TD><TD ROWSPAN=3 VALIGN=middle>
( <SELECT NAME="param1" onChange="showResults()">
    <OPTION VALUE=0>0
    <OPTION VALUE=1>1
    <OPTION VALUE=2>2
    <OPTION VALUE=3>3
    <OPTION VALUE=5>5
</SELECT>,
<SELECT NAME="param2" onChange="showResults()">
    <OPTION >(None)
    <OPTION VALUE=5>5
    <OPTION VALUE=10>10
    <OPTION VALUE=-1>-1
    <OPTION VALUE=-5>-5
    <OPTION VALUE=-10>-10
</SELECT> ) </TD>
<TD><INPUT TYPE="text" NAME="result1" SIZE=25></TD>
</TR>
</FORM>
</TABLE>
</BODY>
</HTML>
```

Figure 34-1: Lab for exploring the string.slice() method

string.split("*delimiterCharacter*"[, *limitInteger*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓			✓	✓	✓

Example

Use The Evaluator (Chapter 13) to see how the `string.split()` method works. Begin by assigning a comma-delimited string to a variable:

```
a = "Anderson,Smith,Johnson,Washington"
```

Now split the string at comma positions so that the string pieces become items in an array, saved as `b`:

```
b = a.split(",")
```

To prove that the array contains four items, inspect the array's `length` property:

```
b.length    // result: 4
```

string.substr(*start* [, *length*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Listing 34-6 lets you experiment with a variety of values to see how the `string.substr()` method works.

Listing 34-6: Reading a Portion of a String

```
<HTML>
<HEAD>
<TITLE>String Slicing and Dicing, Part II</TITLE>
```

```
<SCRIPT LANGUAGE="JavaScript">
var mainString = "Electroencephalograph"
function showResults() {
    var form = document.forms[0]
    var param1 = parseInt(form.param1.options[form.param1.selectedIndex].value)
    var param2 = parseInt(form.param2.options[form.param2.selectedIndex].value)
    if (!param2) {
        form.result1.value = mainString.substr(param1)
    } else {
        form.result1.value = mainString.substr(param1, param2)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="showResults()">
<B>String substr() Method</B>
<HR>
Text used for the methods:<BR>
<FONT SIZE=+1><TT><B>Electroencephalograph<BR>
----5----5----5----5-</B></TT></FONT>
<TABLE BORDER=1>
<FORM>
<TR><TH>String Method</TH><TH>Method Parameters</TH><TH>Results</TH></TR>
<TR>
<TD>string.substr()</TD><TD ROWSPAN=3 VALIGN=middle>
( <SELECT NAME="param1" onChange="showResults()">
    <OPTION VALUE=0>0
    <OPTION VALUE=1>1
    <OPTION VALUE=2>2
    <OPTION VALUE=3>3
    <OPTION VALUE=5>5
</SELECT>,
<SELECT NAME="param2" onChange="showResults()">
    <OPTION >(None)
    <OPTION VALUE=5>5
    <OPTION VALUE=10>10
    <OPTION VALUE=20>20
</SELECT> ) </TD>
<TD><INPUT TYPE="text" NAME="result1" SIZE=25></TD>
</TR>
</FORM>
</TABLE>
</BODY>
</HTML>
```

string.substring(*indexA*, *indexB*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

Listing 34-7 lets you experiment with a variety of values to see how the `string.substring()` method works. If you are using Navigator 4, try changing the LANGUAGE attribute of the script to `JavaScript1.2` and see the different behavior when you set the parameters to `5` and `3`. The parameters switch themselves, essentially letting the second index value become the beginning of the extracted substring.

Listing 34-7: **Reading a Portion of a String**

```
<HTML>
<HEAD>
<TITLE>String Slicing and Dicing, Part III</TITLE>
<SCRIPT LANGUAGE="JavaScript">
var mainString = "Electroencephalograph"
function showResults() {
    var form = document.forms[0]
    var param1 = parseInt(form.param1.options[form.param1.selectedIndex].value)
    var param2 = parseInt(form.param2.options[form.param2.selectedIndex].value)
    if (!param2) {
        form.result1.value = mainString.substring(param1)
    } else {
        form.result1.value = mainString.substring(param1, param2)
    }
}
</SCRIPT>
</HEAD>
<BODY onLoad="showResults()">
<B>String substr() Method</B>
<HR>
Text used for the methods:<BR>
<FONT SIZE=+1><TT><B>Electroencephalograph<BR>
----5----5----5----5-</B></TT></FONT>
<TABLE BORDER=1>
<FORM>
<TR><TH>String Method</TH><TH>Method Parameters</TH><TH>Results</TH></TR>
<TR>
<TD>string.substring()</TD><TD>
```

```
( <SELECT NAME="param1" onChange="showResults()">
    <OPTION VALUE=0>0
    <OPTION VALUE=1>1
    <OPTION VALUE=2>2
    <OPTION VALUE=3>3
    <OPTION VALUE=5>5
</SELECT>,
<SELECT NAME="param2" onChange="showResults()">
    <OPTION >(None)
    <OPTION VALUE=3>3
    <OPTION VALUE=5>5
    <OPTION VALUE=10>10
</SELECT> ) </TD>
<TD><INPUT TYPE="text" NAME="result1" SIZE=25></TD>
</TR>
</FORM>
</TABLE>
</BODY>
</HTML>
```

string.toLowerCase()
string.toUpperCase()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility	✓	✓	✓	✓	✓	✓	✓	✓	✓

Example

You can use the `toLowerCase()` and `toUpperCase()` methods on literal strings, as follows:

```
var newString = "HTTP://www.Netscape.COM".toLowerCase()
    // result = "http://www.netscape.com"
```

The methods are also helpful in comparing strings when case is not important, as follows:

```
if (guess.toUpperCase() == answer.toUpperCase()) {...}
    // comparing strings without case sensitivity
```

string.toString()
string.valueOf()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Examples

Use The Evaluator to test the `valueOf()` method. Enter the following statements into the top text box and examine the values that appear in the Results field:

```
a = new String("hello")
typeof a
b = a.valueOf()
typeof b
```

Because all other JavaScript core objects also have the `valueOf()` method, you can build generic functions that receive a variety of object types as parameters, and the script can branch its code based on the type of value that is stored in the object.

Chapter 35 Examples

The following section contains examples from Chapter 35, “The Math, Number, and Boolean Objects.”

Number Object

Properties

`MAX_VALUE`
`MIN_VALUE`
`NEGATIVE_INFINITY`
`POSITIVE_INFINITY`

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Example

Enter each of the four `Number` object expressions into the top text field of The Evaluator to see how the browser reports each value.

Methods

number.**toExponential(***fractionDigits***)**
number.**toFixed(***fractionDigits***)**
number.**toPrecision(***precisionDigits***)**

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility				✓					✓

Example

You can use The Evaluator to experiment with all three of these methods with a variety of parameter values. Before invoking any method, be sure to assign a numeric value to one of the built-in global variables in The Evaluator (`a` through `z`). None of these methods works with number literals (for example, `123.toExponential(2)` does not work).

number.toString([*radix*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Example

Use The Evaluator to experiment with the `toString()` method. Assign the number `12` to the variable `a` and see how the number is converted to strings in a variety of number bases:

```
a = 12
a.toString()    // base 10
a.toString(2)
a.toString(16)
```

Chapter 37 Examples

The following section contains examples from Chapter 37, "The Array Object."

Array Object Methods

array.concat(*array2*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓			✓	✓	✓

Example

Listing 37-6 is a bit complex, but it demonstrates both how arrays can be joined with the `array.concat()` method and how values and objects in the source arrays do or do not propagate based on their data type. The page is shown in Figure 37-1.

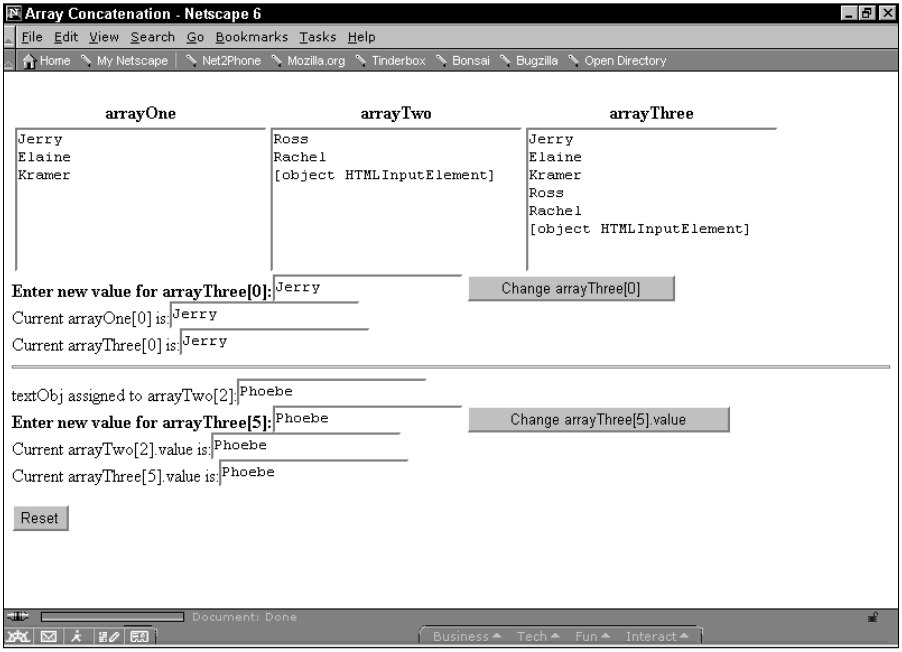

Figure 37-1: Object references remain "alive" in a concatenated array.

After you load the page, you see readouts of three arrays. The first array consists of all string values; the second array has two string values and a reference to a form object on the page (a textbox named "original" in the HTML). In the initialization routine of this page, not only are the two source arrays created, but they are joined with the `array.concat()` method, and the result is shown in the third box. To show the contents of these arrays in columns, I use the `array.join()` method, which brings the elements of an array together as a string delimited in this case by a return character — giving us an instant column of data.

Two series of fields and buttons let you experiment with the way values and object references are linked across concatenated arrays. In the first group, if you enter a new value to be assigned to `arrayThree[0]`, the new value replaces the string value in the combined array. Because regular values do not maintain a link back to the original array, only the entry in the combined array is changed. A call to `showArrays()` proves that only the third array is affected by the change.

More complex is the object relationship for this demonstration. A reference to the first text box of the second grouping has been assigned to the third entry of `arrayTwo`. After concatenation, the same reference is now in the last entry of the combined array. If you enter a new value for a property of the object in the last slot of `arrayThree`, the change goes all the way back to the original object — the first text box in the lower grouping. Thus, the text of the original field changes in response to the change of `arrayThree[5]`. And because all references to that object yield the same result, the reference in `arrayTwo[2]` points to the same text object, yielding the same new answer. The display of the array contents doesn't change, because both arrays still contain a reference to the same object (and the `VALUE` attribute showing in the `<INPUT>` tag of the column listings refers to the default value of the tag, not to its current algorithmically retrievable value shown in the last two fields of the page).

Listing 37-6: **Array Concatenation**

```
<HTML>
<HEAD>
<TITLE>Array Concatenation</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
// global variables
var arrayOne, arrayTwo, arrayThree, textObj
// initialize after load to access text object in form
function initialize() {
    var form = document.forms[0]
    textObj = form.original
    arrayOne = new Array("Jerry", "Elaine","Kramer")
    arrayTwo = new Array("Ross", "Rachel",textObj)
    arrayThree = arrayOne.concat(arrayTwo)
    update1(form)
    update2(form)
    showArrays()
}
// display current values of all three arrays
function showArrays() {
    var form = document.forms[0]
    form.array1.value = arrayOne.join("\n")
    form.array2.value = arrayTwo.join("\n")
    form.array3.value = arrayThree.join("\n")
}
// change the value of first item in Array Three
function update1(form) {
    arrayThree[0] = form.source1.value
    form.result1.value = arrayOne[0]
    form.result2.value = arrayThree[0]
    showArrays()
}
// change value of object property pointed to in Array Three
function update2(form) {
    arrayThree[5].value = form.source2.value
    form.result3.value = arrayTwo[2].value
    form.result4.value = arrayThree[5].value
    showArrays()
}
```

```
</SCRIPT>
</HEAD>
<BODY onLoad="initialize()">
<FORM>
<TABLE>
<TR><TH>arrayOne</TH><TH>arrayTwo</TH><TH>arrayThree</TH></TR>
<TR>
<TD><TEXTAREA NAME="array1" COLS=25 ROWS=6></TEXTAREA></TD>
<TD><TEXTAREA NAME="array2" COLS=25 ROWS=6></TEXTAREA></TD>
<TD><TEXTAREA NAME="array3" COLS=25 ROWS=6></TEXTAREA></TD>
</TR>
</TABLE>
<B>Enter new value for arrayThree[0]:</B><INPUT TYPE="text" NAME="source1"
VALUE="Jerry">
<INPUT TYPE="button" VALUE="Change arrayThree[0]"
onClick="update1(this.form)"><BR>
Current arrayOne[0] is:<INPUT TYPE="text" NAME="result1"><BR>
Current arrayThree[0] is:<INPUT TYPE="text" NAME="result2"><BR>
<HR>

textObj assigned to arrayTwo[2]:<INPUT TYPE="text" NAME="original"
onFocus="this.blur()"></BR>
<B>Enter new value for arrayThree[5]:</B><INPUT TYPE="text" NAME="source2"
VALUE="Phoebe">
<INPUT TYPE="button" VALUE="Change arrayThree[5].value"
onClick="update2(this.form)"><BR>
Current arrayTwo[2].value is:<INPUT TYPE="text" NAME="result3"><BR>
Current arrayThree[5].value is:<INPUT TYPE="text" NAME="result4"><P>

<INPUT TYPE="button" VALUE="Reset" onClick="location.reload()">
</FORM>
</BODY>
</HTML>
```

array.join(*separatorString*)

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Example

The script in Listing 37-7 converts an array of planet names into a text string. The page provides you with a field to enter the delimiter string of your choice and shows the results in a textarea.

Listing 37-7: **Using the Array.join() Method**

```
<HTML>
<HEAD>
<TITLE>Array.join()</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
solarSys = new Array(9)
solarSys[0] = "Mercury"
solarSys[1] = "Venus"
<HTML>
solarSys[2] = "Earth"
solarSys[3] = "Mars"
solarSys[4] = "Jupiter"
solarSys[5] = "Saturn"
solarSys[6] = "Uranus"
solarSys[7] = "Neptune"
solarSys[8] = "Pluto"

// join array elements into a string
function convert(form) {
    var delimiter = form.delim.value
    form.output.value = unescape(solarSys.join(delimiter))
}
</SCRIPT>
<BODY>
<H2>Converting arrays to strings</H2>
This document contains an array of planets in our solar system.<HR>
<FORM>
Enter a string to act as a delimiter between entries:
<INPUT TYPE="text" NAME="delim" VALUE="," SIZE=5><P>
<INPUT TYPE="button" VALUE="Display as String" onClick="convert(this.form)">
<INPUT TYPE="reset">
<TEXTAREA NAME="output" ROWS=4 COLS=40 WRAP="virtual">
</TEXTAREA>
</FORM>
</BODY>
</HTML>
```

Notice that this method takes the parameter very literally. If you want to include nonalphanumeric characters, such as a newline or tab, do so with URL-encoded characters (`%0D` for a carriage return; `%09` for a tab) instead of inline string literals. In Listing 37-7, the results of the `array.join()` method are subjected to the `unescape()` function in order to display them in the TEXTAREA.

array.reverse()

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Example

Listing 37-8 is an enhanced version of Listing 37-7, which includes another button and function that reverse the array and display it as a string in a text area.

Listing 37-8: Array.reverse() Method

```
<HTML>
<HEAD>
<TITLE>Array.reverse()</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
solarSys = new Array(9)
solarSys[0] = "Mercury"
solarSys[1] = "Venus"
solarSys[2] = "Earth"
solarSys[3] = "Mars"
solarSys[4] = "Jupiter"
solarSys[5] = "Saturn"
solarSys[6] = "Uranus"
solarSys[7] = "Neptune"
solarSys[8] = "Pluto"

// show array as currently in memory
function showAsIs(form) {
    var delimiter = form.delim.value
    form.output.value = unescape(solarSys.join(delimiter))
}
// reverse array order, then display as string
function reverseIt(form) {
    var delimiter = form.delim.value
    solarSys.reverse()   // reverses original array
    form.output.value = unescape(solarSys.join(delimiter))
}
</SCRIPT>
<BODY>
<H2>Reversing array element order</H2>
This document contains an array of planets in our solar system.<HR>
<FORM>
```

Continued

Listing 37-8 *(continued)*

```
Enter a string to act as a delimiter between entries:
<INPUT TYPE="text" NAME="delim" VALUE="," SIZE=5><P>
<INPUT TYPE="button" VALUE="Array as-is" onClick="showAsIs(this.form)">
<INPUT TYPE="button" VALUE="Reverse the array" onClick="reverseIt(this.form)">
<INPUT TYPE="reset">
<INPUT TYPE="button" VALUE="Reload" onClick="self.location.reload()">
<TEXTAREA NAME="output" ROWS=4 COLS=60>
</TEXTAREA>
</FORM>
</BODY>
</HTML>
```

Notice that the `solarSys.reverse()` method stands by itself (meaning, nothing captures the returned value) because the method modifies the `solarSys` array. You then run the now inverted `solarSys` array through the `array.join()` method for your text display.

array.sort([*compareFunction*])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility		✓	✓	✓		✓	✓	✓	✓

Example

You can look to Listing 37-9 for a few examples of sorting an array of string values. Four buttons summon different sorting routines, three of which invoke comparison functions. This listing sorts the planet array alphabetically (forward and backward) by the last character of the planet name and also by the length of the planet name. Each comparison function demonstrates different ways of comparing data sent during a sort.

Listing 37-9: **Array.sort() Possibilities**

```
<HTML>
<HEAD>
<TITLE>Array.sort()</TITLE>
<SCRIPT LANGUAGE="JavaScript1.1">
solarSys = new Array(9)
```

```
solarSys[0] = "Mercury"
solarSys[1] = "Venus"
solarSys[2] = "Earth"
solarSys[3] = "Mars"
solarSys[4] = "Jupiter"
solarSys[5] = "Saturn"
solarSys[6] = "Uranus"
solarSys[7] = "Neptune"
solarSys[8] = "Pluto"
// comparison functions
function compare1(a,b) {
    // reverse alphabetical order
    if (a > b) {return -1}
    if (b > a) {return 1}
    return 0
}
function compare2(a,b) {
    // last character of planet names
    var aComp = a.charAt(a.length - 1)
    var bComp = b.charAt(b.length - 1)
    if (aComp < bComp) {return -1}
    if (aComp > bComp) {return 1}
    return 0
}
function compare3(a,b) {
    // length of planet names
    return a.length - b.length
}
// sort and display array
function sortIt(form, compFunc) {
    var delimiter = ";"
    if (compFunc == null) {
        solarSys.sort()
    } else {
        solarSys.sort(compFunc)
    }
    // display results in field
    form.output.value = unescape(solarSys.join(delimiter))
}
</SCRIPT>
<BODY onLoad="document.forms[0].output.value = unescape(solarSys.join(';'))">
<H2>Sorting array elements</H2>
This document contains an array of planets in our solar system.<HR>
<FORM>
Click on a button to sort the array:<P>
<INPUT TYPE="button" VALUE="Alphabetical A-Z" onClick="sortIt(this.form)">
<INPUT TYPE="button" VALUE="Alphabetical Z-A"
onClick="sortIt(this.form,compare1)">
<INPUT TYPE="button" VALUE="Last Character"
onClick="sortIt(this.form,compare2)">
```

Continued

Listing 37-9 *(continued)*

```
<INPUT TYPE="button" VALUE="Name Length" onClick="sortIt(this.form,compare3)">
<INPUT TYPE="button" VALUE="Reload Original" onClick="self.location.reload()">
<INPUT TYPE="text" NAME="output" SIZE=62>
</TEXTAREA>
</FORM>
</BODY>
</HTML>
```

array.splice(*startIndex* , *deleteCount*[, *item1*[, *item2*[,...*itemN*]]])

	NN2	NN3	NN4	NN6	IE3/J1	IE3/J2	IE4	IE5	IE5.5
Compatibility			✓	✓					✓

Example

Use The Evaluator (Chapter 13) to experiment with the `splice()` method. Begin by creating an array with a sequence of numbers:

```
a = new Array(1,2,3,4,5)
```

Next, remove the center three items, and replace them with one string item:

```
a.splice(1, 3, "two/three/four")
```

The Results box shows a string version of the three-item array returned by the method. To view the current contents of the array, enter `a` into the top text box.

To put the original numbers back into the array, swap the string item with three numeric items:

```
a.splice(1, 1, 2, 3, 4)
```

The method returns the single string, and the `a` array now has five items in it again.

✦ ✦ ✦

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The files on this CD-ROM can be accessed and used from both Windows 95 (or later) and Macintosh environments. Some Macintosh program files require MacOS 8.6 or later, but program listing text files can be opened with any MacOS version. For Windows, access the software with My Computer or Windows Explorer. Macintosh users can access files by using the Finder.

You can open all of the example file listings directly from the CD-ROM, but access will be faster — and you will be able to experiment with modifying the files more readily — if you copy the listings to your hard drive. Copy the folder named Listings from the CD-ROM to any location on your hard drive.

To open the listing scripts on this CD-ROM, you should have a copy of Microsoft Internet Explorer 5 (or later), Netscape Navigator 6 (or later), or both browsers installed on your computer. You will find installers for recommended minimum versions of the two browsers on this CD-ROM.

To run the listing scripts from your browser, open the file named index.html in the Listings folder. This page provides a table of contents consisting of direct links to the listings, showing which browsers are compatible with each listing.

Access the Adobe Acrobat (PDF) files for the book's contents from the CD-ROM. Be sure to install the index files into your copy of Acrobat to take advantage of full-text search.

For more details on installing and running the CD-ROM contents, see Appendix E.