









Charles Babbage

British scientist and inventor, 1860'sKnown as 'the Father of the Computer'



Babbage's computer *Difference Engine *could compute and print tables, but never got out of the 'working prototype' stage because of technological limits

Babbage's dream machine

- ∺The Analytical Engine
- Steam powered calculating machine using programs on punched cards.
- The analytical engine was never completed in his lifetime.



Analytical Engine, con't

%Contained all the elements of moderncomputers including ⊠'mill' (for calculating) ⊠'store' (for holding instructions)

- \boxtimes 'operator' (for carrying out
- instructions)
- ⊠reading and writing device

Countess Ada Augusta Lovelace

- Mathematician
- Devised way to use punched cards to give instructions to Babbage's machines
- He 'first computer programmer'







Thomas Watson, Sr. (head of IBM in 1924)

- Made his fortune in punched card tabulating equipment and office equipment
- *****Never convinced that computing machines were worth the risk.
- Turned over the company to his son in mid 1950's

Early Electronic Computers

Konrad Zuse
German engineering student, 1930's
Never allowed to complete his computer
ABC Computer
Atanasof and Berry
1937
Mark I, Harvard, 1944
Automatic calculator used paper tapes













The First Generation of Computers

<mark>∺</mark>1951-1958

- **%**Vacuum tubes for internal operations
- Magnetic drums for memory



Heat and maintenance problems







1st Generation (con't)

Punched cards for input and output
 Slow input, processing and output
 Low-level symbolic languages for programming

UNIVAC

₩UNIVAC I (1951)

- #developed by Mauchley and Eckert for Remington Rand
- Replaced IBM tabulating machines at the Census Bureau



Machine language

*Machine language: 0's and 1's, the only language a computer can directly execute.

Assembly language

#Uses abbreviations instead of binary code i.e., LD for load.

%Machine-dependent (not portable)

The Second Generation of Computers

- #1959-1964
 #Transistors for internal operations
- Magnetic cores for memory
- Increased memory capacity



Second Generation (con't)

- #Magnetic tapes and disks for storage
- $\ensuremath{\texttt{R}}\xspace$ Reductions in size and heat generation
- Increase in processing speed and reliability
- #Increased use of high-level languages

High-level languages

 The first high-level programming languages were
 FORTRAN (1954)
 COBOL (1956)
 LISP (1961)
 BASIC (1964)

Admiral Grace Hopper



1952 She introduces the new concept that computers could be programmed using symbols on paper (languages).

Later writes the COBOL language.

The Third Generation of Computers

∺1965-1970

Integrated circuits on silicon chips for internal operations (IC's)

#Increased memory capacity

#Common use of minicomputers



Third generation (con't)

#Emergence of the software industry
#Reduction in size and cost

- #Increase in speed and reliability
- **#**Introduction of families of computers

Key term: LSI

#LSI (Large Scale Integration) - method by which circuits containing

thousands of components are packed on a single chip

Third generation (con't)

Compatibility problems (languages, I/O devices, etc. were informally standardized)

#Minicomputers popular in offices.



The Fourth Generation of Computers

∺1971-today

KVLSI (100,000's of components/chip)
 Development of the microprocessor
 Microcomputers and supercomputers



Ted Hoff, Intel Designer of first microprocessor





Fourth Generation (con't)

- ∺Greater software versatility
- #Increase in speed, power and storage
 capacity
- Parallel processing
- #Artificial intelligence and expert systems
 #Robotics



Key term: Microprocessor

Microprocessor: programmable unit on a single silicon chip, containing all essential CPU components (ALU, controller)



Key term: Microcomputer

Microcomputer: small, low-priced, personal computer.









Programming language giants





BASIC, 1964 David Kennedy, Dartmouth U

Key term: Supercomputer

- Supercomputer: perform millions of operations per second and process
 enormous amounts of data
- ₭Costs in tens of millions of dollars









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