

**General Items:**

- ? Any questions?
- ? Everyone is clear about the lab assignment?

**Reading Materials:**

- ? Read 52-65

**Miscellaneous:**

- ?

**“Well-informed people know it’s IMPOSSIBLE to transmit voice over wires and that were it possible to do so, the thing would be of NO practical value.”**

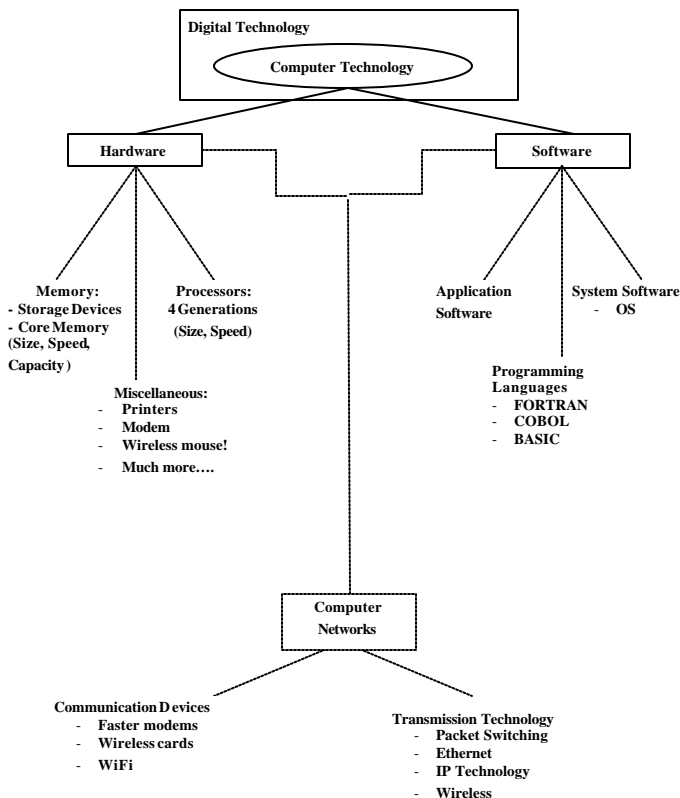
*Boston Post*, 1865, quote from an article concerning the arrest of a man who had been attempting to raise funds for work on a telephone

**“My recommendation to the [patent] office is that everything that CAN be invented HAS been invented!”**

The Commissioner of the United States Office of Patents, 1899, recommendation to abolish his office

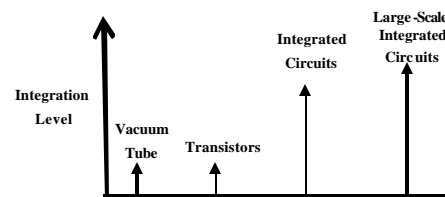
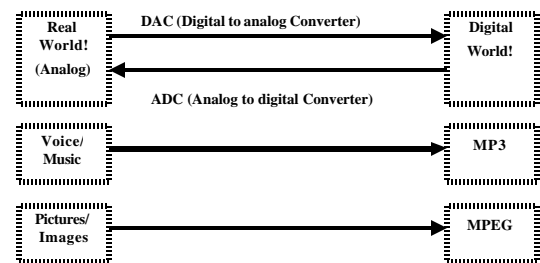
**“I don’t really foresee any commercial possibilities for COMPUTERS and I predict a world market for maybe FIVE computers!”**

Thomas Watson, 1940, Chairman of IBM



**Digital technology**

- ⌘ Data representation
  - ⌘ Analog
  - ⌘ Digital (0,1)
- ⌘ The real world is ANALOG
- ⌘ Digital technology is based on two states (ON/OFF)



## Digital Technology Developments

### First came the "Vacuum Tubes"

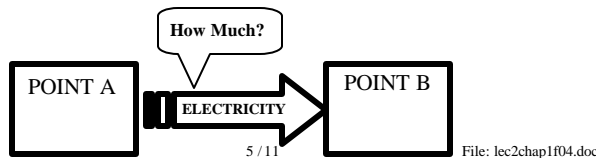


- ⌘ An integrated device (contains many components)
- ⌘ Controlling electron current
- ⌘ Expensive, unreliable, hot, and bulky
- ⌘ They were used in first computers
  - ⌘ 1946: ENIAC (Electronic Numerical Integrator and Computer)
  - ⌘ First large-scale general purpose digital computer
  - ⌘ Used 18,000 tubes, Consumed 160 KW, 30'x50'

### Then came "Transistors"



- ⌘ A semiconductor device (GaAs)
- ⌘ Invented by Bardeen, Brattain, and Shockley (1947,NJ)
- ⌘ Revolutionized the digital technology
  - ⌘ 1951: UNIVAC I (Universal Automatic C omputer)
    - First commercially available computer
    - Correctly predicted the election results!
    - Major step in public awareness
  - ⌘ 1953: IBM650 /700
    - Development of the Core Memory
    - Sold about 1000 units!
  - ⌘ 1957: IBM 305 (RAMAC)
    - Using magnetic disk for external storage



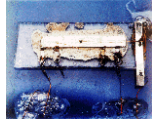
## Personal Computers

- ⌘ Apple was there first (1976)
- ⌘ Then came IBM PCs
- ⌘ By 1982 there were 3 million PCs around
- ⌘ In 1982 IBM introduced AT version 80286 Intel Processor
- ⌘ In 1989 IBM marketed Intel 486 (1.2 million transistors on a single chip)
- ⌘ Intel introduced Pentium chip (1993) with 3.1 million transistors
  - Pentium II, III , IV (42 million transistors)

Speed
Size
Power consumption
# of transistors
Architecture (32-bit)

## Later came "Integrated Circuits"

- Also called CHIPS
- Placing several million transistors on a piece of silicon
- The size of a fingertip
- Invented by Jack Kilby in 1958
- Start of the second generation computers
  - ⌘ High-speed computers

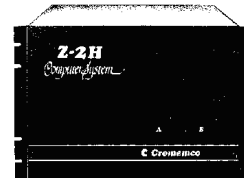


### Advances in integrated circuits (1964)

- More controlling devices we re integrated on a single chip
- Mid-scale integration (1000 circuits on a single chip)
- Start of the third-generation computers
- 18,000 computers were around!
- Computers were being used by business people and scientists

### Large-scale integration (1970)

- 15,000 circuits on a chip
- Computers were getting much smaller
- Smaller processors (1971-1976)
  - ⌘ Intel 4004 (microprocessor)– programmable computer chip
  - ⌘ First Apple Computer was introduced
- Winchester Hard Drives (Developed by IBM)



## Low-cost hard disk computers are here

11 megabytes of hard disk and 64 kilobytes of fast RAM in a Z80A computer for under \$10K. Two floppy drives, too. Naturally, it's from Cromemco.

## Computer Hardware Examples

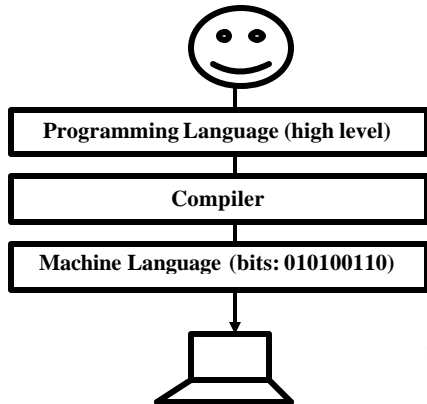
- ⌘ Hard Drive (Winchester – 1970s)
- ⌘ Modem (Hayes – 1982)
- ⌘ LaserJet Printers (HP – 1984)
- ⌘ CDs and DVD – Optical disc storage technology (1997)
- ⌘ Other Gadgets....
  - Palm hand / e-book / Mobile PC (Supporting WiFi, BT)
  - E-books / TabletPC / PDA

## Computers and the Society

- ⌘ 1982 – 3 million people had computers
- ⌘ Today-there are 250,000,000 computers around
- ⌘ Computers are becoming a part of our daily lives
  - E-commerce (\$100 million a year, 5 mil.for advertising alone!)
  - Internet (with annual growth of 700%)

## Computer Software

- ✚ The key to computer development was its Programmability!
- ✚ The basic questions:
  - Where should we keep a program?
  - How should we write a program?
  - How should the program interact with the hardware?
- ✚ Introducing “Stored Program” Concept (1945)
  - The Memory should hold both programs and data (John Neumann)
- ✚ Introducing “Reusable Software” (1952)
  - Programming computers with symbol notations (Grace Hopper)
  - Generating a layer between the machine language and software
- ✚ New programming languages (200 languages by 1958)
  - FORTRAN (efficient, easy-to-use) - 1957
  - COBOL (high-level, used for business people) – 1960
  - BASIC (Very easy, simple instructions) - 1965
  - Structured Programming – Dijkstra – 1968
  - Object Oriented programming language



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- ✚ About silicon:  
<http://www.kn.pacbell.com/wired/fil/pages/listsiliconbi.html>

## Development of operating systems

- Apple OS
- MS-DOS used for IBM PCs
- MAC OS – Using GUI interface – 1984
- Windows 3.1 – 1992
- Another OS called Linux
- Window 95, 98, .....Me, XP

How many lines of codes?

- ✚ What is the point of all these?
  - Technology is a combined effort of thousands of minds!
  - Changes in technology are very political!
  - Let's try to be wise consumers!

## NOT USED!

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- ✚ Application Software
  - First Spreadsheet program for Apple (1979)
  - Lotus 1-2-3 – Editor, Spreadsheet, database programs
  - MS Office becomes very popular
- ✚ Windows being tested by 50,000 people, 10 million lines
- ✚ MP: Moving Picture Expert Group Layer 3 (Layer 3 algorithm to filter out the inaudible noise) – compressed format
- ✚ Semiconductor: Electrical conductor between metals and insulators – Silicon (IV group in the periodic table) - compounds such as GaAs used in transistors.

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