**History of Computers**

A **computer** is an electronic device that executes the instructions in a program.

* Is a machine;
* processes, stores and transforms data into information;
* follows the given instruction.

**People**

**"Computer"** was originally a job title: it was used to describe those human beings

**The Four Basic Periods**

* Pre-Mechanical Era
* Mechanical Era
* Electro-Mechanical Era
* Electronic Era

**Pre-Mechanical Era (3000 B.C. – 1450 A.D.)**

**Writing and Alphabets** (communication)

* Petroglyths – signs or simple figures carved in rock
* Cuneiform- the first true written language and the first real information system

**Cuneiform evolution**

* Phoenicians – created symbols that expressed single syllables and consonants.
* Greeks - they added vowels
* Romans - gave the letters Latin names to create the alphabets we use today.

**Papers and Pens** (Input technologies)

* Sumerians - Stylus that could scratch marks in wet clay
* Egyptians (2600BC) – Papyrus plant
* Chinese (100AD) – papers from rags.

**Books and Libraries (**Output technologies)

**Evolution of Books and Libraries**

* Religious leaders in Mesopotamia kept the earliest **books.**
* The Egyptians kept **scrolls.**
* The Greeks, around 600 BC began to fold sheets of papyrus vertically into leaves and bind them together.

**The First Numbering Systems**

* **The Egyptian System**

The numbers 1 – 9 as vertical lines, the number 10 as U or circle, the number 100 as coiled rope and the number 1,000 as a lotus blossom.

* **The Hindu System in India**

Between 100 and 200 AD, they created a nine-digit numbering system which was similar to those in use today.

* Around 875 AD, Arab developed the concept of zero.

**Abacus**- (The First Calculator) sliding beads on small wooden rods, strung on a wooden frame

It was the man’s first recorded adding machine.It was invented in Babylonia during 500 BC and then developed and popularized in China.

**Mechanical Era (1450 – 1850)**

* **The First Information Explosion byJohan Gutenberg** (1387-1468)

 He invented the movable metal-type printing process in 1450 in Mainz, Germany.

**Leonardo Da Vinc**i’s drawing showing gears arranged for computing (1425-1519)

* **The First General-Purpose Computer (1614) by John Napier** , Baron of Merchiston, Scotland introduced logarithms, which were a technology that allows multiplication to be performed via addition.
* Napier’s Bone (1617)

Napier, employing an ancient numerical scheme known as the Arabic lattice, lays out a special version of the multiplication tables on a set of four-sided wooden rods, allowing users to multiply and divide large numbers and find square and cube roots.

* Calculating Clock

The first gear-driven calculating machine to actually be built was probably the ***calculating clock***, so named by its inventor, the German professor **Wilhelm Schickard** in 1623. This device got little publicity because Schickard died soon afterward in the bubonic plague.

Schickard’s Calculating Clock

* Slide Rule – (1625)

Napier's invention led directly to the ***slide rule***, first built in England in **1632** and still in use in the 1960's by **William Oughtred** and the NASA engineers of the Mercury, Gemini, and Apollo programs which landed men on the moon.

* Pascaline (1642 )

**Blaise Pascal**, at age 19, invented the ***Pascaline*** the gear-driven one-function calculator (it could only add).

Pascal was a child prodigy. At the age of 12, he was discovered doing his version of Euclid's thirty-second proposition on the kitchen floor. Pascal went on to invent probability theory, the hydraulic press, and the syringe.

* Stepped Reckoner

**Gottfried Wilhelm Leibniz**, a German mathematician(co-inventor with Newton of calculus) managed to build a four-function calculator that he called the ***stepped reckoner***

* Automatic Loom

In 1801 the Frenchman **Joseph Marie Jacquard** invented a power loom that could base its weave (and hence the design on the fabric) upon a pattern automatically read from punched wooden cards, held together in a long row by rope.

* Arithmometer (1820)

A pinwheel type mechanical adding machine invented by Charles Xavier Thomas de Colmar.

It performed the same type of computations as the Stepped reckoner but it was more reliable.

**Charles Babbage** - the father of modern computers ( English Mathematician)

* Difference Engine (1822)

A Steam driven calculating machine about the size of a room. This machine was able to compute tables of numbers, such as logarithm tables.

* Analytic Engine

**Lady Ada Augusta Lovelace Byron** - She was known as the first computer programmer.

**The beginning of Telecommunication**

**Electro-Mechanical Era (1840 - 1940)**

* The **Voltaic Cell** by **Alessandro Volta**- The first electric battery.

These are stack of alternating discs of zinc and copper or silver separated by felt soaked in brine.

It was the first simple source of electrical energy that didn’t rely on mechanical means.

* The **Morse Code & The Telegraph**

Samuel F.B. Morse conceived of his version of an electromagnetic telegraph in 1832 and constructed an experimental version in 1835. He finally built a line in 1844 from Baltimore to Washington.

* **The Telephone** (1876), Alexander Graham Bell developed the first working telephone and was introduced on a large scale at Philadelphia Centennial Exposition in1877.
* **Radio**(1894) Guglielmo Marconi

discovered that electrical waves travel through space and can produced an effect far from the point at which they originated.

* 1852**,** George Boole developed binary algebra. This became known as Boolean Algebra and became important in the 20th century when binary computers were developed
* The Tabulating Machine (1853) By Pehr and Edvar Scheutz

It was capable of processing fifteen- digit numbers, printing out results and rounding off to eight digits.

* Comptometer (1855) **by Dorr Felt**. It was a key driven adding and subtracting calculator.

Comptograph with Printer

Hollerith Desk (1890)

**An operator working at a Hollerith Desk**

***Hollerith desk***, consisted of a card reader which sensed the holes in the cards, a gear driven mechanism which could count to display the results of the count.

Preparation of punched cards for the US Census

A few Hollerith Desk still exists today.

Hollerith success made him the “**father of information processing”.** He founded the Tabulating Machine Company which later became the Computer Tabulating Recording Company. He retired in 1921 and his company went on and became IBM Corporation today.

Two types of computer punched cards

Incidentally, the Hollerith census machine was the first machine to ever be featured on a magazine cover.

The Millionaire (1893)

The first efficient four-function calculator invented by Otto Shweiger, a Swiss engineer.

The Vacuum Tubes (1906)

It was the first major electrical part of a computer replacing manual switches.

It was developed by Lee de Forest.

1941 - Present

**The Zuse Z1 in its residential setting**

Konrad Zuse

Z1 and Z3

***Z3***, built in 1941, was probably the first operational, general-purpose, programmable (that is, software controlled) digital computer.

The Z3 was destroyed by an Allied bombing raid. The Z1 and Z2 met the same fate and the Z4 survived only because Zuse hauled it in a wagon up into the mountains.

Harvard Mark I (1942) - The First Stored-program Computer

This was the first programmable digital computer made in the U.S. But it was not a purely electronic computer. Instead the Mark I was constructed out of switches, relays, rotating shafts, and clutches

Harvard Mark I Electro-Mechanical Computer

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What could the Mark I do?

The Mark I operated on numbers that were 23 digits wide. It could add or subtract two of these numbers in three-tenths of a second, multiply them in four seconds, and divide them in ten seconds. Forty-five years later computers could perform an addition in a billionth of a second!

**One of the four paper tape readers on the Harvard Mark I (you can observe the punched paper roll emerging from the bottom)**

The first computer bug

One of the primary programmers for the Mark I was a woman, ***Grace Hopper***.

The Flow-Matic

In 1953 Grace Hopper invented the first high-level language, "Flow-matic". This language eventually became COBOL which was the language most affected by the infamous Y2K problem.

A high-level language is designed to be more understandable by humans than is the binary language understood by the computing machinery.

Compiler

A program to translate Computer Language into the binary language of the computer and hence Grace Hopper also constructed the world's first compiler. Grace remained active as a Rear Admiral in the Navy Reserves until she was 79 (another record).

33 foot length Mark I

The Atanasoff-Berry Computer

One of the earliest attempts to build an all-electronic digital computer occurred in 1937 by ***J. V. Atanasoff***, a professor of physics and mathematics at Iowa State University. By 1941 he and his graduate student, Clifford Berry, had succeeded in building a machine that could solve 29 simultaneous equations with 29 unknowns.

The ABC Inventors

What could ABC do?

This machine was the first to store data as a charge on a capacitor, which is how today's computers store information in their main memory (***DRAM*** or ***dynamic RAM***).

As far as its inventors were aware, it was also the first to employ binary arithmetic.

The Atanasoff-Berry Computer

The Colossus

Another candidate for granddaddy of the modern computer was ***Colossus***, built during World War II by Britain for the purpose of breaking the cryptographic codes used by Germany.

**Two views of the code-breaking Colossus of Great Britain**

The Four Generations of Digital Computing

First Generation ( 1951 – 1958 )

It was characterized by the use of vacuum tubes.

Punch cards to input and externally store data.

Rotating magnetic drums for internal storage of data and programs.

Programs were written in machine and assembly language.

Requires a compiler.

The Vacuum Tubes

Characteristics of first generation computers

It was composed of vacuumtubes, resistors and welded metal joints.

They were large, slow, expensive and poduced a lot of heat

They often broke down because of burned-out vacuum tubes.

It also needed many experts to operate them.

ENIAC
Electrical Numerical Integrator and Calculator

ENIAC was built at the University of Pennsylvania between 1943 and 1945 by two professors, ***John Mauchly*** and the 24 year old ***J. Presper Eckert***, who got funding from the war department after promising they could build a machine that would replace all the "computers", meaning the women who were employed calculating the firing tables for the army's artillery guns.

Characteristics of ENIAC

It had more than 18,000 vacuum tubes

It took up 1,800 sq.ft of space

The electrical current required could power more than a thousand computers.

ENIAC

Reprogramming ENIAC involved a hike [U.S. Army photo

Replacing a bad tube.

Other early computers that uses vacuum tubes

The EDVAC – by John Von Neumann

ILLIAC

JOHNNIAC

MANIAC

UNIVAC – first commercial computer

ILLIAC II built at the University of Illinois

Magnetic Core Memory(1953)

It consists of tiny ferrite donuts that were arranged on a lattice of wires. The polarity could be changed or detected by passing through the wires. It can store one bit.

IBM 701-The first electronic business computer

The Apple I in 1976 sold at $600

**The Apple 1 which was sold as a do-it-yourself kit (without the lovely case seen here)**

**Typical wiring in an early mainframe computer**

Computers had been incredibly expensive because they required so much hand assembly, such as the wiring seen in this ***CDC 7600***:

Second Generation
1956 - 1963

Characterized by the use of Transistor

Computers became smaller.

Magnetic tape disks replaced punch cards as external storage devices.

Magnetic cores strung on wire within the computer became the primary internal storage technology

Transistor- a small, solid state component designed to monitor the flow of electric current.

Characteristics of Transistor

Smaller, faster, cheaper, required less power and produced less heat than vacuum tubes.

It can amplify a signal or open a close circuit.

It function as an electrical switch or bridge.

It allowed second generation computers to communicate over telephone lines

It could run multiple programs and could address input and output at the same time.

Third Generation

By the late 1960’s, the trend was to make less expensive computers. To do this, the transistors had been replaced with something natural. 1958, Jack Kilby from Texas Instruments invented The **Integrated Circuit**

The Third Generation (1963-1974)

Individual transistors were replaced by Integrated circuits.

Magnetic tapes and disks completely replaced punch cards as external storage devices.

Magnetic core was replaced by MOS(Metal Oxide Semi-conductor memory which used silicon -backed chips.

COBOL (1961) Common Business Oriented Language

DEC(1964) Digital Equipment Corporation by Ken Olsen released the first minicomputer.

BASIC-Computer language to help teach people how to program

The IC

It combines all electronic components into a small silicon disk made of **quartz.**

It was faster, offered impoved memory and reduced the price of computers.

**The semi conductor** – more components were fitted into a small disk, thus mini computers were born.

**An integrated circuit ("silicon chip")**

The ***microelectronics revolution*** is what allowed the amount of hand-crafted wiring seen in the prior photo to be mass-produced as an ***integrated circuit*** which is a small sliver of silicon the size of your thumbnail .

Fourth Generation
1971 - present

The birth of Microprocessor.

LSI- Large Scale Integration – it could fit hundreds of electronic components into a single chip.

1980’s – VLSI could fit hundreds of thousands of components

ULSI- compacted millions of components into a chip

1981 – IBM introduced PC

The Microprocessor

It serves as the brains inside personal computers and delivers intelligence to countless other devices as well.

**The IBM 7094, a typical mainframe computer [photo courtesy of IBM]**

Mainframes

There were 2 ways to interact with a mainframe. The first was called ***time sharing*** because the computer gave each user a tiny sliver of time in a round-robin fashion. Perhaps 100 users would be simultaneously logged on, each typing on a ***teletype*** such as the following:

**The Teletype was the standard mechanism used to interact with a time-sharing computer**

**An IBM Key Punch machine which operates like a typewriter except it produces punched cards rather than a printed sheet of paper**

Altair 8800

The first Personal Computer.

It made computer available to everyone

It was design for computer experts

A very little memory.

Required assembly by the owner.

It had to be coded by flipping switches by hand

It had 256 bytes of memory. Ans ran a version of BASIC written by Bill Gates.

**The Altair 8800, the first PC**

Apple Computers

Steve Jobs and Steve Wozniak founded the Apple Computers. They aim to build a simple yet powerful computer that the average person could unpack, plug in and begin using immediately.

Apple II- the first PC to come in plastic case.

Other development

VisiCalc(1978) – the first spreadsheet program

Wordstar (1979) – the first word processor later became WordPerfect.

IBM PC (1981)

**The original IBM Personal Computer (PC)**

Apple Macintosh (1984)

It features a simple graphical interface, uses the 8-MHz, 32-bit Motorola, 68,000 CPU and has built-in 9-inch B/W screen

Amiga – the first multimedia computer with advanced graphics.

**A typical Busicom desk calculator**

THE IBM

A Harvard freshman by the name of ***Bill Gates*** decided to drop out of college so he could concentrate all his time writing programs for this computer. This early experienced put Bill Gates in the right place at the right time once IBM decided to standardize on the Intel microprocessors for their line of PCs in 1981. The Intel Pentium 4 used in today's PCs is still compatible with the Intel 8088 used in IBM's first PC.

Pentium Processor (1993)

Windows 95

Current trends in ICT

Blu-ray Disc- a high storage capacity optical disc format used for storing high definition video. Audio, photos and other digital content.

Current trends in ICT

Virtual Reality- allows the users to interact with computers using all of his/her senses.

Current trends in ICT

Wearablecomputers-a computer that can be worn by the users.

Current trends in ICT

Wi-Fi – technology implemented for wireless networks

Current trends in ICT

Speech Recognition- eliminates the tedious typing of data.

Current trends in ICT

3G- allows cellular networks to provide higher network capacity thus enabling them to provide advanced services to mobile users.

Computers now are becoming very powerful and widespread. The trend nowadays is to link PC to other computers in a network.

New Technology is good only if you don’t abuse it.