

Webster's Dictionary defines "computer" as any programmable electronic device that can store, retrieve, and process data. The basic idea of computing develops in the 1200's when a Moslem cleric proposes solving problems with a series of written procedures.

As early as the 1640's mechanical calculators are manufactured for sale. Records exist of earlier machines, but Blaise Pascal invents the first commercial calculator, a hand powered adding machine. Although attempts to multiply mechanically were made by Gottfried Leibnitz in the 1670s the first true multiplying calculator appears in Germany shortly before the American Revolution. ¹

In 1801 a Frenchman, Joseph-Marie Jacquard builds a loom that weaves by

reading punched holes stored on small sheets of hardwood. These plates are then inserted into the loom which reads (retrieves) the pattern and creates (process) the weave. Powered by water, this "machine" came 140 years before the development of the modern computer.

Shortly after the first mass-produced calculator(1820), Charles Babbage begins his lifelong quest for a programmable machine. Although Babbage was a poor communicator and record-keeper, his difference engine is sufficiently developed by 1842 that Ada Lovelace uses it to mechanically translate a short written work. She is generally regarded as the first programmer. Twelve years later George

Boole, while professor of Mathematics at Cork University, writes *An Investigation of the Laws of Thought* (1854), and is generally recognized as the father of computer science. ²

The 1890 census is tabulated on punch cards similar to the ones used 90 years earlier to create weaves. Developed by Herman Hollerith of MIT, the system uses electric power (non-mechanical). The Hollerith Tabulating Company is a forerunner of today's IBM.

Just prior to the introduction of Hollerith's machine the first printing calculator is introduced. In 1892 William Burroughs, a sickly ex-teller, introduces a commercially successful printing calculator. Although hand-powered, Burroughs quickly introduces an electronic model. ³

In 1925, unaware of the work of Charles Babbage, Vannevar Bush of MIT builds a machine he calls the differential analyzer. Using a set of gears and shafts, much like Babbage, the machine can handle simple calculus problems, but accuracy is a problem.

The period from 1935 through 1952 gets murky with claims and counterclaims of who invents what and when. Part of the problem lies in the international situation that makes much of the research secret. Other problems include poor record-keeping, deception and lack of definition. 4

In 1935, Konrad Zuse, a German construction engineer, builds a mechanical calculator to handle the math involved in his profession. Shortly after completion, Zuse starts on a

programmable electronic device which he completes in 1938.

John Vincent Atanasoff begins work on a digital computer in 1936 in the basement of the Physics building on the campus of Iowa State. A graduate student, Clifford (John) Berry assists. The "ABC" is designed to solve linear equations common in physics. It displays some early features of later computers including electronic calculations. He shows it to others in 1939 and leaves the patent application with attorneys for the school when he leaves for a job in Washington during World War II. Unimpressed, the school never files and ABC is cannibalized by students.

The Enigma, a complex mechanical encoder is used by the Germans and they believe it to be unbreakable. Several people involved, most notably Alan Turing, conceive machines to handle the problem, but none are technically feasible. Turing proposes a "Universal Machine" capable of "computing" any algorithm in 1937. That same year George Steblitz creates his Model K(itchen), a conglomeration of otherwise useless and leftover material, to solve complex calculations. He improves the design while working at Bell Labs and on September 11, 1940, Steblitz uses a teletype machine at Dartmouth College in New Hampshire to transmit a problem to his Complex Number Calculator in New York and

receives the results. It is the first example of a network. 6

First in Poland, and later in Great Britain and the United States, the Enigma code is broken. Information gained by this shortens the war. To break the code, the British, led by Turing, build the Colossus Mark I. The existence of this machine is a closely guarded secret of the British Government until 1970. The United States Navy, aided to some extent by the British, builds a machine capable of breaking not only the German code but the Japanese code as well. 7

In 1943 development begins on the Electronic Numerical Integrator And Computer (ENIAC) in earnest at Penn State. Designed by **John Mauchly** and **J. Presper Eckert** of the Moore School,

they get help from **John von Neumann** and others. In 1944, the Harvard Mark I is introduced. Based on a series of proposals from **Howard Aiken** in the late 1930's, the Mark I computes complex tables for the U.S. Navy. It uses a paper tape to store instructions and Aiken hires **Grace Hopper**("Amazing Grace") as one of three programmers working on the machine. **Thomas J. Watson Sr.** plays a pivotal role involving his company, IBM, in the machine's development. 8

Early in 1945, with the Mark I stopped for repairs, Hopper notices a moth in one of the relays, possibly causing the problem. From this day on, Hopper refers to fixing the system as "debugging". The same year Von Neumann proposes the concept of a

"stored program" in a paper that is never officially published.

Work completes on ENIAC in 1946.

Although only three years old the machine is woefully behind on technology, but the inventors opt to continue while working on a more modern machine, the EDVAC.

Programming ENIAC requires it to be rewired. A later version eliminates this problem. To make the machine appear more impressive to reporters during its unveiling, a team member (possibly Eckert) puts translucent spheres (halved ping pong balls) over the lights. The US patent office will later recognize this as the first computer. 9

The next year scientists employed by Bell Labs complete work on the transistor (**John Bardeen, Walter**

Brattain and **William Shockley** receive the Nobel Prize in Physics in 1956), and by 1948 teams around the world work on a "stored program" machine. The first, nicknamed "Baby", is a prototype of a much larger machine under construction in Britain and is shown in June 1948.

The impetus over the next 5 years for advances in computers is mostly the government and military. UNIVAC, delivered in 1951 to the Census Bureau, results in a tremendous financial loss to its manufacturer, Remington-Rand. The next year Grace Hopper, now an employee of that company proposes "reuseable software," code segments that could be extracted and assembled according to instructions in a "higher level language." The concept of

compiling is born. Hopper would revise this concept over the next twenty years and her ideas would become an integral part of all modern computers. CBS uses one of the 46 UNIVAC computers produced to predict the outcome of the 1952 Presidential Election. They do not air the prediction for 3 hours because they do not trust the machine. 10

IBM introduces the 701 the following year. It is the first commercially successful computer. In 1956 FORTRAN is introduced (proposed 1954, it takes nearly 3 years to develop the compiler). Two additional languages, LISP and COBOL, are added in 1957 and 1958. Other early languages include ALGOL and BASIC. Although never widely used, ALGOL is the basis for many of today's languages.

With the introduction of Control Data's CDC1604 in 1958, the first transistor powered computer, a new age dawns. Brilliant scientist **Seymour Cray** heads the development team. This year integrated circuits are introduced by two men, **Jack Kilby** and **John Noyce**, working independently. The second network is developed at MIT. Over the next three years computers begin affecting the day-to-day lives of most Americans. The addition of MICR characters at the bottom of checks is common. 11

In 1961 Fairchild Semiconductor introduces the integrated circuit. Within ten years all computers use these instead of the transistor. Formally building sized computers are now room-sized, and are considerably more

powerful. The following year the Atlas becomes operational, displaying many of the features that make today's systems so powerful including virtual memory, pipeline instruction execution and paging. Designed at the University of Manchester, some of the people who developed Colossus thirty years earlier make contributions. 12

On April 7, 1964, IBM introduces the System/360. While a technical marvel, the main feature of this machine is business oriented...IBM guarantees the "upward compatibility" of the system, reducing the risk that a business would invest in outdated technology.

Dartmouth College, where the first network was demonstrated 25 years earlier, moves to the forefront of the "computer age" with the introduction of

TSS(Time Share System) a crude(by today's standards) networking system. It is the first Wide Area Network. In three years Randy Golden, President and Founder of Golden Ink, would begin working on this network. 13

Within a year MIT returns to the top of the intellectual computer community with the introduction of a greatly refined network that features shared resources and uses the first minicomputer(DEC's PDP-8) to manage telephone lines. Bell Labs and GE play major roles in its design.

In 1969 Bell Labs, unhappy with the direction of the MIT project, leaves and develops its own operating system, UNIX. One of the many precursors to today's Internet, ARPANet, is quietly launched. **Alan Keys**, who will later

become a designer for Apple, proposes the "personal computer." Also in 1969, unhappy with Fairchild Semiconductor, a group of technicians begin discussing forming their own company. This company, formed the next year, would be known as Intel. The movie *Colossus: The Forbin Project* has a supercomputer as the villain. Next year, *The Computer Wore Tennis Shoes* was the first feature length movie with the word computer in the title. In 1971, Texas Instruments introduces the first "pocket calculator." It weighs 2.5 pounds.

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With the country embroiled in a crisis of confidence known as Watergate, in 1973 a little publicized judicial decision takes the patent for the computer away from Mauchly and Eckert and awards it

to Atanasoff. Xerox introduces the mouse. Proposals are made for the first local area networks.

In 1975 the first personal computer is marketed in kit form. The Altair features 256 bytes of memory. **Bill Gates**, with others, writes a BASIC compiler for the machine. The next year Apple begins to market PC's, also in kit form. It includes a monitor and keyboard. The earliest RISC platforms become stable. In 1976, Queen Elizabeth goes on-line with the first royal email message. 15

During the next few years the personal computer explodes on the American scene. Microsoft, Apple and many smaller PC related companies form (and some die). By 1977 stores begin to sell PC's. Continuing today, companies strive to reduce the size and price of

PC's while increasing capacity. Entering the fray, IBM introduces its PC in 1981 (it's actually IBM's second attempt, but the first failed miserably). Time selects the computer as its Man of the Year in 1982. *Tron*, a computer-generated special effects extravaganza is released the same year.