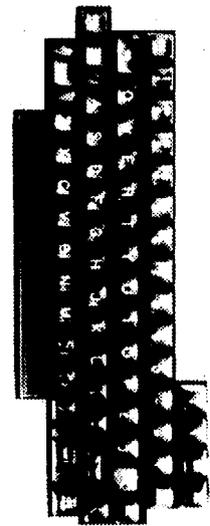


AN INCOMPLETE HISTORY OF MICROCOMPUTING



by Rory Donaldson

<p>_____ 3000 B.C. _____ The abacus is developed in Babylonia.</p>	<p>_____ 1820 _____ The Arithmometer, the first commercial calculator.</p>	<p>_____ 1890 _____ The first automated U.S. census is tabulated on the Hollerith Tabulating Machine. Because of the extra reports that this automaton is able to generate, the census costs nearly twice as much as projected, creating a controversy about the benefits of automation that continues to this day.</p>
<p>_____ 1400 _____ Moslem astronomers understand the mathematical use of zero.</p>	<p>_____ 1831 _____ Michael Faraday builds the first electric generator.</p>	<p>_____ 1893 _____ The Millionaire, the first efficient four-function calculator, hits the market.</p>
<p>_____ 1500s _____ Geneva becomes the world's center for the mother of all machines, the clock.</p>	<p>_____ 1837 _____ Samuel Morse and Alfred Vall develop a simple way to send a signal to a distant receiver. Their invention is called the telegraph.</p>	<p>_____ 1900-1910 _____ Mechanical calculators become commonplace.</p>
<p>_____ 1600 _____ Galileo brings together the experimental and mathematical into a single stream of inquiry that leads to the scientific method.</p>	<p>_____ 1854 _____ English mathematician George Boole creates Boolean Algebra and lays the groundwork for information theory.</p>	<p>_____ 1903 _____ Nikola Tesla patents electrical logic circuits called gates or switches.</p>
<p>_____ 1623 _____ The Schickard mechanical calculator.</p>	<p>_____ 1855 _____ G. E. Scheutz builds the first practical mechanical computer.</p>	<p>_____ 1924 _____ IBM founded.</p>
<p>_____ 1630 _____ The slide rule.</p>	<p>_____ 1862 _____ Charles Babbage's difference and analytical engines promise steam-driven machines that will mechanize thought. He draws thousands of detailed drawings that project the fundamentals on which today's computers operate.</p>	<p>_____ 1928 _____ The cathode ray tube (CRT).</p>
<p>_____ 1652 _____ The Pascal calculator relieves the tedium of adding long columns of numbers.</p>	<p>Augusta Ada, Countess of Lovelace, the first computer software genius, programs Babbage's engine and understands the power of simulating a generalized machine that will do your bidding. The engine is so mechanically complex that it is unable to overcome its own friction and never actually works, but the concept is in place.</p>	<p>_____ 1936 _____ Alan Turing describes the very idea of a universal machine, the <i>Turing Machine</i>, in a paper titled, "On Computable Numbers with an Application to the Entscheidungsproblem."</p>
<p>_____ 1673 _____ The Leibnitz calculator, the first digital machine, can multiply, add, divide, subtract.</p>	<p>_____ 1875 _____ Frank Baldwin opens the first American calculator shop.</p>	<p>_____ 1937 _____ Atanasoff formulates the principles of the first electronic digital calculator, including the use of base-2, binary, on-off, or "digital" signals. He builds the world's first working model of the electronic digital computer. In 1973 a U.S. district court recognizes Atanasoff as the official inventor of the computer.</p>
<p>_____ Early 1800s _____ Hans Christian Oersted discovers that electricity in motion creates a magnetic field that can be converted to mechanical energy. Up to this point, electricity has had no practical use other than generating heat.</p>	<p>_____ 1886 _____ William Burroughs develops the first successful mechanical adding machine.</p>	
<p>_____ 1801 _____ Joseph Marie Jacquard invents the punch-card-operated loom, creating a model for future punch-card-operated computers.</p>		

1938

Konrad Zuse finishes his Z1, the first binary calculating machine.

1941

The Zuse 3 is the first electro-mechanical general-purpose program controlled calculator.

1943

The IBM Mark I, the first electronic digital computer to use mechanical relays.

The U.S. Army appropriates \$61,700 to build ENIAC, the first productive electronic-digital computer (no relays).

1945

While working on the Mark I, Grace Hopper discovers the first computer bug, crushed in a relay. She goes on to begin the world's first programming career.

Yannevar Bush describes the first personal computer in an article, "As We May Think," in *Atlantic Monthly* magazine. What Bush has in mind is a miniature machine called the memex — memory extender — consisting of a desk, screens, keyboards, levers, that would act as a calculator, word processor, picture editor, and filer.

1946

Mauchly and Eckert finish ENIAC and turn it on on February 13. Budgeted at \$61,700 three years earlier, ENIAC ends up costing \$486,804. The machine was designed to compute the trajectory of artillery shells during World War II, but the war ends before the system can be put to use. It is then used running feasibility studies for the development of the hydrogen bomb.

ENIAC weighs 30 tons and contains 70,000 resistors, 18,000 vacuum tubes, 3,000 neon bulbs, and 500,000 soldered joints.

John von Neumann builds the logical framework for a generalized program-mable machine: a central processor, a memory, an arithmetic unit, input/output devices, operating in a step-by-step manner.

The EDVAC computer is able to switch between different programs.

1947

Bell Labs invents the transistor, allowing huge amounts of information to be handled by very small, inexpensive, cool devices that replace thousands of vacuum tubes.

1950

Alan Turing proposes the classic test of machine intelligence in a paper titled *Computer Machinery and Intelligence*: "A machine may be deemed intelligent when it can pass for a human being in a blind test."

1951

Univac, the first commercially available computer, is constructed by Remington Rand for the U.S. Bureau of Census.

Grace Hopper conceives of a program known as a compiler.

1956

With the help of Marvin Minsky, John McCarthy, an assistant professor at Dartmouth College, coins the phrase *Artificial Intelligence (AI)*.

1958

IBM estimates that five large computers are all that will be needed to satisfy all of the world's data processing requirements. IBM passes up the chance to purchase a small company that has just developed a process known as Xerography, discounting the technology as "unimportant."

1959

The IBM RAMAC, the first disk-based computer of consequence, uses disk platters four feet in diameter.

Grace Hopper develops the compiler.

1960

J. C. R. Licklider formulates the goal of interactive computing in his paper "Man-Computer Symbiosis." Interactive computing implies a continuous dialog between user and system, as opposed to batch processing where data is accumulated over a period of time and then submitted without any intervening response from the receiving unit.

Project Multiple Access Computing (MAC) explores interactive time-sharing computing at MIT.

1961

Robert Noyce of Intel and Jack Kirby of Texas Instruments solve the most important engineering problem of their time: how to integrate all the components of an electronic circuit onto a single flake of silicon. An integrated circuit (IC) replaces thousands of transistors with a single silicon chip. ICs go on the market for \$120 each.

The IBM 360, the first programmable computer.

1962

Spacewar, the first interactive computer game, is written by Steve Russell while a student at MIT.

Sketchpad, the first interactive graphics program, is designed by Ivan Sutherland.

1963

The first portable electronic calculator is introduced by the Bell Punch Co.

1964

The first criminally prosecuted computer crime. Texas Hancock is sentenced to five years for pirating \$5 million worth of his employer's software.

The first personal computer (PC), the Linc. It costs \$40,000, has a personal filing system, keyboard, interactive display, and is "transportable."

Douglas Engelbart of the Stanford Research Institute develops the first Mouse. It is pretty much ignored until 1983, when Apple's Lisa is introduced.

Dartmouth BASIC (Beginner's All-purpose Symbolic Instruction Code) is developed by Kemeny and Kirk in order to give students access to big computers with only a semester or two of study.

1967

Alan Kay and Ed Cheadle develop the FLEX computer with multiple windows and graphics. It proves too difficult to use and leads Kay to describe the Dynabook: a computer for under \$1,000 that would satisfy the most demanding of computer users: children. Kay realizes that the technology just isn't there to successfully develop his machine.

1968

The Hal computer mutinies in 2001: *A Space Odyssey*.

1969

Ted Hoff of Intel introduces a new era in integrated electronics: the 4004 microprocessor. This is the universal engine, a general-purpose, programmable combination of all the elements of a computer on a single chip of silicon. The 4004 is able to address 4K of RAM and perform 60,000 instructions a second.

Kenneth Thompson of Bell Labs writes the first version of UNIX for the DEC PDP-7 minicomputer, unleashing the essence of communal computing: remote access and time sharing.

1970

Stanford develops the Mycin inference engine, the first expert system, dedicated to diagnosing blood infections.

continued

1971

Journalist Don Hoefler refers to a 100-square-mile valley southeast of San Francisco as "Silicon Valley" because of all the high-tech industry. So long: plums, prunes, pears.

Electronic News publishes the first ad for a microchip, the 4004. For the first time the public is let in.

The Kenbak-I PC, the first commercially available PC, can be programmed to make its lights blink in patterns (and not much more). It is aimed at the education market. At \$750, 40 are sold.

Esquire magazine publishes the first national article on the computer underground. The article details the escapades of Captain Crunch (John Draper) and "phone phreaking," a method of gaining access to long-distance phone lines for free. He accomplishes this wizardry with frequencies generated by blowing into a free whistle packed with Captain Crunch breakfast cereal. Steve Wozniak (the Woz) builds the first "blue box" to electronically emulate the whistle. Steve Jobs helps him market the boxes.

1972

Alan Kay develops the Smalltalk operating environment for Xerox's personal computer, the \$30,000 Alto. The Alto has a keyboard, mouse, windows, and a high-resolution display.

Nolan Bushnell starts Atari and ships the first arcade computer game ever, *Pong*.

1973

In *Radio Electronics* magazine, Don Lancaster publishes plans for a generalized TV typewriter that will actually display letters and numbers on a television screen.

The Micro 8 Build-It-Yourself Kit, using an 8008 chip, is the subject of an article in *Popular Electronics*.

1974

Ted Nelson publishes the handbook of the Hacker's Ethic, *Dream Machines and Computer Lib*: "all information should be free, authority should be mistrusted, decentralization should be promoted, and money is a necessary annoyance."

Intel announces another landmark, the 8080, 10 times faster than the 8008, able to address 64K RAM. The 8080 is the first microprocessor powerful enough to drive a real computer, and leads directly to the development of the commercial personal computer.

1975

The January *Popular Electronics* has as its cover story the eight-bit Altair micro kit using the Intel 8080 — thousands of micro hobbyists receive the subliminal signal that the era of personal computing has finally arrived. At last there is a machine powerful enough to write software for.

The Homebrew Computer Club (the first micro user's group) is founded in Gordon French's garage in Menlo Park, California. Among the luminaries in membership are the two Steves, Wozniak and Jobs, who go on to found Apple Computers.

40 different microprocessors are introduced. Few survive.

The first full-screen word processor, *Electric Pencil*, runs on the Altair and Sol personal computers. At last, non-technical people can use a micro to do something practical.

The first computer store opens in Los Angeles.

1976

Steve Wozniak debuts his masterpiece, the first version of the Apple II (built around the Motorola 6502 microprocessor) to the Homebrew Computer Club. Designed by the Woz and Alan Baum, the goal of the Apple II was to deliver a complete computer in one box: keyboard, power supply, BASIC and color graphics. The computer could be easily hooked to a color television.

1977

Commodore unveils the PET computer for \$595, assembled.

The first 4K RAM chips begin to show up.

Radio Shack releases the first TRS-80 home computer for \$399.

1978

The first company-sponsored telecommuting program is established by Blue Cross/Blue Shield of South Carolina to provide employees with personal computers that allow them to key in medical claim forms from home.

The first computerized bulletin board is set up by Ward Christensen and Randy Weis. Their phone number is (312) 545-8086, and can still be reached today.

1980

The first 16K RAM chips arrive.

1981

Kenji Urada, 37, is run over by a robot he's working on and becomes the first robot fatality.

Adam Osborne releases the Osborne I computer: a 24-pound, luggable complete system bundled with 64K RAM, monitor and keyboard, two disk drives, a serial and parallel port, WordStar, MailMerge, SuperCalc, CP/M and BASIC — all for the unprecedented price of \$1,795.

Xerox releases the 8010 Star system and 820 micro. The Star, PARC's first commercial computer, is overpriced. The 820 is the same old eight-bit CP/M, very poorly executed.

IBM strikes the market with the first 16-bit microbullet machine, the IBM PC, built around Intel's 8088. IBM copies the open architecture of the Apple II, making the system totally open to third-party developers.

Sinclair releases the ZX80 \$100 micro through mail order and the local drugstore. Although puny, it still sells like crazy.

The first 64K RAM chips appear.

Epson shows off the first laptop computer, the HX-20.

1982

The first 256K RAM chips come on the market.

1983

Time magazine chooses the micro as "Man of the Year."

1984

IBM announces the ability to manufacture 1-megabyte RAM chips.

Magazines targeted at computerphiles number 450, the largest number ever devoted to a single subject.

Apple releases the Macintosh to rave reviews. Alan Kay says it is the first PC worthy of criticism.

The Computer Museum opens in Boston.

1986

It's possible to buy a 256K PC clone with two disk drives, amber monitor and letter-quality printer for \$999.

Theories of parallel processing, where information is processed continuously and collectively (instead of in bit-by-bit fashion as in today's von Neumann-type machines) begin to describe the way nerve cells interact to solve problems. The human brain continues to have more memory available than all the RAM manufactured in the world in a year. ■

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