

Some Computing History

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Some Computing History

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- 2 Some Early Machines

A Short Computer History Chronology

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- 2 Some Early Machines

A Short Computer History Chronology

- 3000 BC Dust abacus is invented, probably in Babylonia [3].
- 500 BC Bead and wire abacus originates in Egypt.

A Short Computer History Chronology

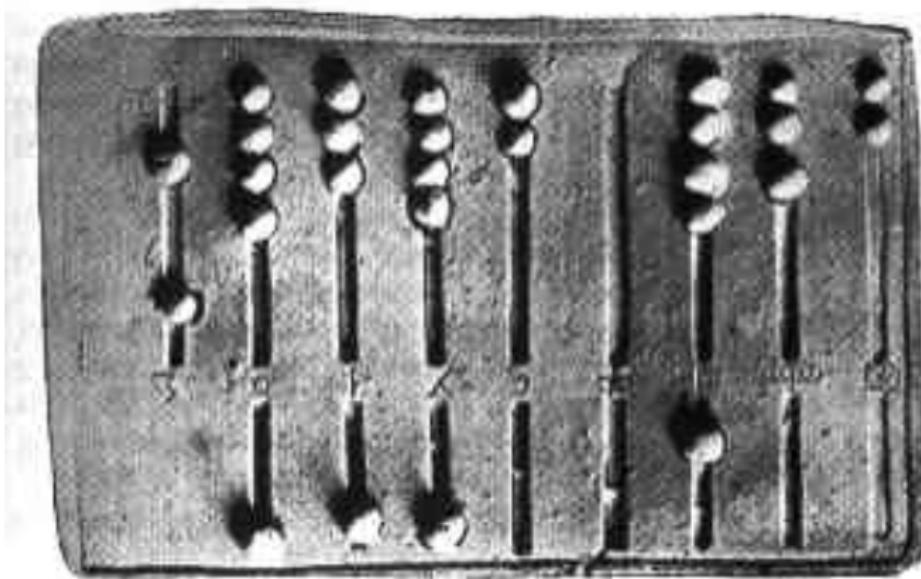


Figure: A roman Abacus [24]

A Short Computer History Chronology

1642 First numerical calculating machine in Paris.

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Figure: La Pascaline

A Short Computer History Chronology

- 1673 Mechanical calculating machine.
- 1725 Basille Bouchon, son of an organist at Lyon, invents a loom controlled by a punched paper tape.
- 1780 American Benjamin Franklin discovers electricity [5, 9].

A Short Computer History Chronology

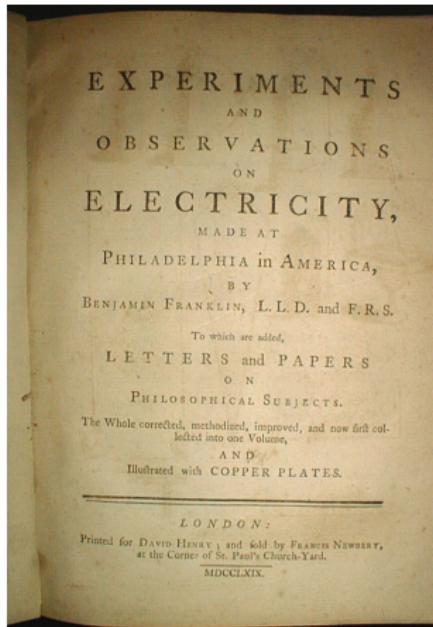


Figure: Franklin's book



Figure: Franklin asking for troubles

A Short Computer History Chronology

1801 Jacquard invents fully automated looms, driven by punch cards.

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Figure: Jacquard's loom [33]

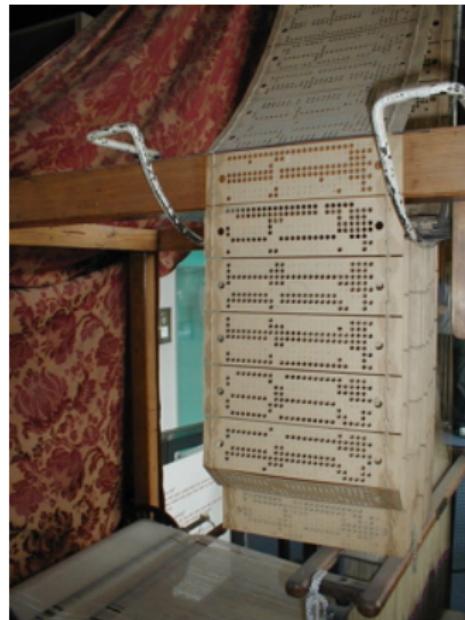


Figure: Punched cards [33]

A Short Computer History Chronology

1833 Babbage designs a machine driven by punched-cards.
The first general purpose computer.

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Figure: Babbage's machine finally constructed

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1876 Telephone is patented by Alexander Graham Bell, a few hours before Elisha Gray.

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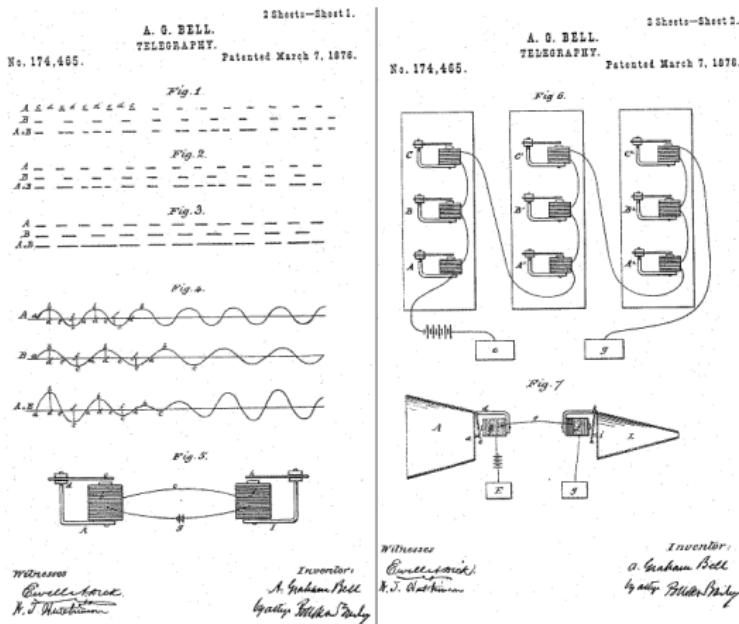


Figure: United States Patent No. 174,465: Bell's telephone

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1911 Computer-Tabulating-Recording Company is formed

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Figure: Computer-Tabulating-Recording

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1924 Computing-Tabulating-Recording Company changes its name to International Business Machines (IBM).

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Figure: International Business Machines

A Short Computer History Chronology

- 1927 First public demonstration of television.
- 1936 First calculator, the Z1, is built in Germany by Konrad Zuse [1].

A Short Computer History Chronology



Figure: Z1 in the apartment of Konrad Zuse's parents in 1936 [35]

A Short Computer History Chronology

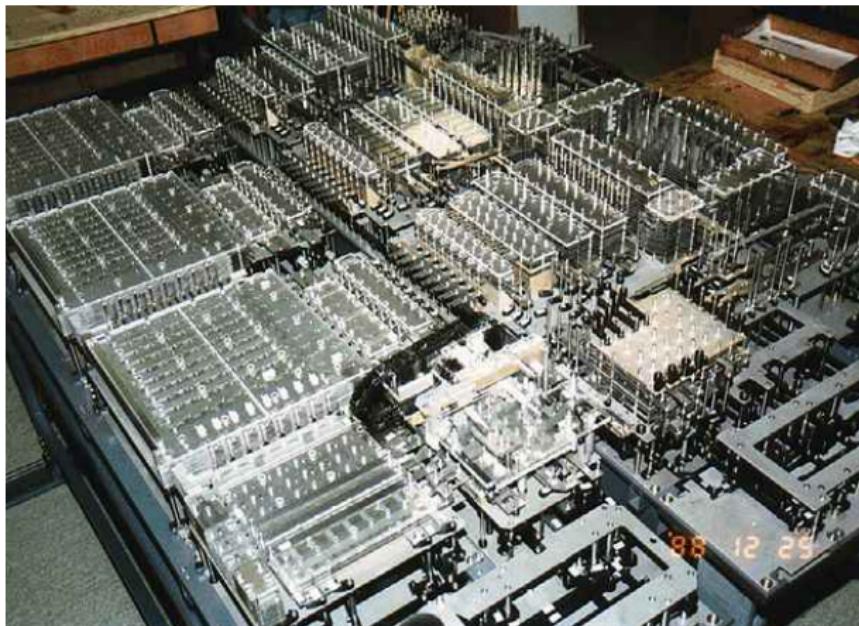


Figure: The Z1 reconstructed by K. Zuse

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- 1939 First Radio Shack catalog is published.
- 1939 Design of the ABC (Atanasoff-Berry Computer).
Ruled the first automatic digital computer in 1973.

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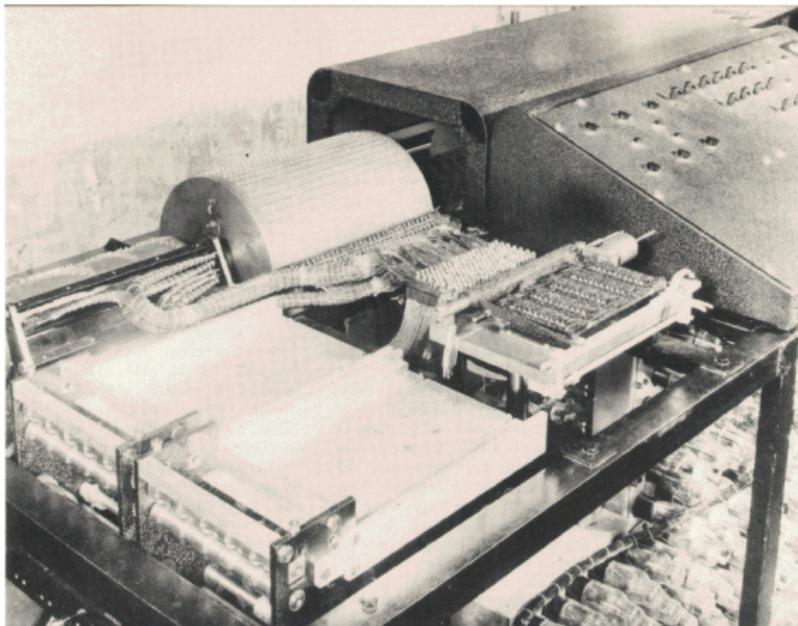


Figure: The Atanasoff-Berry Computer

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- 1940 Complex Number Calculator, which may be the first digital computer (Bell Labs).
- 1940 First color TV broadcast.
- 1941 Zuse's Z3, the first reliable, freely programmable, working computer based on a binary floating-point number and switching system. First Turing-complete machine.

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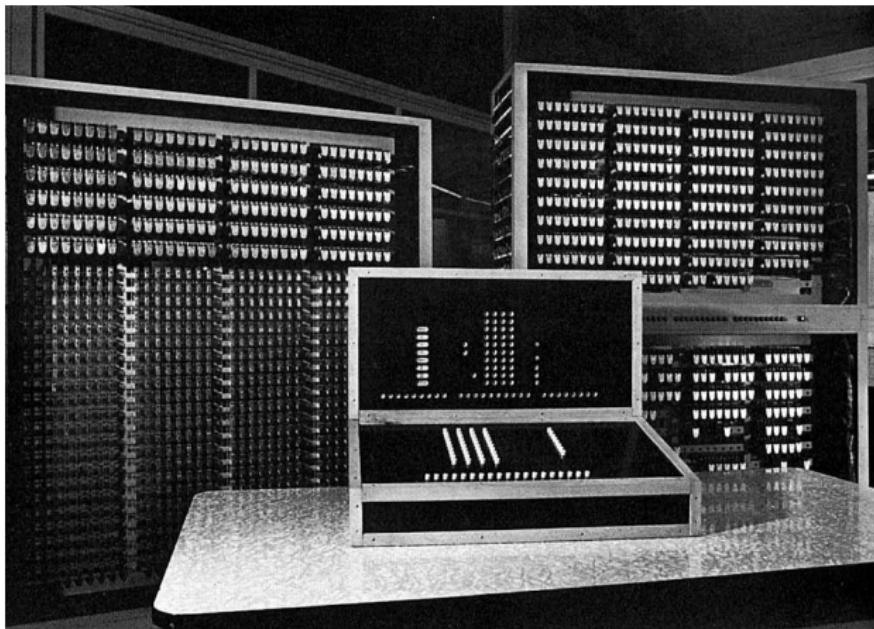


Figure: The Z3 rebuilt in 1961 by Zuse

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1944 Harvard Mark I (IBM Automatic Sequence Controlled Calculator (ASCC)) is completed at Harvard and IBM. A relay-based computer.

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Figure: The IBM ASCC

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1945, Sep 9th Grace Hopper finds the first computer bug on a Harvard Mark II [15].
Actually it was not her who found it [33, Computer_bug].

A Short Computer History Chronology

Photo # NH 96566-KN First Computer "Bug", 1945

92

9/9

0800	Anutan started	{ 1.2700 9.037 897 025
1000	stopped - anutan ✓	9.037 896 995 connect
	13° 00' (032) MP-MC	1.582162000 2.130476415 (2) 4.615925059 (-)
	(033) PRO 2	2.130476415
	connect	2.130476415
	Relays 9-2 in 033 failed special speed test	Relay 3145
	in relay	Relay 3371
	(Relays changed)	
1100	Started Cosine Tape (Sine check)	
1525	Started Multi. Adder Test.	
1545	 Relay #70 Panel F (Moth) in relay.	
1625/60	First actual case of bug being found.	
1700	closed down.	

Figure: The first bug, logged

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- 1946, Feb 14 First electronic calculator: ENIAC (Electronic Numerical Integrator and Computer), at the University of Pennsylvania.
- 1946 Design of the Universal Automatic Computer (Univac).
- 1948 IBM builds a computer with 12,000 tubes.
- 1948 Transistor is invented.

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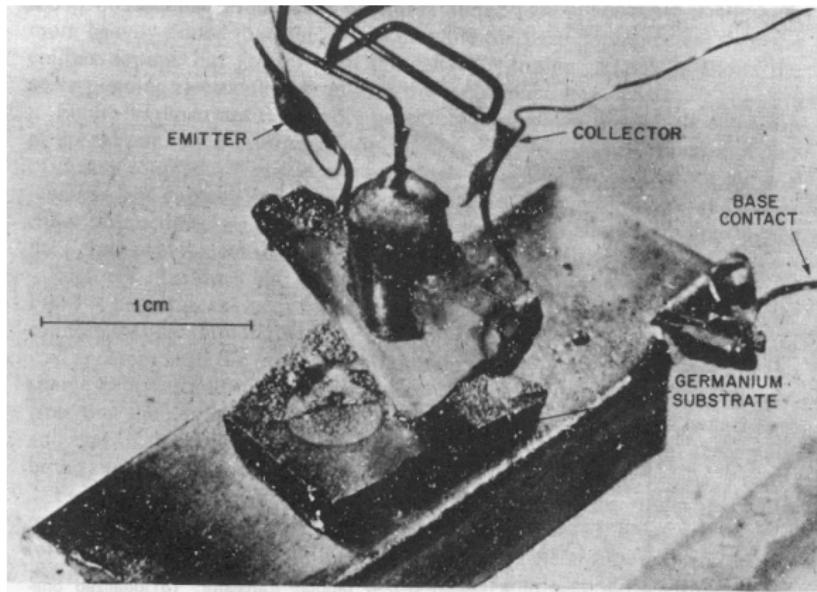


Fig. 1 The first transistor.¹

Figure: First transistor

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- 1949 EDVAC (Electronic Discrete Variable Automatic Computer) supports the first tests of magnetic disks.
- 1949 March Binac (Binary Automatic Computer), the first computer to operate in real time.
- 1949 MIT builds the first chess playing machine.
- 1951, Jun 14th UNIVAC I, first commercially available computer.
Features a magnetic tape unit as a buffer memory.

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Figure: UNIVAC I

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- 1952 RCA develops Bizmac with iron-core memory and a magnetic drum supporting the first database.
- 1953 First high-speed printer is developed (by Remington-Rand for Univac).

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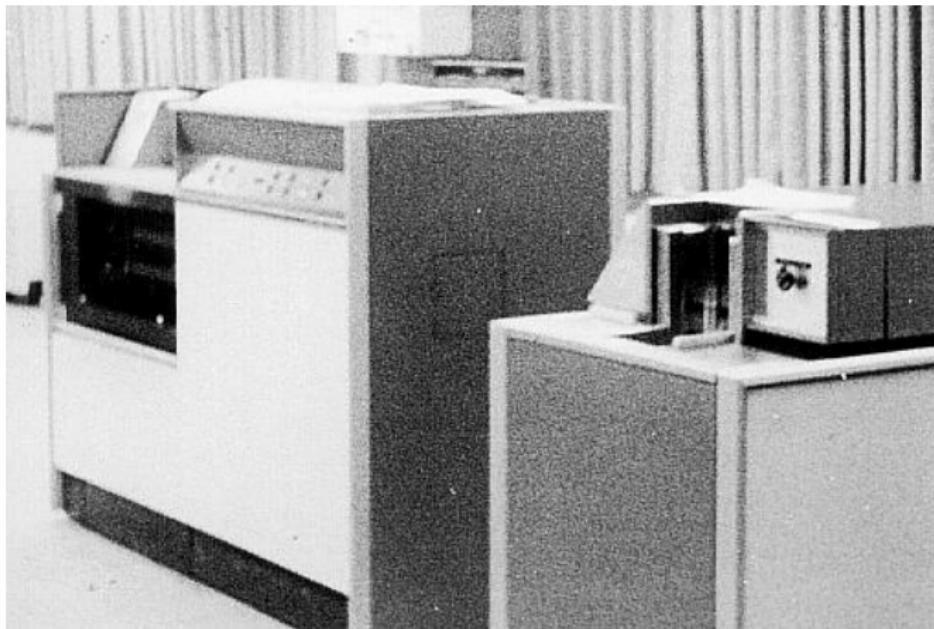


Figure: Printer for the UNIVAC 1107 in the 60's[29] Music

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1953 First magnetic tape device.

1953 April 7 IBM introduces the 701, its first electronic stored-program computer. It is a vacuum tube, or first generation, computer.

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Figure: IBM 701

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1954 FORTRAN is created.

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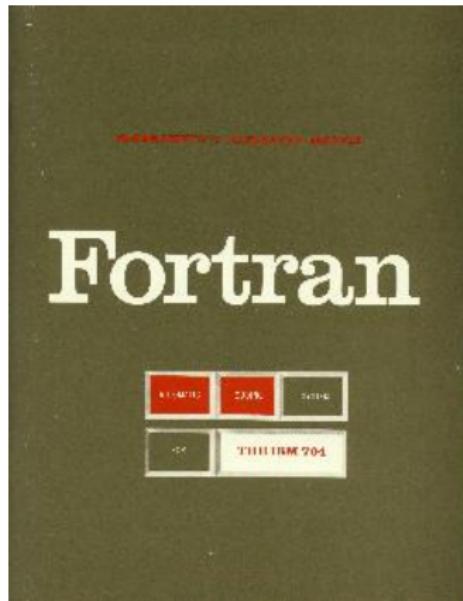
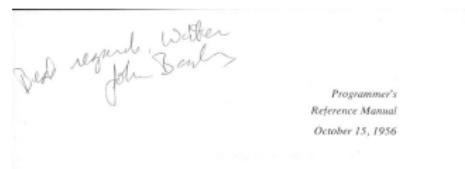


Figure: FORTRAN doc...



THE FORTRAN AUTOMATIC CODING SYSTEM FOR THE IBM 704 EDPM®

This manual supersedes all earlier information about the FORTRAN system. It describes the system which will be made available during late 1956, and is intended to permit planning and FORTRAN coding in advance of that time. An Introductory Programmer's Manual and an Operator's Manual will also be issued.

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Figure: ... autograph by J. Backus

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C	FOR COMMENT	STATEMENT NUMBER	CONTINUATION NUMBER	FORTRAN STATEMENT	72	73	80	IDENTI- FICATION
C			7	PROGRAM FOR FINDING THE LARGEST VALUE				
C	X			ATTAINED BY A SET OF NUMBERS				
				DIMENSION A(999)				
				FREQUENCY 30(2,1,10), 5(100)				
				READ 1, N,-(A(I), I = 1,N)				
		1		FORMAT (I3/(12F6.2))				
				BIGA = A(1)				
		5		DO 20 I = 2,N				
				IF (BIGA-A(I)) 10,20,20				
		10		BIGA = A(I)				
				CONTINUE				
				PRINT 2, N, BIGA				
		2		FORMAT (22H1THE LARGEST OF THESE 13, 12H NUMBERS IS F7.2)				
				STOP 77777				

Figure: A FORTRAN sample

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1954 The first operating system, used on IBM 704.

Nov 1954 Scientists from RAND Corporation have created this model to illustrate how a "home computer" could look in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use

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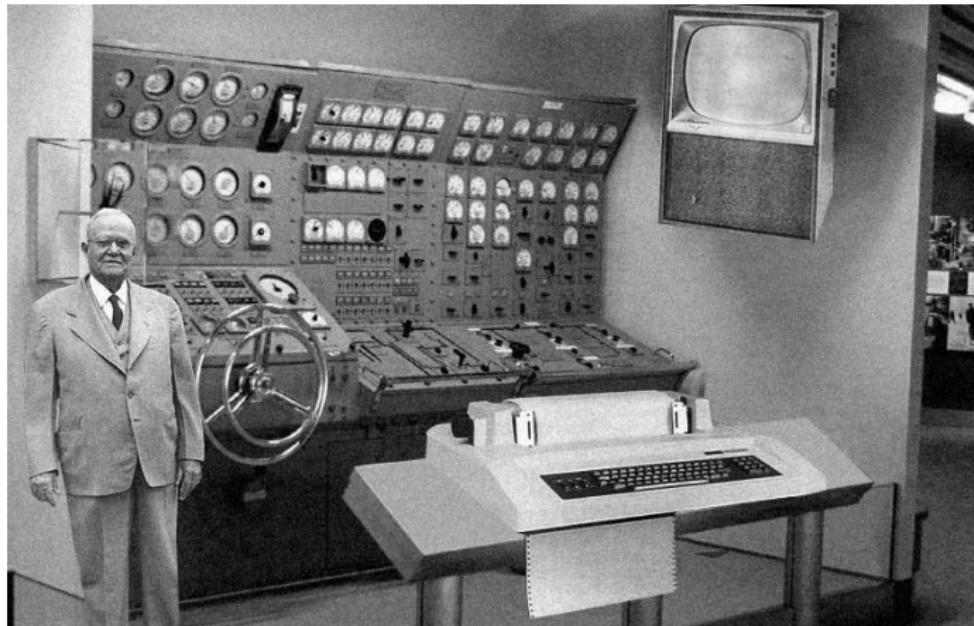


Figure: 1954 preview of computers in 2004. Note the joystick.

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Figure: Submarine maneuvering room [23].

A Short Computer History Chronology

- 1955 First computer user group: SHARE (IBM 701) [18].
- 1957 The Traitorous Eight leave the Shockley Semiconductor Laboratory to form Fairchild Semiconductor.

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Figure: The Traitorous Eight at Fairchild Semiconductor in 1959:
Gordon Moore, Sheldon Roberts, Eugene Kleiner, **Robert Noyce**, Victor Grinich, Julius Blank, Jean Hoerni, and Jay Last.

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- 1958 The first fully transistorized supercomputer, the CDC 1604.
- 1958 Texas Instruments makes the first integrated circuit.

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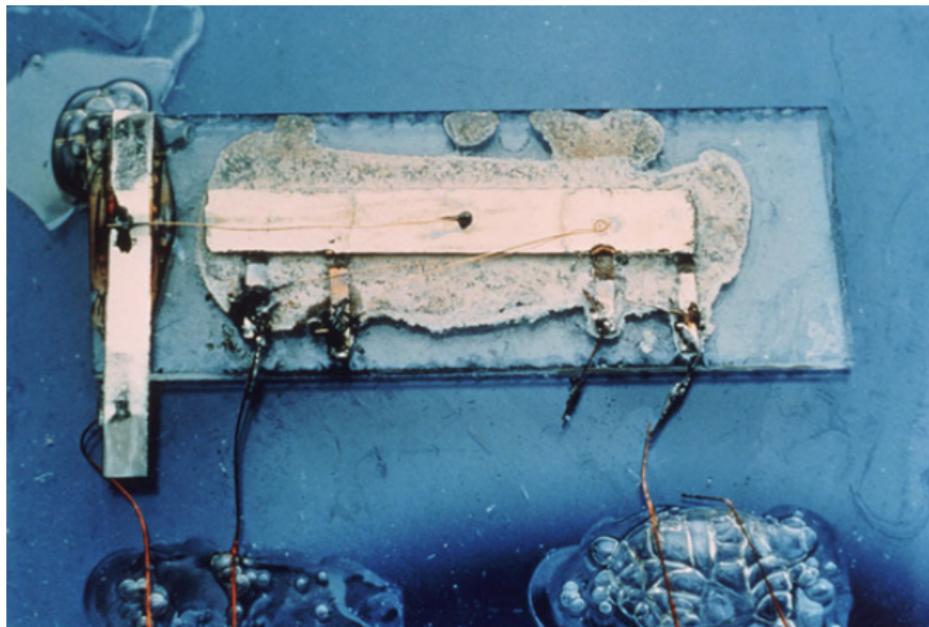


Figure: Jack Kilby's first integrated circuit

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- 1959 COBOL is defined.
- 1959 IBM introduces the 1401. Over 10,000 units will be delivered during its lifetime.
- 1959 Texas Instruments files a patent for the first integrated circuit.
- 1960 First computer driven telephone switch.

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Figure: Operator driven switch board [30]



Figure: Computer driven switch board [30]

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- 1960 Removable disks first appear.
- 1960 The first minicomputer, the PDP-1 (Programmed Data Processor).

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Figure: PDP-1

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1962 The first video game: Space war. Play the original game [20]

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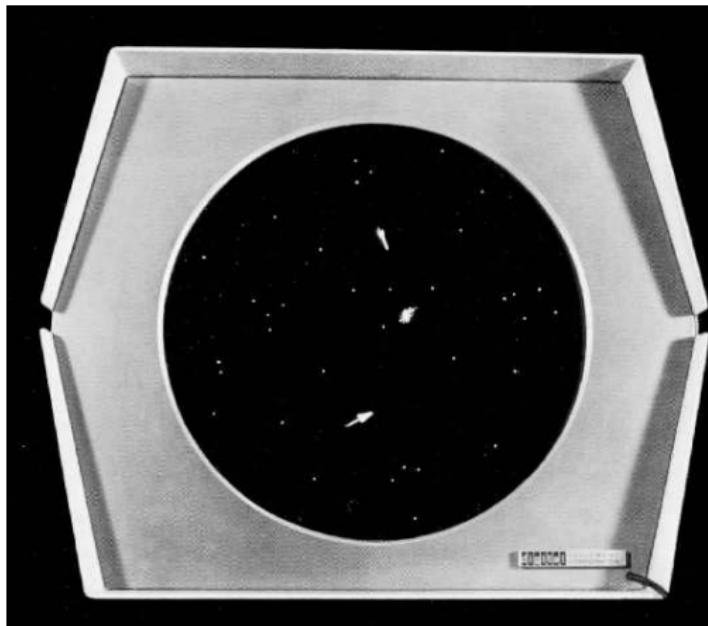


Figure: Spacewar! screenshot

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Figure: Steve Russell in 2002 [12]

A Short Computer History Chronology

- 1963 Tandy acquires Radio Shack (9 stores).
- 1964 MIT students play music on a PDP-1 [21] Music
- 1964 Control Data Corporation introduces the CDC 6000,
the most powerful computer for several years.
- 1964 BASIC (Beginners All-purpose Symbolic Instruction
Language) is created.

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1964 “A computer fed information by engineers at Los Angeles took only 1.2 second this week (sic) to come up with what was described as Miss Formula, the girl with everything. Her dimensions: height, 5 feet, 6 inches; weight, 115-118 pounds and measurements, 36-24-36.” [10]

A Short Computer History Chronology



Figure: Miss Formula [10]

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Figure: The Control Data Cyber 70 Bosom-Goggler, which automatically stares at the secretary's breasts, freeing up the busy executive so he can stare at her legs. [10]

A Short Computer History Chronology

- 1965 Control Data Institute provides computer-related education.
- 1965 Douglas Engelbart creates the first mouse [15].

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Figure: The First Mouse

A Short Computer History Chronology

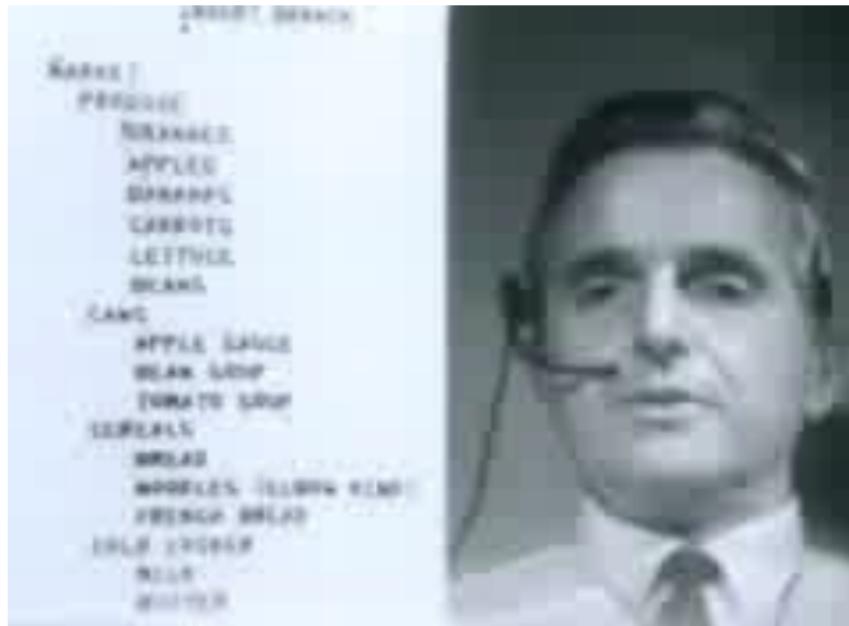


Figure: Demonstration of NLS and the mouse (1968) [17]

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According to Herb Sutter [25] this *Mother of All Demos* demonstrated prototypes for the 16 following technologies:

- The personal computer for dedicated individual use all day long.
- The mouse.
- Internetworks.
- Network service discovery.
- Live collaboration and desktop/app sharing.
- Hierarchical structure within a file system and within a document.
- Cut/copy/paste, with drag-and-drop.
- Paper metaphor for word processing.
- Advanced pattern search and macro search.
- Keyword search and multiple weighted keyword search.
- Catalog-based information retrieval.
- Flexible interactive formatting and line drawing.
- Hyperlinks within a document and across documents.
- Tagging graphics, and parts of graphics, as hyperlinks.
- Shared workgroup document collaboration with annotations etc.
- Live shared workgroup collaboration with live audio/video teleconference in a window.

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1965 IBM ships the first System 360, its first integrated circuit-based, or third generation computer.

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Figure: IBM 360/67

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Figure: IBM 360 in black and white

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Figure: IBM 360 in colors

A Short Computer History Chronology

- 1965 Dec, 5th First computer science Ph.D. is granted to Richard L. Wexelblat at the University of Pennsylvania.
- 1966 Texas Instruments offers the first solid-state hand-held calculator.
- 1968 Jul, 18th Integrated Electronics (Intel) Corp. is founded by Gordon E. Moore (chemist and physicist) and Robert Noyce (physicist and co-inventor of the integrated circuit).
- 1968 First Hewlett-Packard calculator. 20Kg, \$4 900.

A Short Computer History Chronology



MoHPC

Figure: HP 9100a [7]

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1969 AMD is founded.

1969 IBM introduces a minicomputer line, System/3.

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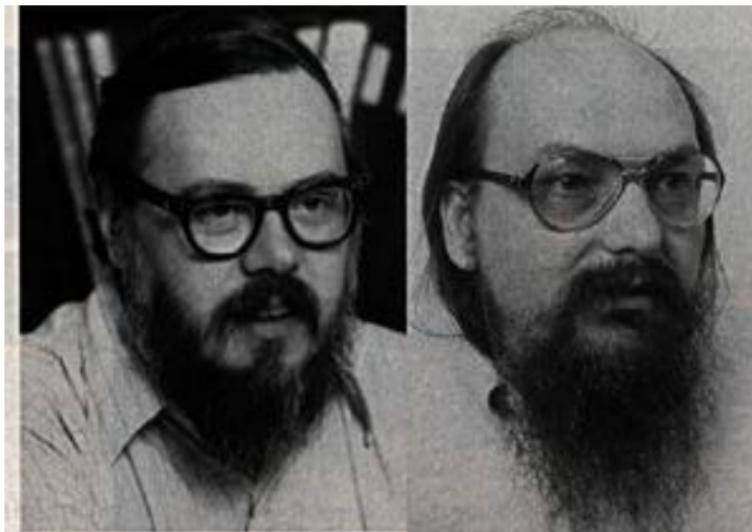
1969 Bell Labs drop out of the MULTICS project (Multiplexed Information and Computing Service). Ken Thompson implements UNICS on a PDP/7 (4K of 18 bit words) in one month while his wife is in vacation. One week per component: kernel, shell, editor, and assembler [11].
UNICS, a joke made by Brian Kernighan (or Peter Neumann [18, Chap. 2]) standing for the UNIplexed Information and Computing Service, since the PDP-7 version could support only one user—Ken. After too many bad puns about EUNUCHS being a castrated MULTICS, the name was changed to UNIX [26].

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Figure: PDP/7 [30]

A Short Computer History Chronology



Dennis Ritchie and Kenneth Thompson: they set the style for software development – and for software developers

Figure: Denis MacAlistair Ritchie & Kenneth Lane Thompson

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Figure: Ken Thompson & Denis Ritchie in front of a PDP/11

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1970 IBM ships its first System 370, a fourth generation, computer.

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Figure: IBM 370 [10]

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- 1971 IBM introduces the 370/135 and 370/195 mainframe computers.
- 1971 IBM introduces floppy disks.
- 1971 Intel Corporation announces the first microprocessor, the Intel 4004 [14], the “mini-programmer”.

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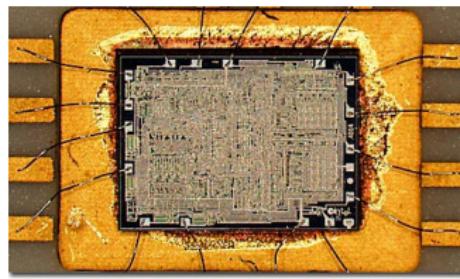


Figure: Intel, inside

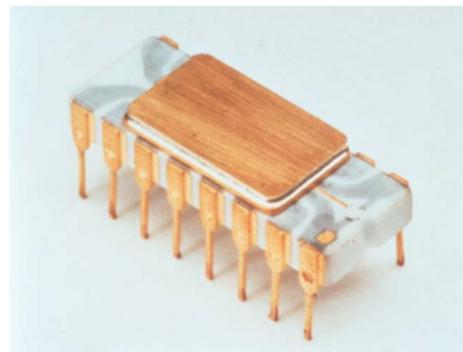


Figure: Intel, outside

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1971 “How It Works...The Computer” is published [6].

A Short Computer History Chronology

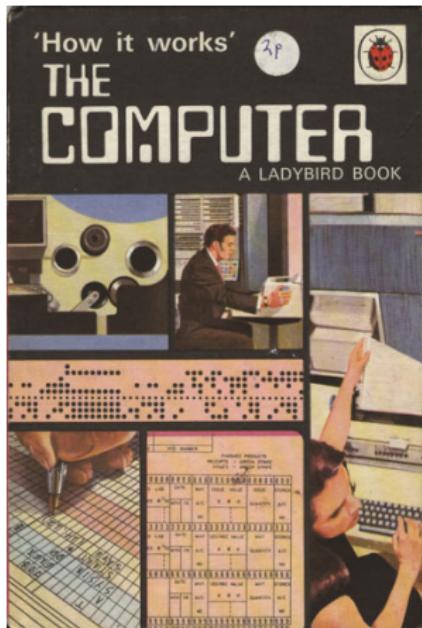


Figure: 1st edition, 1971

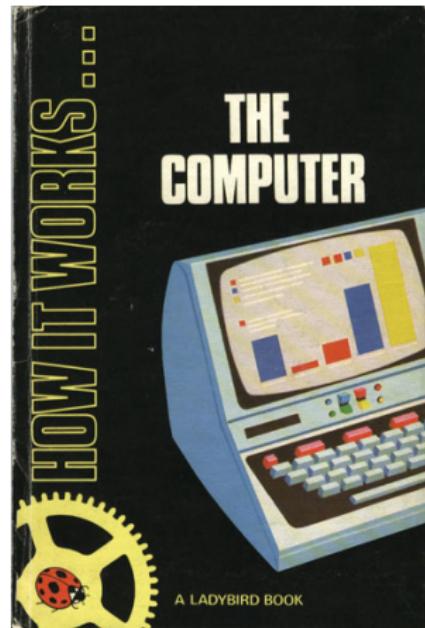


Figure: 2nd edition, 1979

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1971 The first personal computer, the Kenbak I. No processor! Only TTL. 256b RAM. \$750. About 40 units. [8].

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Figure: Kenbak I

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- 1972 Nolan Bushnell of Atari introduces Pong, the first major coin-operated electronic video game.
- 1972 First electronic pocket calculator is developed by Texas Instruments.
- 1973 Ethernet is invented at Xerox PARC by Robert Metcalfe (not only for computer, but for printers too).

A Short Computer History Chronology



Figure: Who's that? Paul Allen, Bill Gates

A Short Computer History Chronology

- 1975 MITS introduces the Altair personal computer, named after a Star Trek episode, A Voyage to Altair. The kit cost \$397. It was designed by Ed Roberts and Bill Yates.
- 1975 Micro Soft is founded after William H. Gates III and Paul Allen sell BASIC to MITS for the Altair PC.

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Figure: Micro Soft logo

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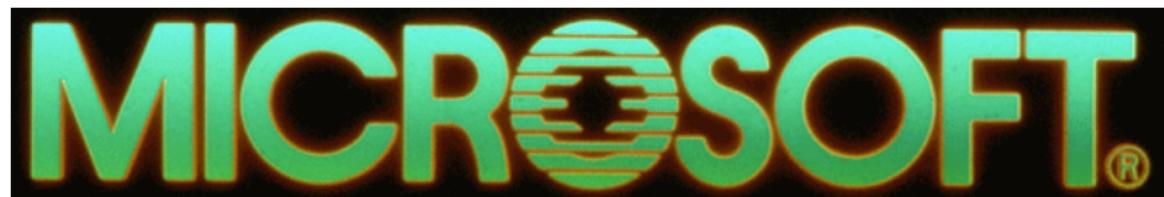


Figure: Microsoft logo in the mid 80s

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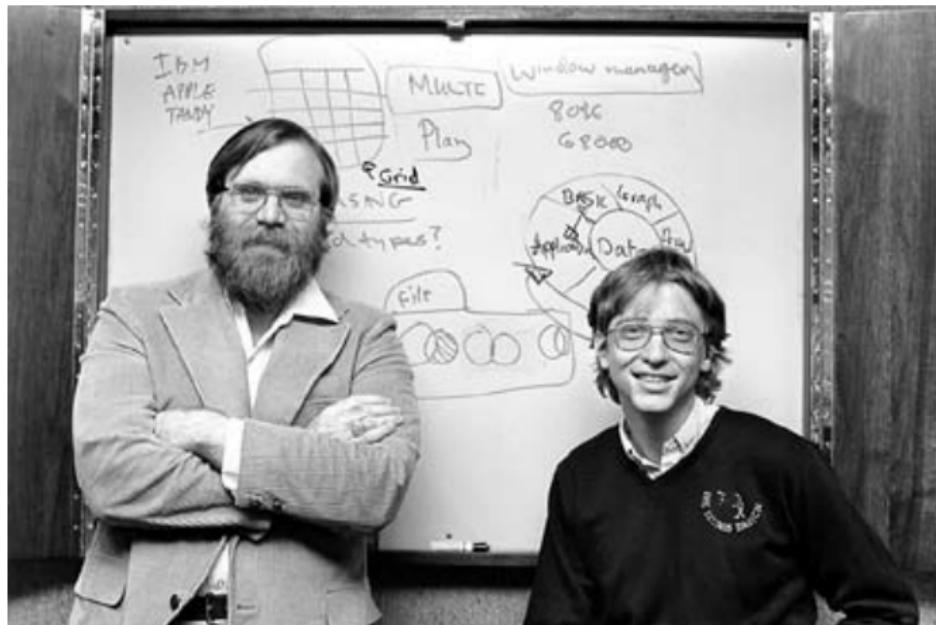


Figure: Paul Allen, Bill Gates

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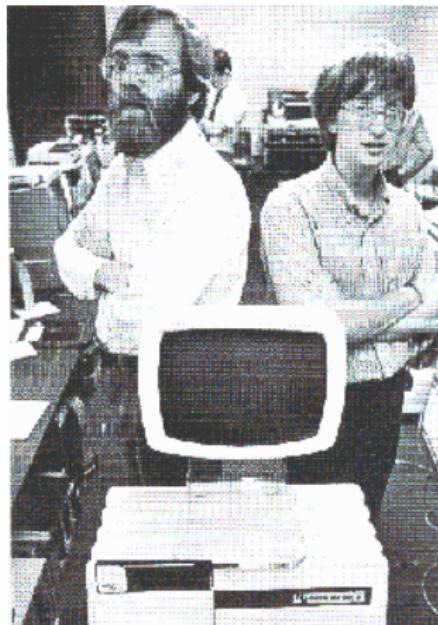


Figure: Paul Allen, Altair Peecee, Bill Gates

A Short Computer History Chronology



Figure: Paul Allen, Bill Gates

A Short Computer History Chronology

- 1975 The first computer store opens in Santa Monica, CA.
- 1975 IBM sells its first personnal computer, the PC 5100.
16K to 64K of memory, BASIC and APL, tape drive
for program storage: \$8,975 to \$19,975.

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Figure: IBM PC 5100

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1976 Z-80 chip is introduced.

1976 Apr, 1st Apple I is commercialized at \$666.66 [19].

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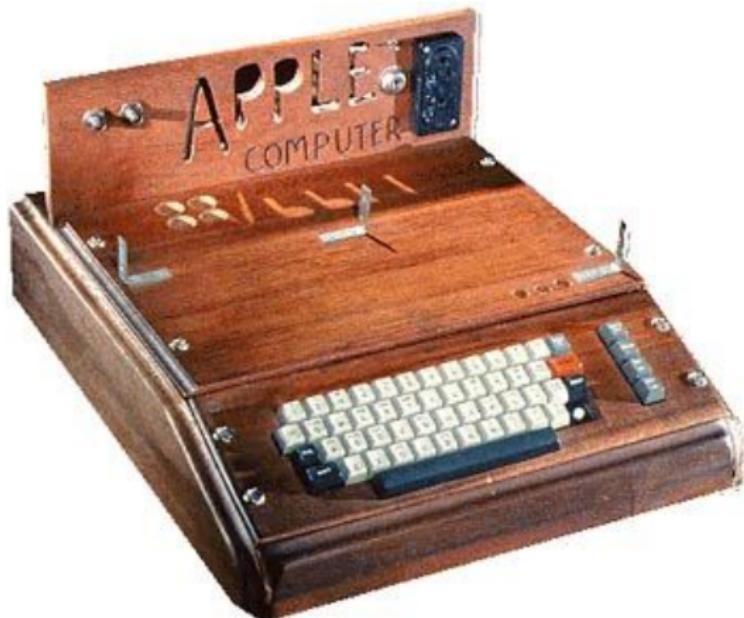


Figure: Apple I

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1977 Oct The Atari VCS 2600 is introduced on the US market [34].

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Figure: Atari VCS 2600

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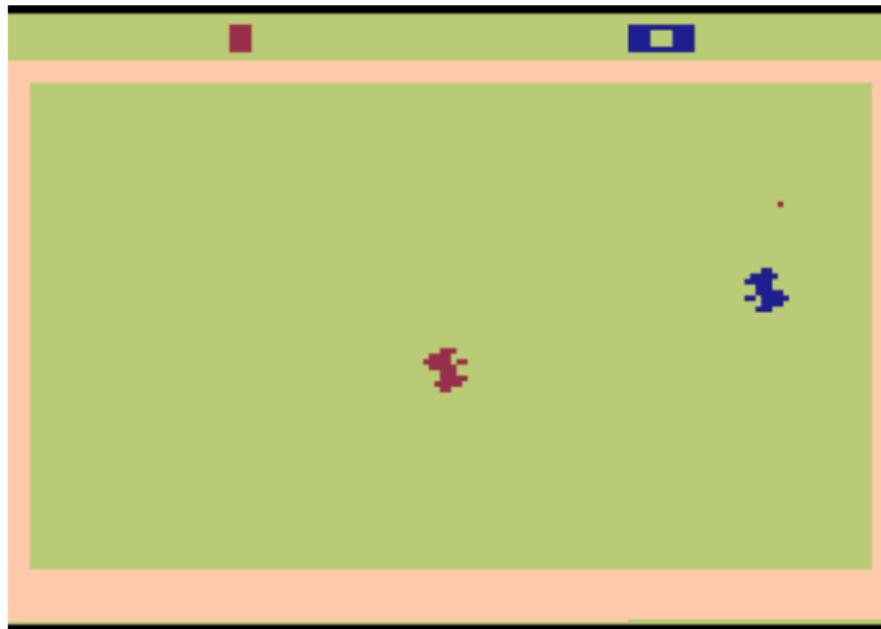


Figure: Combat (1977)

A Short Computer History Chronology



Figure: Space Invaders (1980)

A Short Computer History Chronology



Figure: Pacman (1982)

A Short Computer History Chronology



Figure: Atlantis (1982)

A Short Computer History Chronology



Figure: Donkey Kong (1982)

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Figure: ET (1982)

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Figure: Pitfall (1982)

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Figure: Pole Position (1983)

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Figure: Video games are a huge success

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1977 Dec 13th Bill Gates arrested for traffic infraction.

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Figure: Bill Gates Mugshot

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1977 Apr Apple Computer introduces the Apple][personal computer.

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Figure: Apple][

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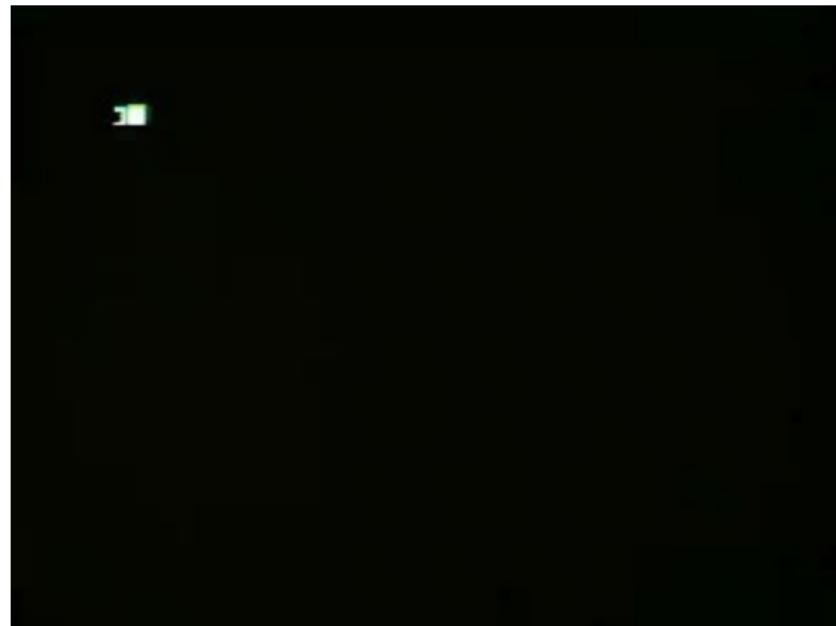


Figure: Jed's Other Poem [22]

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- 1977 Apple, Commodore, and Tandy begin selling personal computers.
- 1978 Jun 11 Texas Instruments introduces the Speak-and-Spell educational toy [31].

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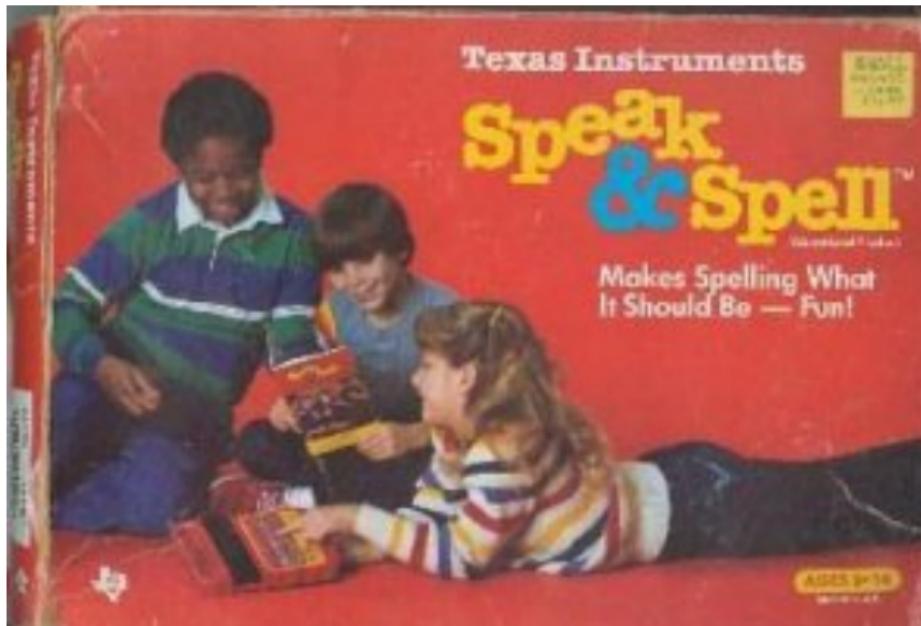


Figure: Speak & Spell Box

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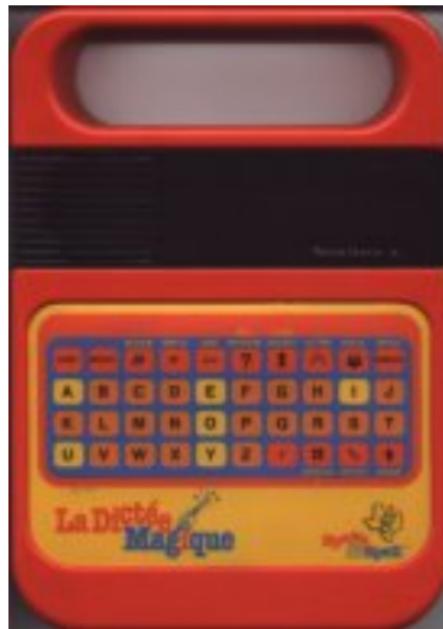


Figure: La dictée magique

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Figure: Speak & Spell Ad

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Figure: Microsoft Staff, 1978 Dec 7th

A Short Computer History Chronology

- 1978 Total computers in use in the U.S. exceed a half million units.
- 1979 The Source and CompuServe Information Services go on-line.
- 1979 Hewlett-Packard introduces the HP-41C.

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MoHPC

Figure: HP-41 C [7]

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1980 Sinclair's ZX80 is sold £99.95.

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Figure: Sinclair ZX 80 [33]

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Figure: Sinclair ZX 80 [16]

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- 1980 Total computers in use in the U.S. exceed one million units.
- 1981 Sinclair's ZX81 is sold \$ 100. 1Kb.

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Figure: Sinclair ZX 81 with a 16Kb extension [33]

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1981 Commodore introduces the VIC-20 home computer, first computer to sell over one million units. 4Kb RAM.

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Figure: Commodore VIC-20

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1981 Aug 12th IBM “enters” the personal computer market with its model PC 5150.

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Figure: IBM PC 5150

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1981 Osborne 1, the first commercially successful portable computer.

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Figure: Osborne 1 [27]

A Short Computer History Chronology

1981 In September, MicroSoft starts the development of the Interface Manager (to become Windows) [2].

1983, Jan 3rd The computer is “Machine of the Year”.

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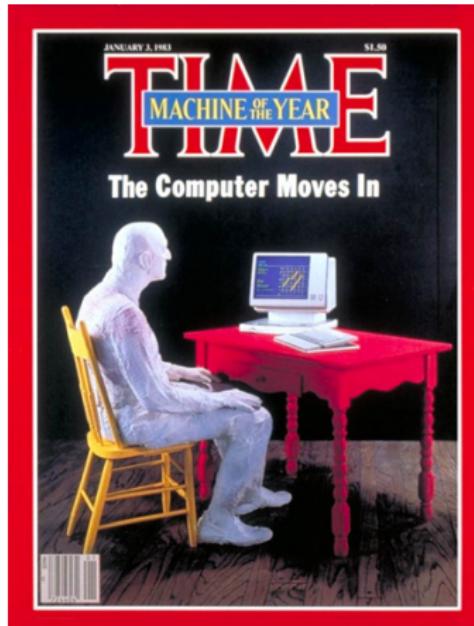


Figure: The Time Magazine Cover [28]

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1983 Sep 27 Richard Stallman makes the first public announcement about the GNU project.

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Figure: Richard M. Stallman [32]...



Figure: ... taming a butterfly

A Short Computer History Chronology

... Many events...

1984 Macintosh.

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Figure: Macintosh Ad

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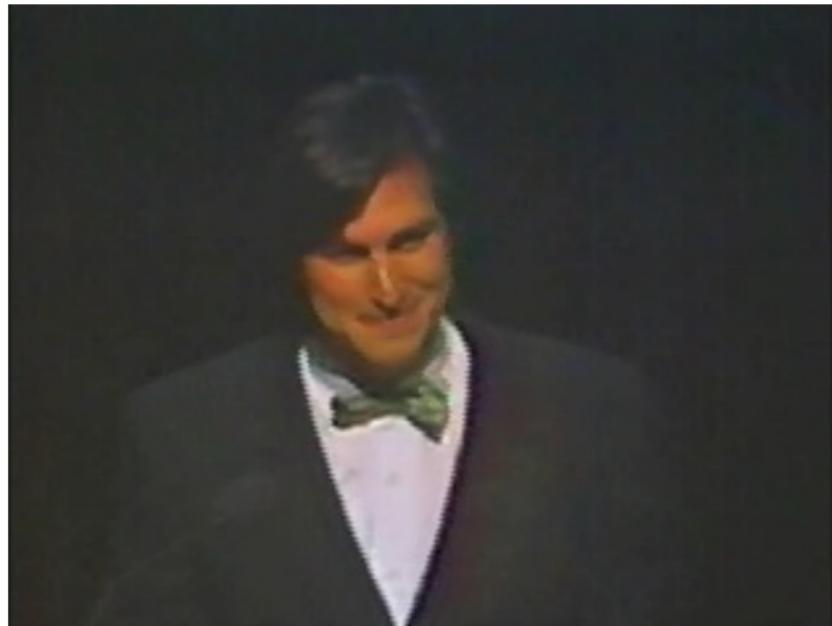


Figure: Introducing Macintosh

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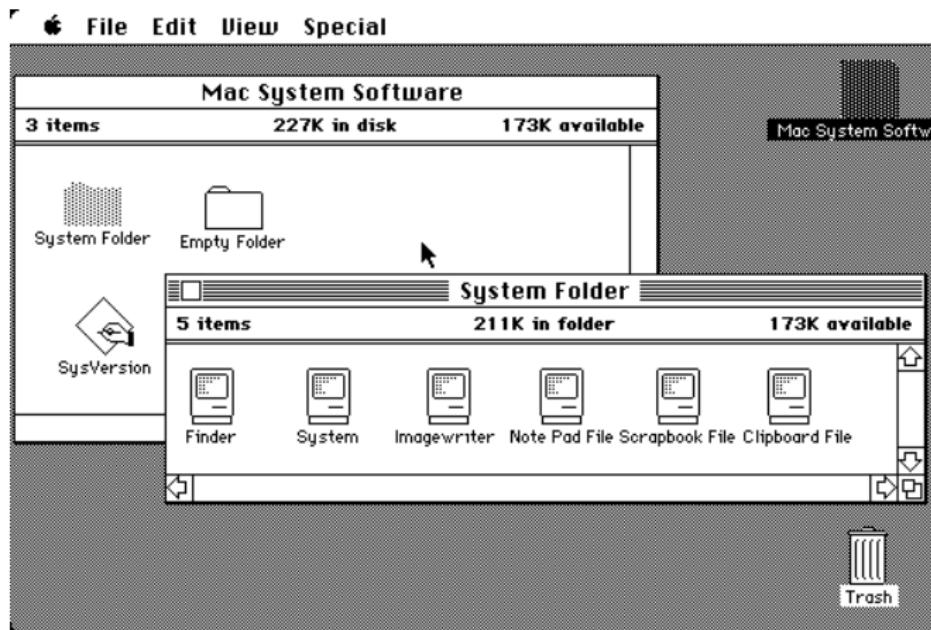


Figure: Macintosh System 1

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1985 Nov 20 Windows 1.0

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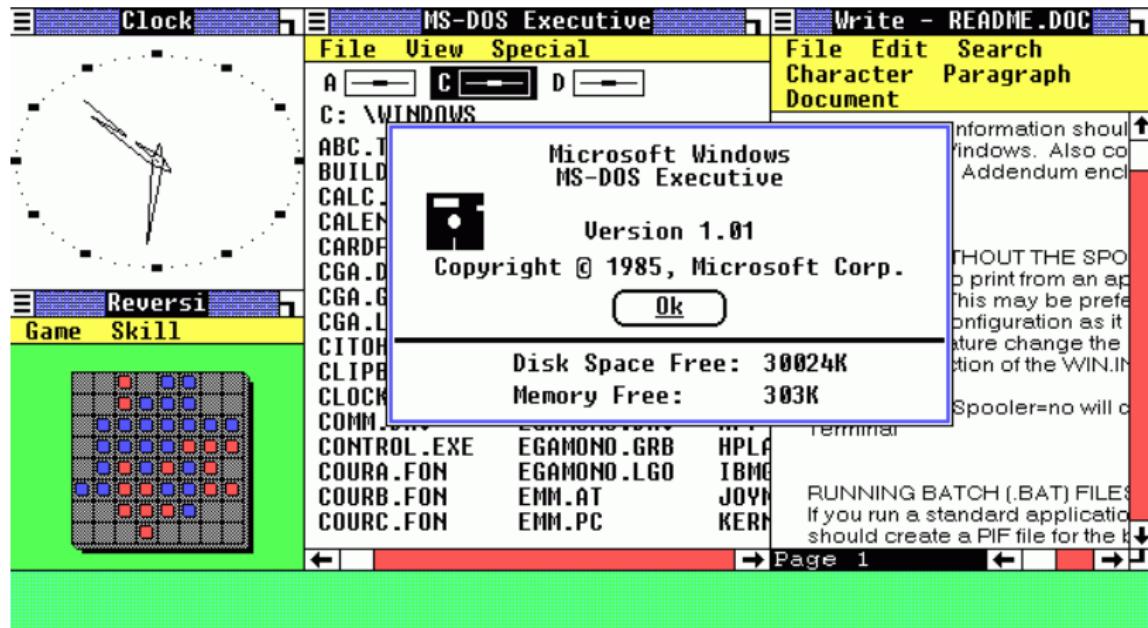


Figure: Windows 1.01

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Figure: Bill Gates in 1985

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Figure: Bill Gates in 1985

A Short Computer History Chronology

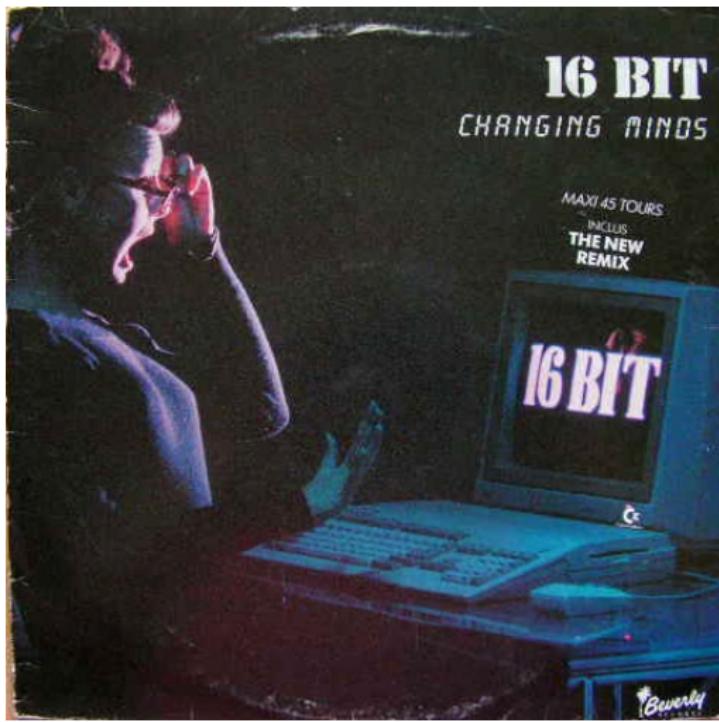


Figure: Bill Gates in 1985

Changing Minds — 16 bits



Changing Minds — 16 bits



Changing Minds — 16 bits

Read the instructions on your plasma screen

store your program an disc

And now you move with the cursor up and down
left and right.

Printing directly from the keyboard

change line fourty in your program

Insert a sheet of paper and let the system run.

Face the fact you're left in the dark
with the fantastic 8 megabyte computer.

Start by checking all the connections

Changing Minds — 16 bits

and now turn on the power.

While holding the bold key
activating the ram expansion port

Insert your final program
and then you press 'return'.

Changing; changing; changing minds

If you have detected an error
enter the following command

Poke eight hundred and fifty eight
one and two
three and four.

Pressing the backspace indicator
touch one of the red function keys

Changing Minds — 16 bits

Select the background colour
the white
the black
the green
the red.

Count these pieces of information
don't be afraid
my friend

Learn to use this computer
don't try to lose control

If you don't follow these instructions
a five pound explosive charge
Will detonate in your face

and now turn off the power!

Some Early Machines

1 A Short Computer History Chronology

2 Some Early Machines

- ENIAC
- The Baby
- Ferranti Pegasus

ENIAC

1 A Short Computer History Chronology

2 Some Early Machines

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- Ferranti Pegasus

Some Early Machines

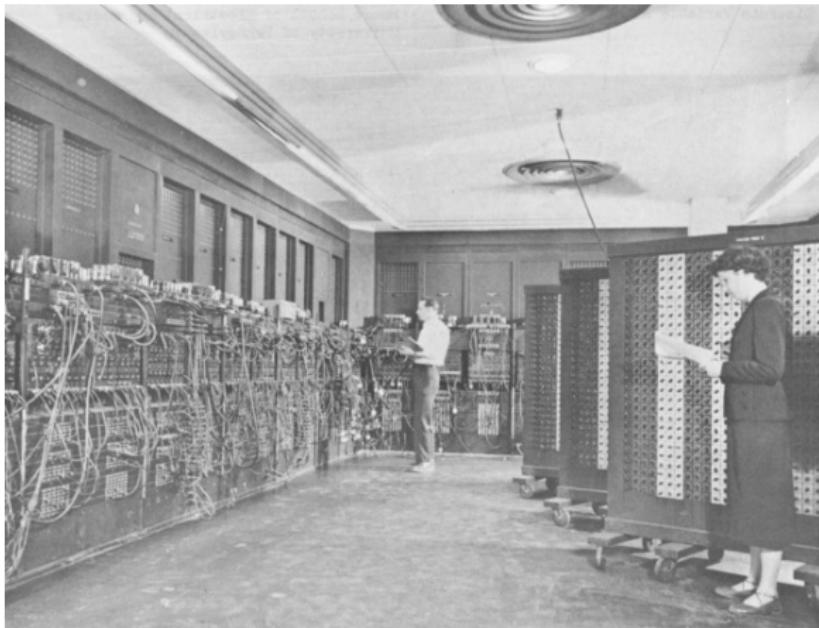


Figure: ENIAC

Some Early Machines

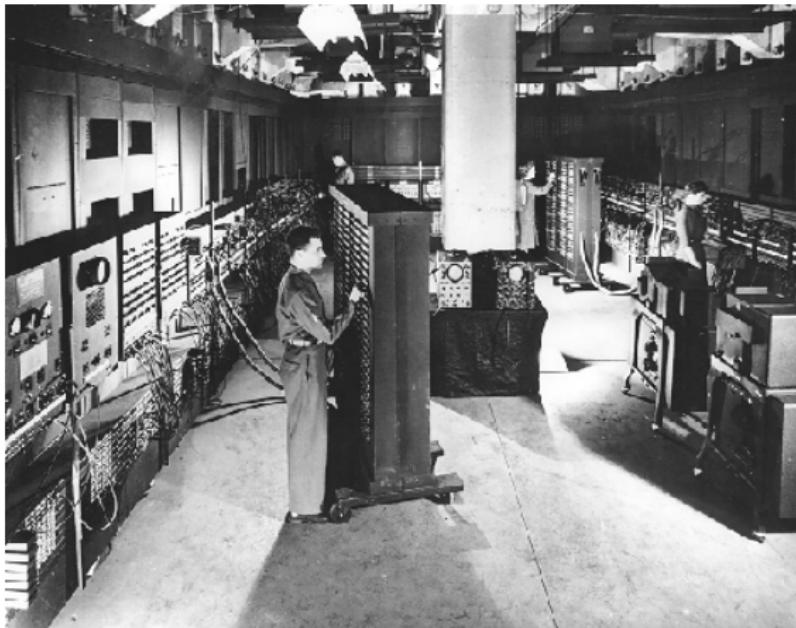
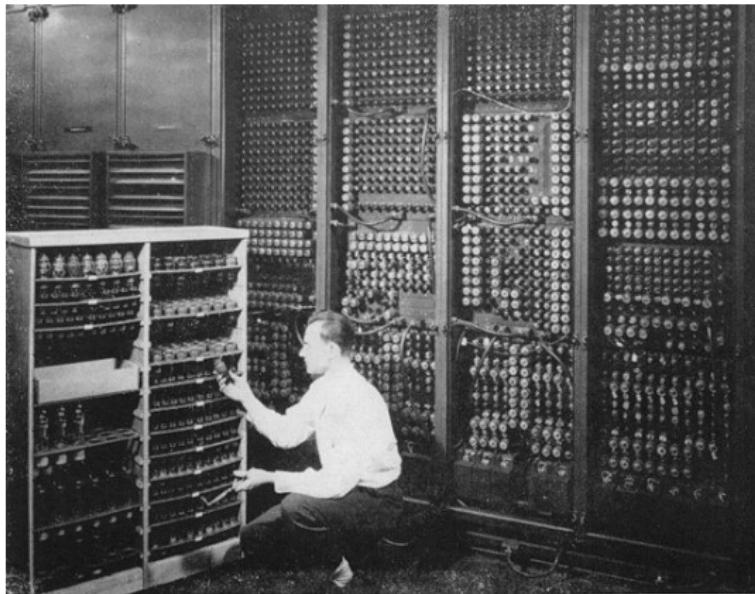


Figure: ENIAC

Some Early Machines



Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

Figure: ENIAC

Some Early Machines

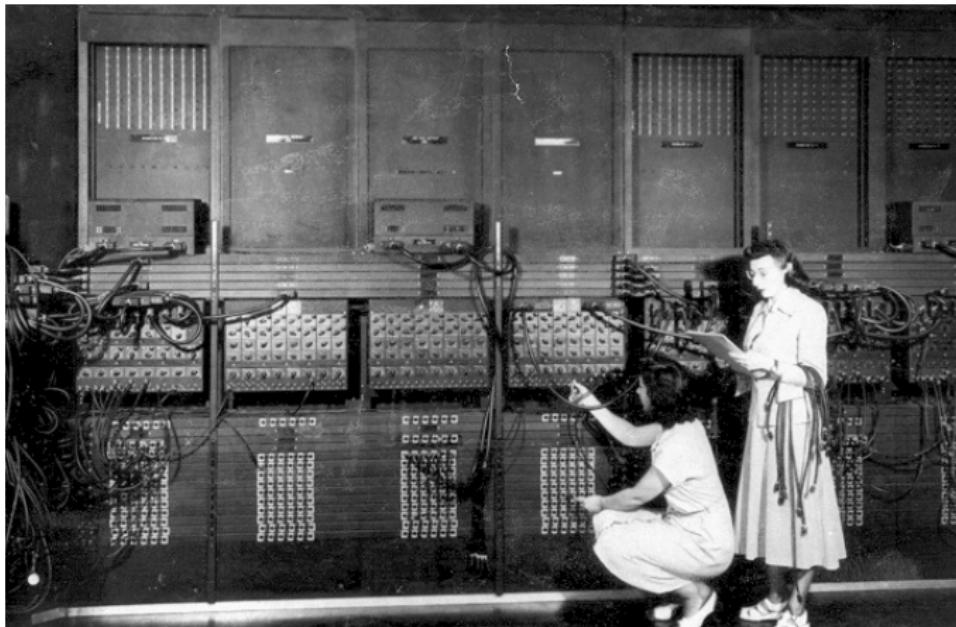


Figure: ENIAC

ENIAC Figures

- 17,468 vacuum tubes
- 7,200 crystal diodes
- 1,500 relays
- 70,000 resistors
- 10,000 capacitors
- around 5 million hand-soldered joints
- 27 tons
- roughly 2.4 m by 0.9 m by 30 m
- took up 167 m²
- consumed 150 kW of power (\$60/d)
- \$500,000

As of 2004, a chip of silicon measuring 0.5 mm square holds the same capacity as the ENIAC

ENIAC: A Product



Some Early Machines

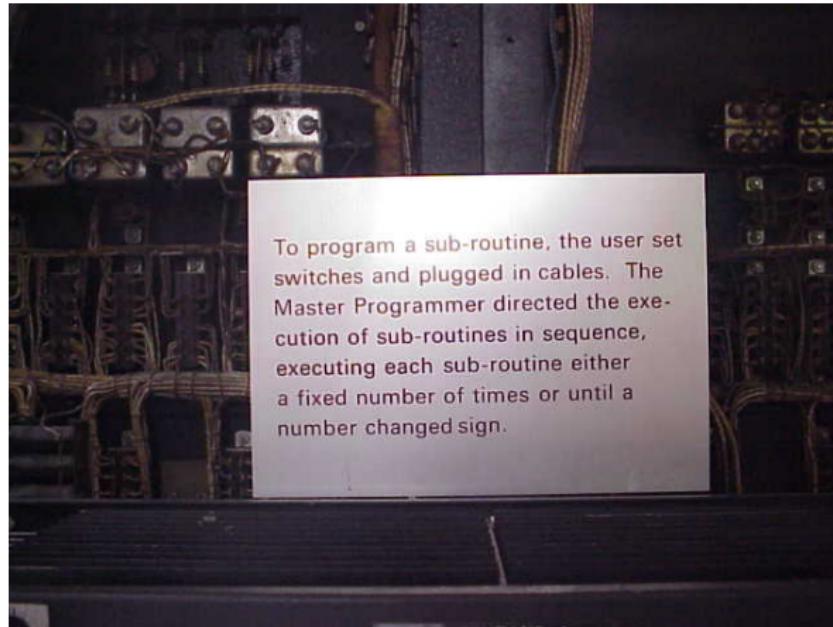
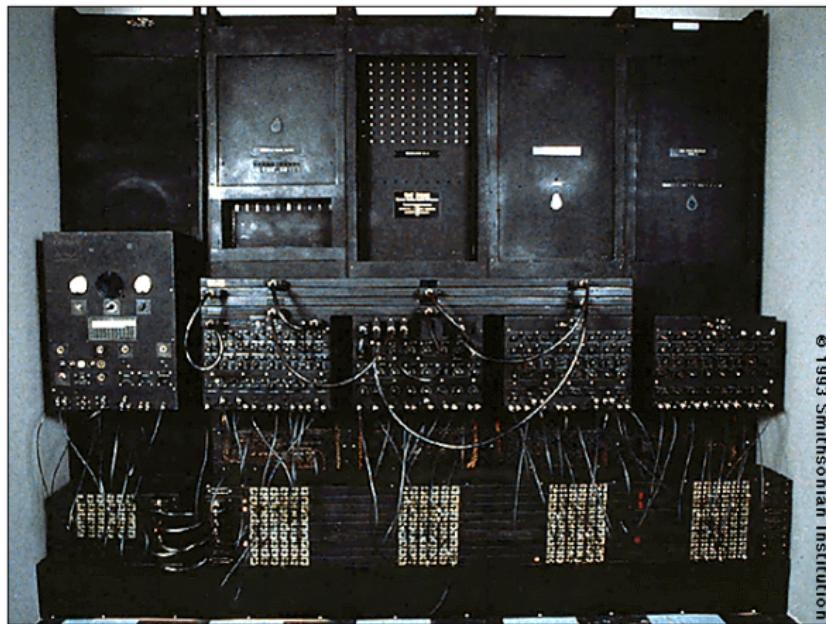


Figure: ENIAC Programming

Some Early Machines



© 1993 Smithsonian Institution

Figure: ENIAC Programming [13]

Some Early Machines

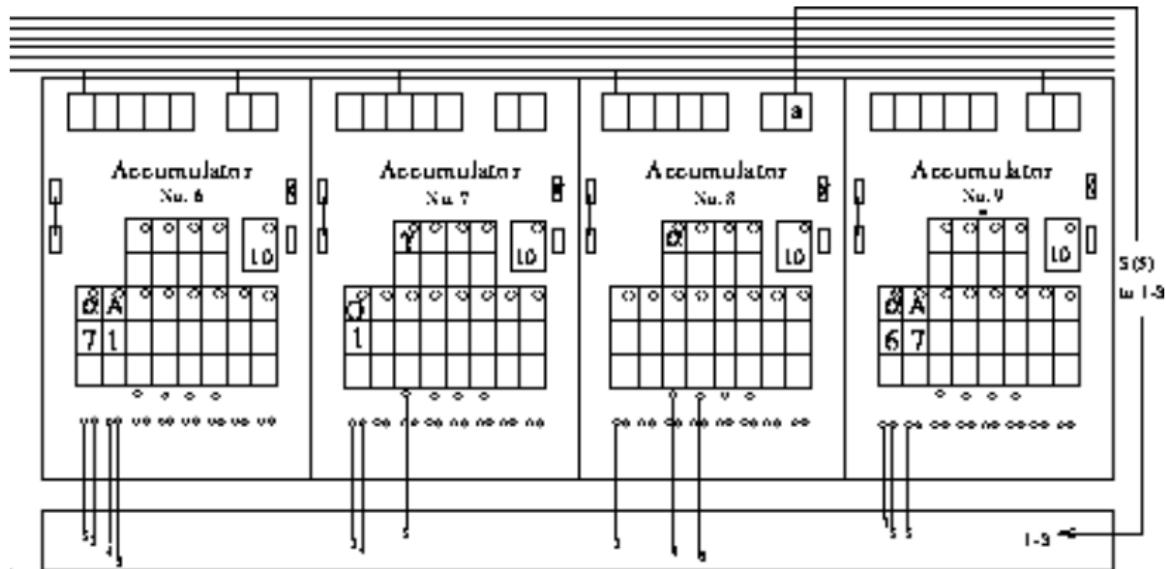


Figure: ENIAC Programming

ENIAC Program

- ① Leave the existing programming on Accumulators 6 and 9 intact.
- ② Set Accumulator 8 to clear by removing all cables from it.
- ③ Set Accumulator 7 to take care of the dummy program.
 - ① Attach Program Line 1-3 to program input terminal 5i.
 - ② Attach Program Line 1-4 to program output terminal 5o.
 - ③ Set the Operation Switch for Program Control 5 to 0.
 - ④ Set the Repeat Switch for Program Control 5 to 1.
- ④ Set Accumulator 6 to transmit.
 - ① Change connection of program output input terminal 6i from Program Line 1-3 to Program Line 1-4.
 - ② Connect Program Line 1-5 to program

- ① Set Accumulator 8 to receive input.
 - ① Connect Program Line 1-4 to program input terminal 1i.
 - ② Connect digit input terminal α to the Digit Line.
 - ③ Set the Operation Switch for Program Control 1 to α .
- ② Set Accumulator 8 to branch.
 - ① Connect Program Line 1-5 to program input terminal 2i.
 - ② Set the Operation Switch for Program Control 2 to S.
 - ③ Now use the special cable to connect decade 5 from digit output terminal S to Program Line 1-3.
- ③ Clear the Eniac.
- ④ Start the Eniac.

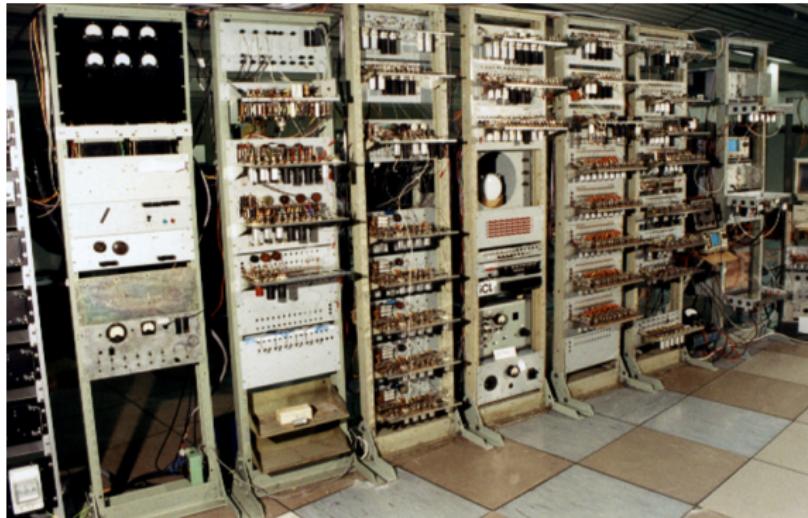
The Baby

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The Manchester Small Scale Experimental Machine: The Baby [4]



The world's first stored-program electronic digital computer.

The First Baby Program: 21st June 1948 [4]

1917/48 Kilburn Highest Factor Routine (amended)

function	C	25	26	27	Line	0	1	2	3	4	5	13	4	6
-245 C	-6 _n	-	-	-	1	0	0	0	1	1	0	1	0	
+2526	-	-6 _n	-	-	2	0	1	0	1	1	1	0		
-265 C	6 _n	-	-	-	3	0	1	0	1	1	0	1		
+2727	-	6 _n	6 _n	-	4	1	1	0	1	1	0			
-235 C	a	T _{an}	-6 _n	b _n	5	1	1	0	1	0	1	0		
subr. 27	a-a/b _n	-	-	-	6	1	0	1	1	0	0	1		
Test	-	-	-	-	7	-	-	-	-	-	-	-		
odd 20 40	-	-	-	-	8	0	0	1	0	1	0	0	0	
subr. 26	r _n	-	-	-	9	0	1	0	1	1	0	1		
+25 25	r _n	-	-	-	10	1	0	0	1	1	0			
-25 GC	-	-	-	-	11	1	0	0	1	1	0			
Test	-	-	-	-	12	-	-	-	-	-	-	0	1	
Stop	0	0	-6 _n	b _n	13	-	-	-	-	-	-	-	-	
-265 C	b _n	r _n	-6 _n	b _n	14	0	1	0	1	1	0			
subr. 21	r _n	-	-	-	15	1	0	1	0	1	0	0	1	
+2727	b _n	-	-	-	16	1	1	0	1	1	1	0		
-275 C	b _n	-	-	-	17	1	1	0	1	1	0	1		
+2726	r _n	-	-	-	18	0	1	0	1	1	1	0		
+276 C	r _n	b _n	r _n	-	19	0	1	0	1	0	0	0		
						out	read							
20	-3	10111100	123	-a		25	-	-	-	-	-			
21	1	10000	24	b _n		26	-	-	-	-	-			
22	4	00100				27	-	-	-	-	-			

or 10100

The Baby Characteristics [4]

- 32-bit word length
- Serial binary arithmetic using 2's complement integers
- A single address format order code
- A random access main store of 32 words, extendable up to 8192 words
- A computing speed of around 1.2 milliseconds per instruction
- Program and data in the same “RAM”.

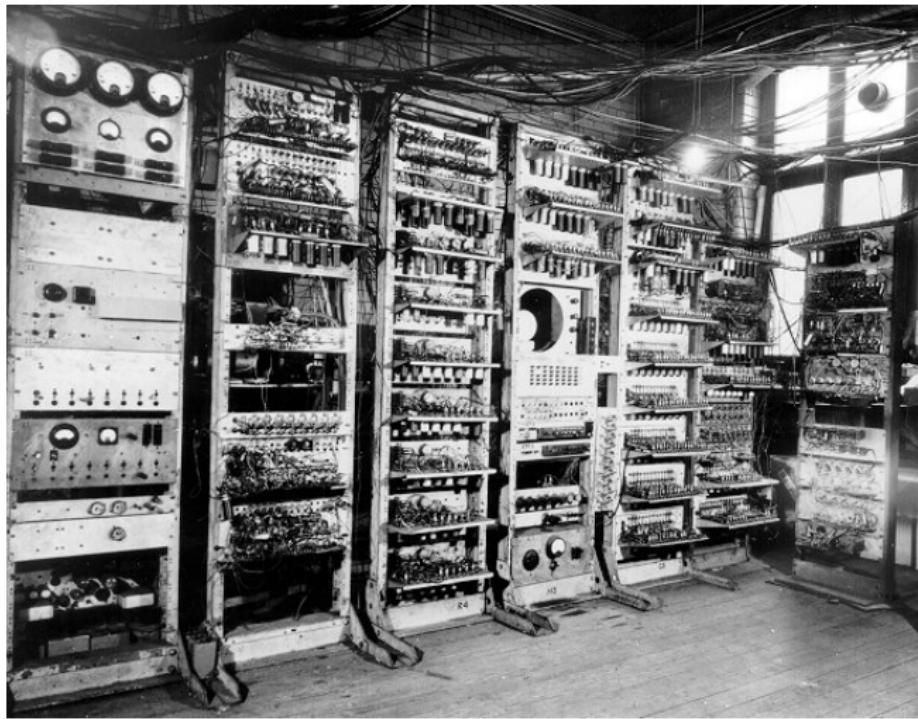
The Baby Instructions [4]

The instruction format was : 3-bit function field (bits 13 to 15) – 13-bit store address (0 to 12) – 16 bits unused

There were 7 instructions:

- $A := -S$ ("S": the contents of the word with address S)
- $A := A - S$
- $S := A$
- If $A < 0$, $CI := CI + 1$ (if A negative, skip the next instruction)
- $CI := S$
- $CI := CI + S$
- Halt the program

Manchester Mark I



Ferranti Pegasus

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Some Early Machines

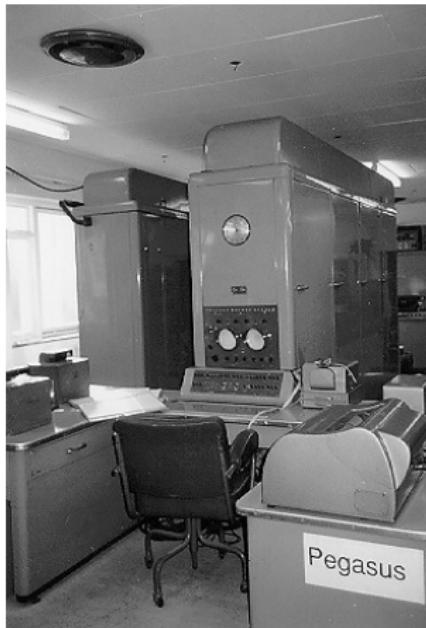


Figure: Ferranti Pegasus

Some Early Machines



Figure: Ferranti Pegasus

Some Early Machines



Figure: Kraftwerk

Some Early Machines



Figure: The Robots — Kraftwerk, 1978

Some Early Machines



Figure: Minimum Maximum — Kraftwerk

Some Early Machines

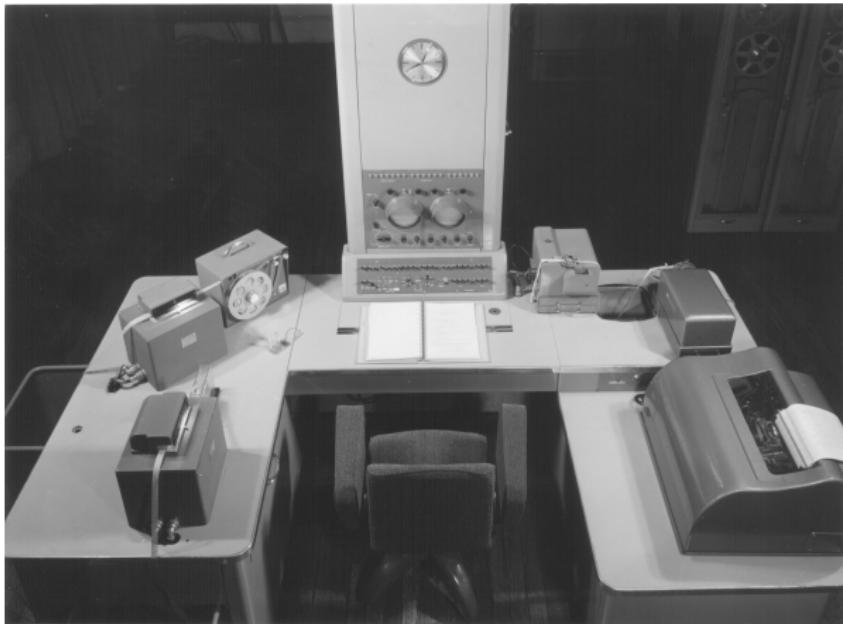


Figure: Ferranti Pegasus

Some Early Machines



Figure: Ferranti Pegasus Assembly Chain

Code Machine

1.3 521
3.0 1125

Instruction “21” Take the number at address 1.3, multiply it by that in accumulator 5, store the result in accumulators 6 & 7.

Instruction “12” Transfer the content of accumulator 1 to address 3.0 “as modified by the number in accumulator 5” .

Autocode

```
v10=TAPEB*
n1=v10
n0=n1
v0=0.0
1)v0=v0+v(10+n0)
n0=n0-1
->1,n0f0
v1=v0/n1
n2=0
2)v2=v(10+n1)
->3n1=n1-1
->2,n1f0
PRINTv1,1025
PRINTn2,2025
(->0)
```

Integer variables (n0, n1...), floating (v1, v2...).

Interpreted language.

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