# The History of Computing in 50 Books

Minor Gordon, PhD
mail@minorgordon.net
minorgordon.net/hc50b

# Introduction

My background:

- Software developer
- Studied computer science
- Passionate about history

History:  > 20 years ago

Books in UHLS

“Clothing Clues: How Fashion Can Help You Date Historical Photographs” (10/1 @ 6:00 PM)



A Jacquard loom showing information punchcards (1800s)
Photo © Wikipedia user Stephencdickson
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# Keith Houston: *Empire of the Sum*

History of calculating devices

- Abacus
- Slide rule
- Mechanical calculators
- Electronic calculators

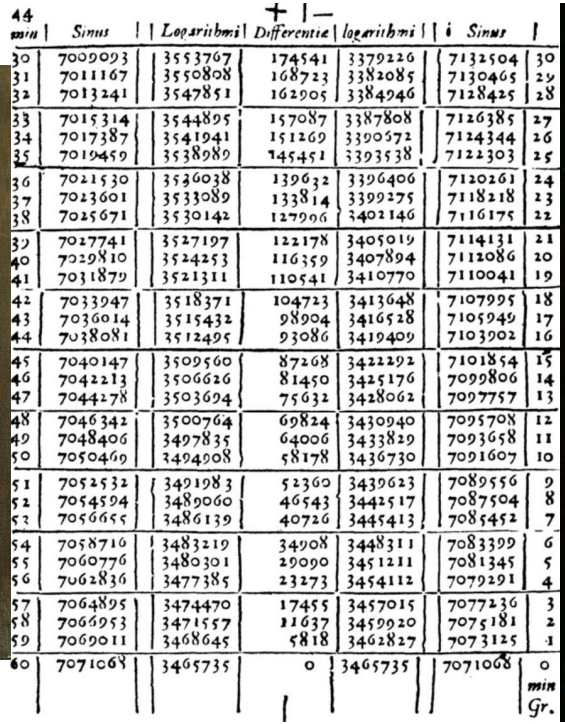



Curta Type 11 mechanical computer (1948)
Photo © Wikipedia user Prioryman
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# Charles Petzold: *The Lost Art of Logarithms (in progress)*




Portrait of John Napier, discoverer of logarithms and popularizer of the decimal point in mathematics
Photo in public domain



| 44 min | Sinus | Logarithmi | + Differentiæ | − logarithmi | i Sinus | |
|---|---|---|---|---|---|---|
| 30 | 7009093 | 3553767 | 174541 | 3379226 | 7132504 | 30 |
| 31 | 7011167 | 3550808 | 168723 | 3382085 | 7130465 | 29 |
| 32 | 7013241 | 3547851 | 162905 | 3384946 | 7128425 | 28 |
| 33 | 7015314 | 3544895 | 157087 | 3387808 | 7126385 | 27 |
| 34 | 7017387 | 3541941 | 151269 | 3390672 | 7124344 | 26 |
| 35 | 7019459 | 3538989 | 145451 | 3393538 | 7122303 | 25 |
| 36 | 7021530 | 3536038 | 139632 | 3396406 | 7120261 | 24 |
| 37 | 7023601 | 3533089 | 133814 | 3399275 | 7118218 | 23 |
| 38 | 7025671 | 3530142 | 127996 | 3402146 | 7116175 | 22 |
| 39 | 7027741 | 3527197 | 122178 | 3405019 | 7114131 | 21 |
| 40 | 7029810 | 3524253 | 116359 | 3407894 | 7112086 | 20 |
| 41 | 7031879 | 3521311 | 110541 | 3410770 | 7110041 | 19 |
| 42 | 7033947 | 3518371 | 104723 | 3413648 | 7107995 | 18 |
| 43 | 7036014 | 3515432 | 98904 | 3416528 | 7105949 | 17 |
| 44 | 7038081 | 3512495 | 93086 | 3419409 | 7103902 | 16 |
| 45 | 7040147 | 3509560 | 87268 | 3422292 | 7101854 | 15 |
| 46 | 7042213 | 3506626 | 81450 | 3425176 | 7099806 | 14 |
| 47 | 7044278 | 3503694 | 75632 | 3428062 | 7097757 | 13 |
| 48 | 7046342 | 3500764 | 69824 | 3430940 | 7095708 | 12 |
| 49 | 7048406 | 3497835 | 64006 | 3433829 | 7093658 | 11 |
| 50 | 7050469 | 3494908 | 58178 | 3436730 | 7091607 | 10 |
| 51 | 7052532 | 3491983 | 52360 | 3439623 | 7089556 | 9 |
| 52 | 7054594 | 3489060 | 46543 | 3442517 | 7087504 | 8 |
| 53 | 7056655 | 3486139 | 40726 | 3445413 | 7085452 | 7 |
| 54 | 7058716 | 3483219 | 34908 | 3448311 | 7083399 | 6 |
| 55 | 7060776 | 3480301 | 29090 | 3451211 | 7081345 | 5 |
| 56 | 7062836 | 3477385 | 23273 | 3454112 | 7079291 | 4 |
| 57 | 7064895 | 3474470 | 17455 | 3457015 | 7077236 | 3 |
| 58 | 7066953 | 3471557 | 11637 | 3459920 | 7075181 | 2 |
| 59 | 7069011 | 3468645 | 5818 | 3462827 | 7073125 | 1 |
| 60 | 7071068 | 3465735 | 0 | 3465735 | 7071068 | 0 |
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Page from John Napier's
*Mirifici logarithmorum canonis descriptio (1614)*
Photo in public domain

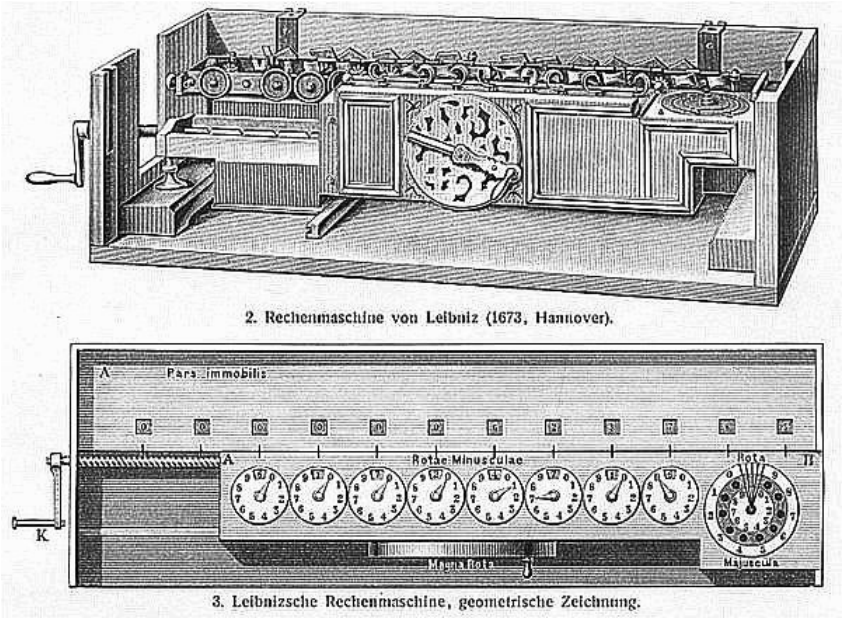


Buzz Aldrin with slide rule and pipe during Gemini 12 mission (1966)
Photo in public domain

# Neal Stephenson: the Baroque Cycle

*It is unworthy of excellent men to lose hours like slaves in the labour of calculation which could safely be relegated to anyone else if machines were used.*

Gottfried Wilhelm Leibniz

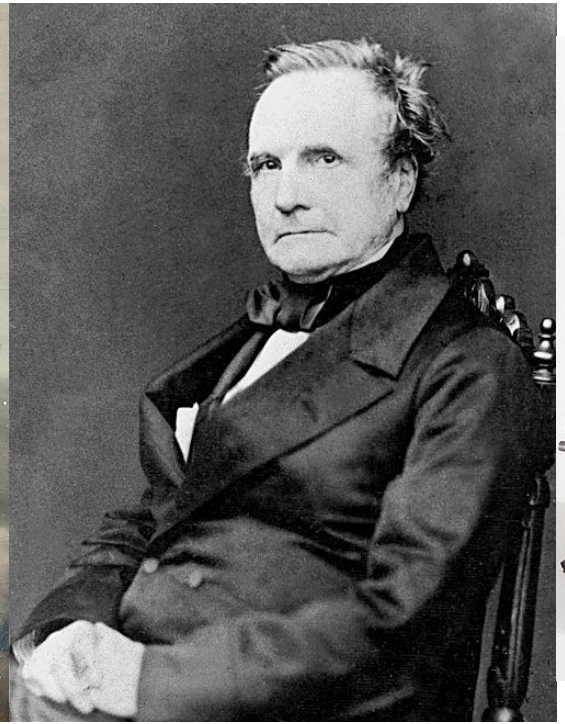



Stepped Reckoner (replica, original 1694)
Photo in public domain

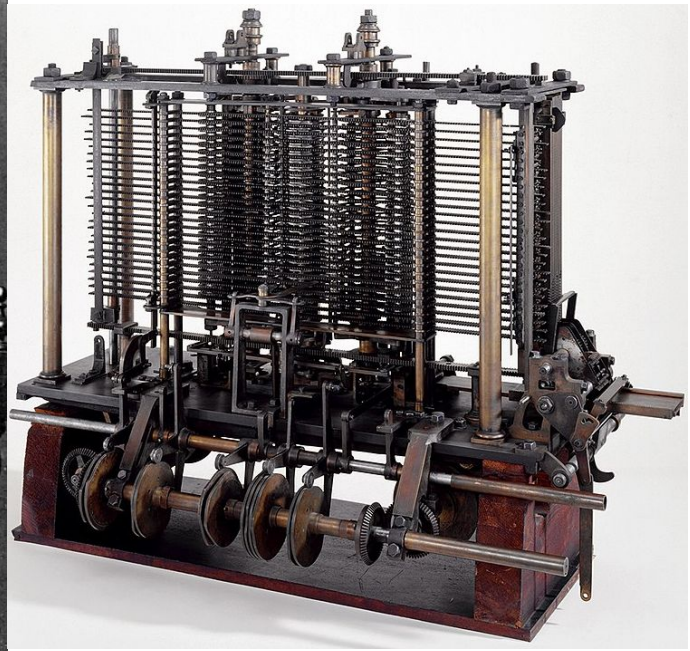
# Sydney Padua: *Thrilling Adventures of Lovelace and Babbage*



Ada Lovelace
Photo in public domain



Charles Babbage
Photo in public domain



Analytical engine
Photo © Wikipedia user Mrjohncummings
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# Charles Petzold: *Computer of the Tides* (in progress)

Special-purpose analog computer designed by William Thomson (Lord Kelvin).

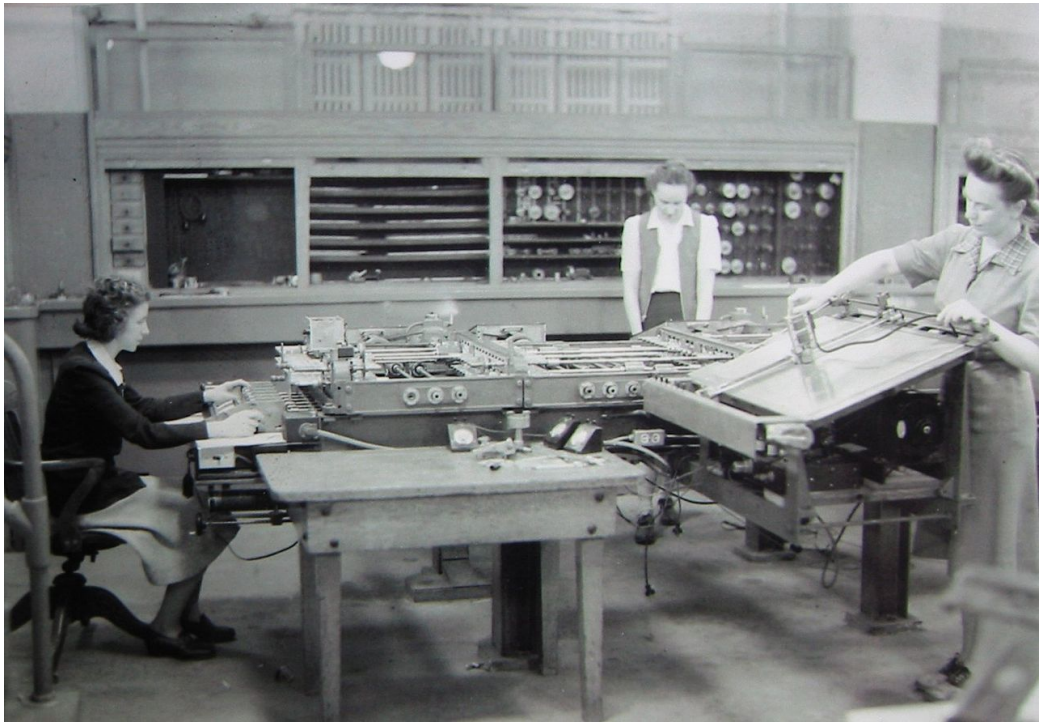
*Thomson was convinced that the world was not old enough for evolution by means of natural selection to occur. He spent the last 40 years of his life in an obsessive quest to establish the age of the earth, and believed that the tides provided a vital clue.*



Tide-predicting machine (1872-73)
Photo © Wikipedia user William M. Connolley
CC BY-SA 3.0

# Vannevar Bush: *Pieces of the Action*

- Differential analyzer built at MIT, 1928-1931
- “Incorporates the same basic idea of interconnection of integrating units as did [Lord Kelvin’s].”
- Claude Shannon ran the differential analyzer in Bush’s lab.

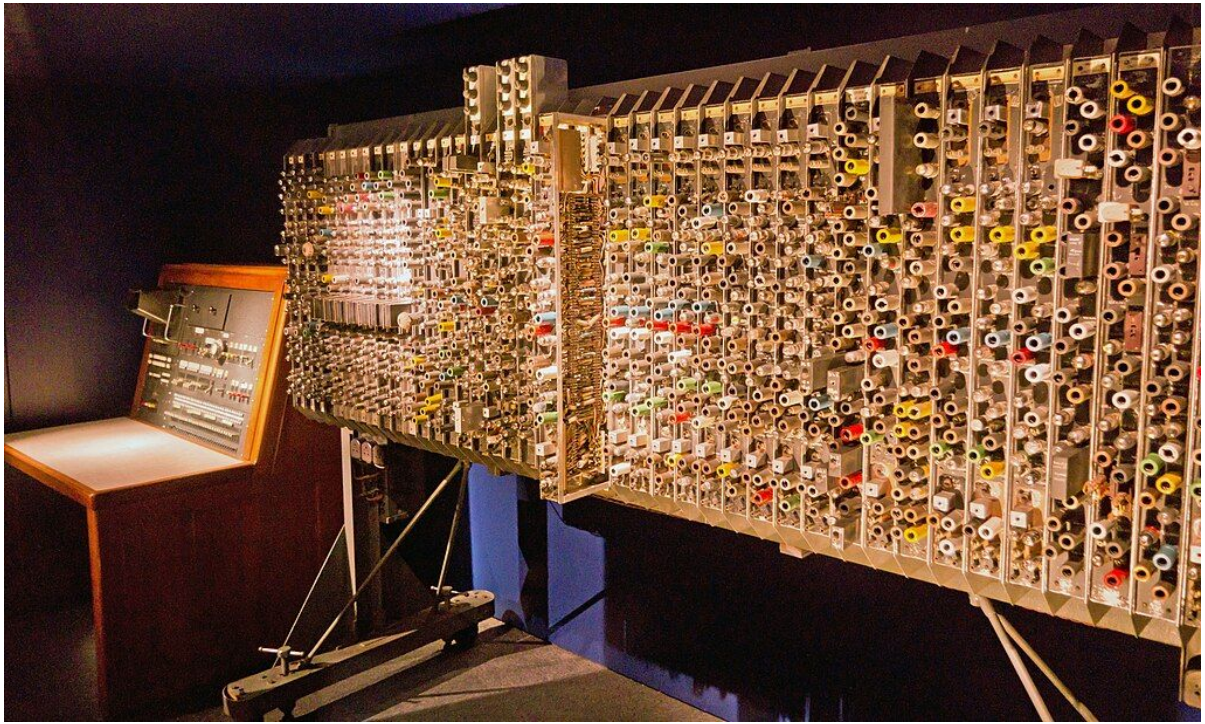


Differential analyser (1942-1945)
Photo in public domain

# Andrew Hodges: *Alan Turing: The Enigma*



Alan Turing in 1951
Photo in public domain

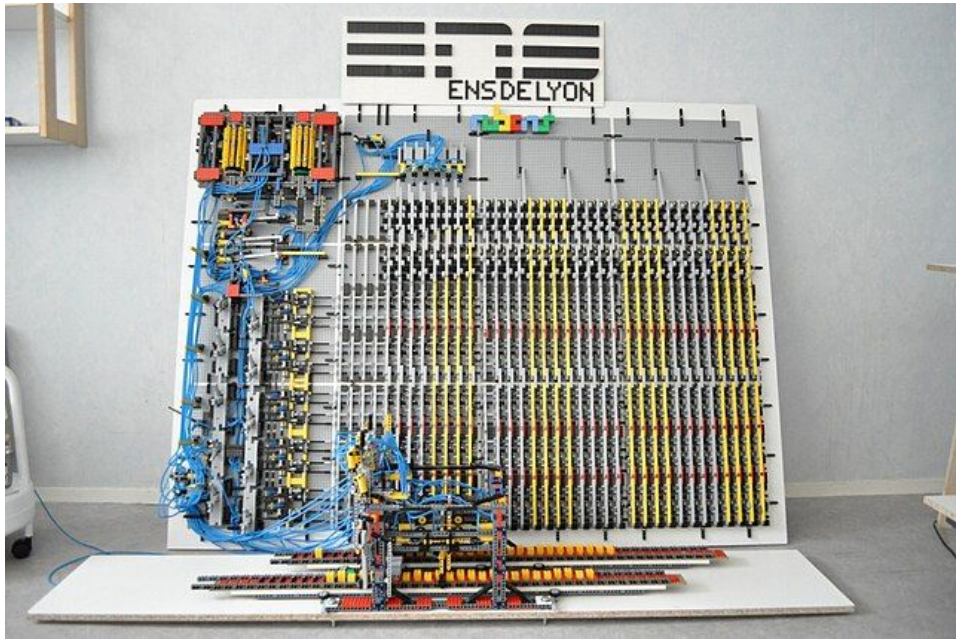


Pilot ACE (Automatic Computing Engine) at the National Physical Laboratory (1950)
Photo © Antoine Taveneaux
CC BY-SA 3.0

# Charles Petzold: *The Annotated Turing*

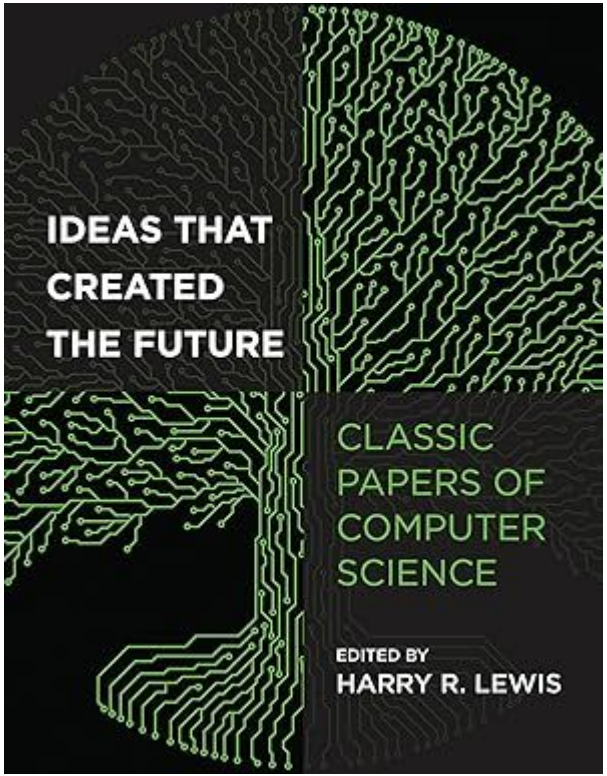
*A Guided Tour Through Alan Turing's Historic Paper on Computability and the Turing Machine*

Annotation and contextualization of Alan Turing's paper "On Computable Numbers, with an Application to the Entscheidungsproblem" (1936)



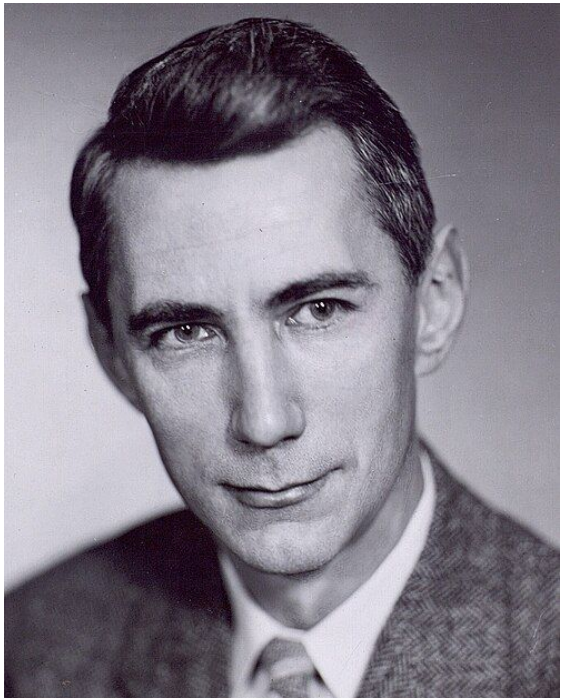

A Turing machine realization using Lego pieces
Photo © Project Rubens, ENS Lyon
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# Harry R. Lewis (ed.): *Ideas That Created the Future*

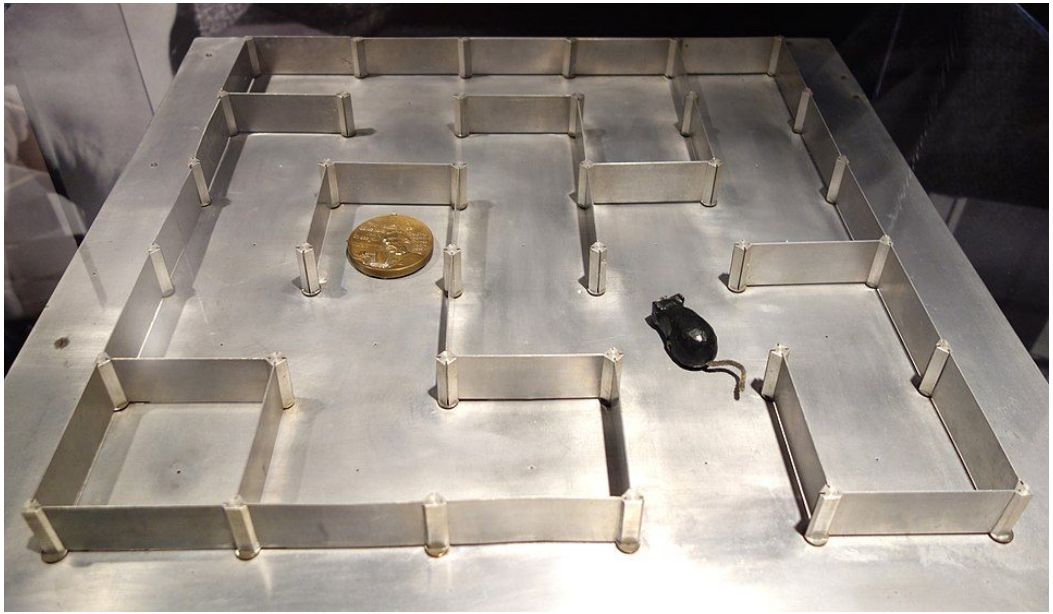



- Boole: “An Investigation of the Laws of Thought” (1854)
- Turing: “On Computable Numbers…” (1936)
- Shannon: “A Symbolic Analysis of Relay and Switching Circuits” (1936)
- McCulloch/Pitts: “A Logical Calculus of the Ideas Immanent in Nervous Activity” (1943)
- von Neumann: “First Draft of a Report on the EDVAC” (1945)
- Bush: “As We May Think” (1945)

# Jimmy Soni and Rob Goodman: *A Mind at Play*

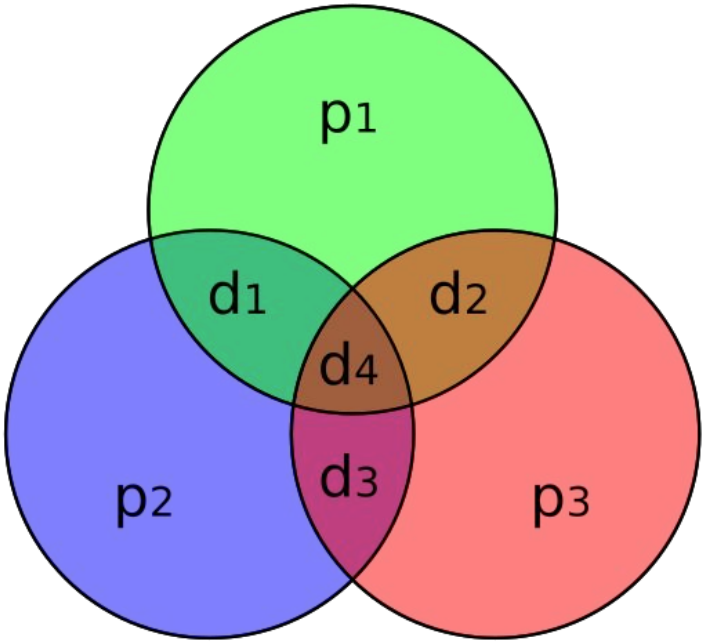


Claude Shannon
Photo © Tekniska Museet
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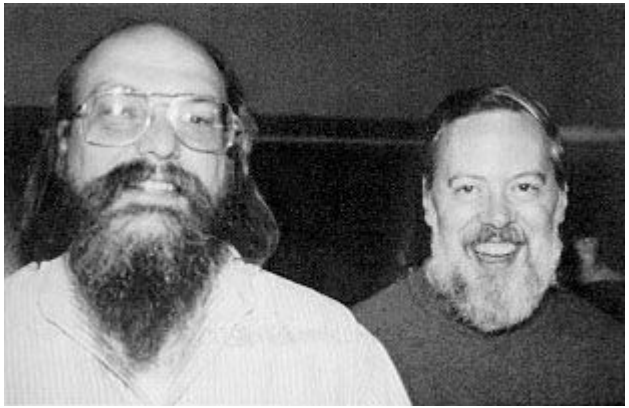


Theseus Maze (1952)
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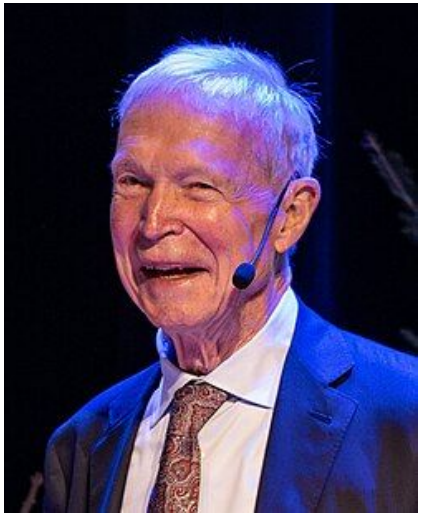
# Jon Gertner: *The Idea Factory: the Bell Labs and the Great Age of American Innovation*




(7, 4) Hamming code
Image © Wikipedia user Cburnett
CC BY-SA 3.0



Ken Thompson and Dennis Ritchie
Photo in public domain



John Hopfield
Photo © Arthur Petron
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# Raúl Rojas and Ulf Hashhagen: *The First Computers*

Focuses on the actual architectures of the first electronic computers

Also see:

- Blaauw and Brooks: *Computer Architecture: Concepts and Evolution*
- Hennessy and Patterson: *Computer Architecture*

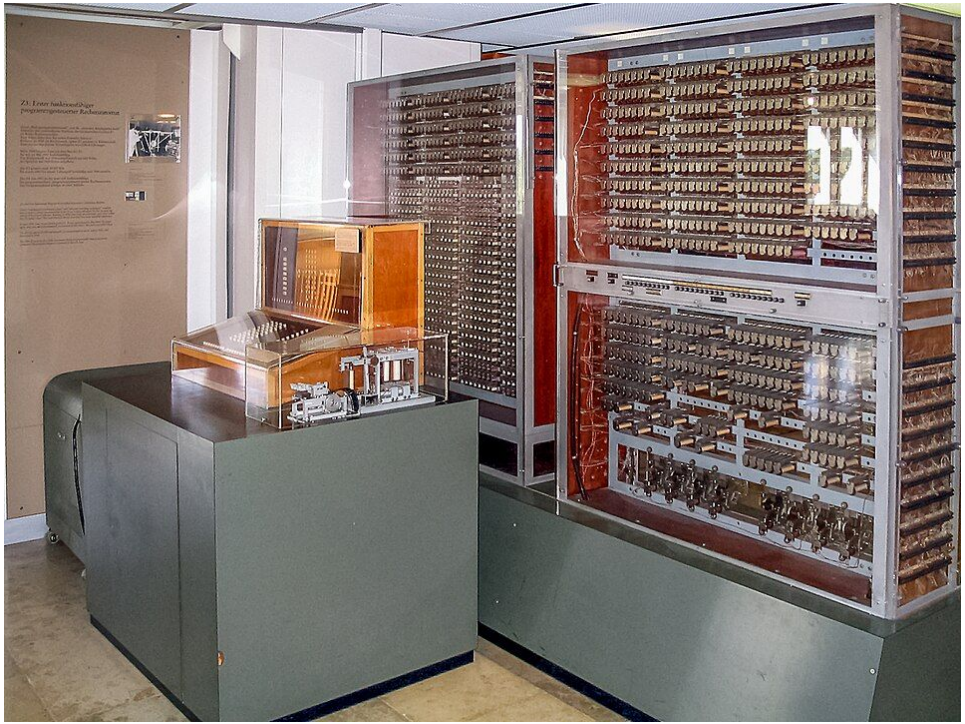


Maurice Wilkes inspecting the mercury delay line of the EDSAC (1949) in construction
Photo © Computer Laboratory, University of Cambridge
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# Raúl Rojas: *Konrad Zuse's Early Computers*

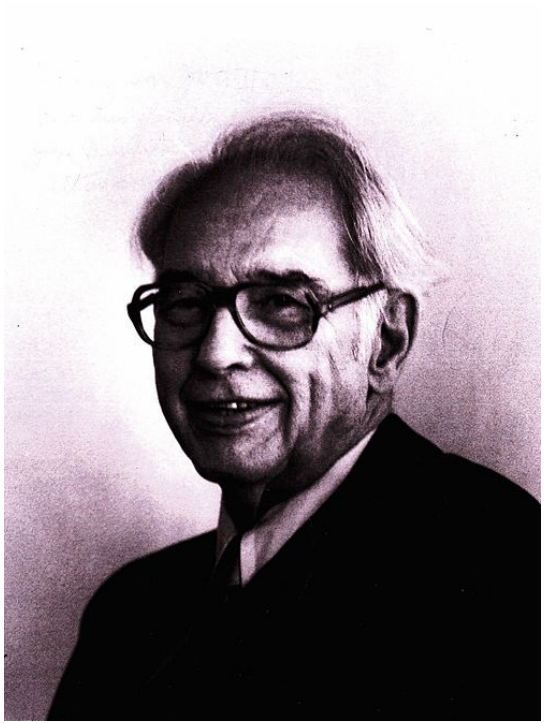


Konrad Zuse in 1992
Photo © Wolfgang Hunscher
CC BY-SA 3.0

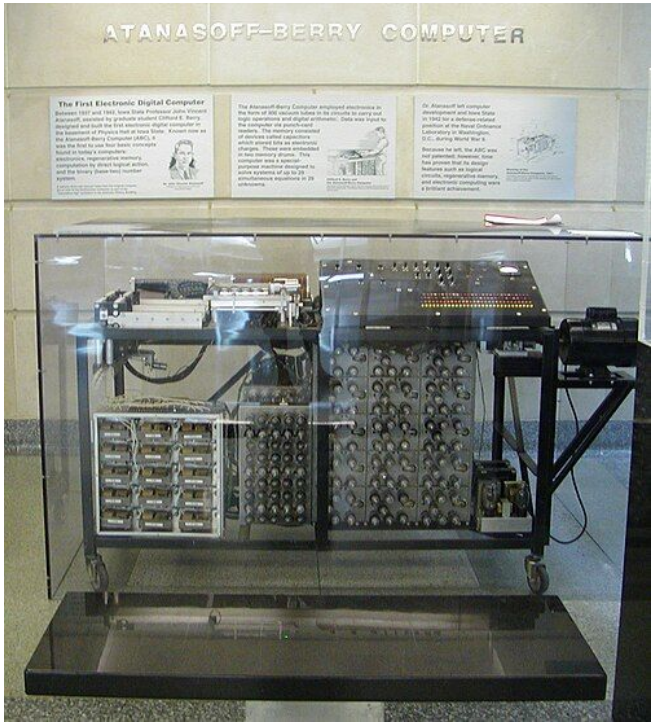


Replica of the Zuse Z3 at the Deutsches Museum (original destroyed in 1943)
The world's first programmable, fully automatic digital computer (still electromechanical)
Photo © Wikipedia user Venusianer CC BY-SA 3.0

# Jane Smiley: *The Man Who Invented the Computer*

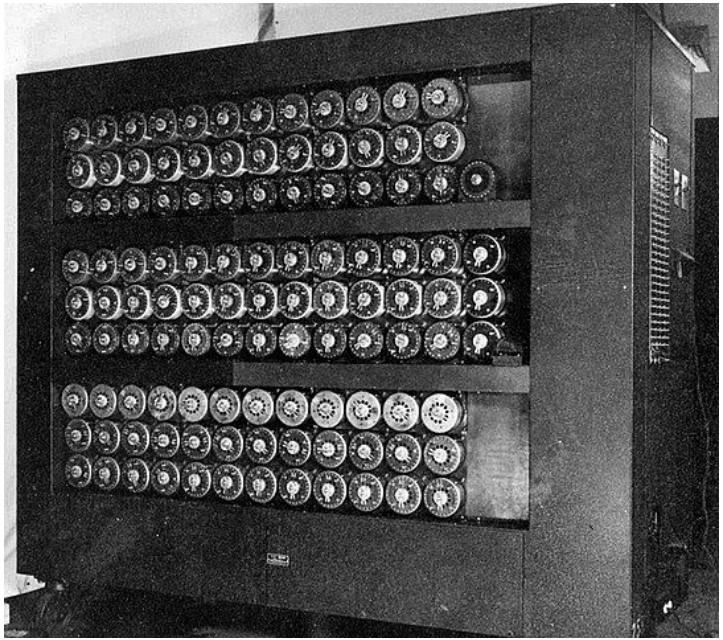


John Atanasoff
Photo © Eye Steel Film
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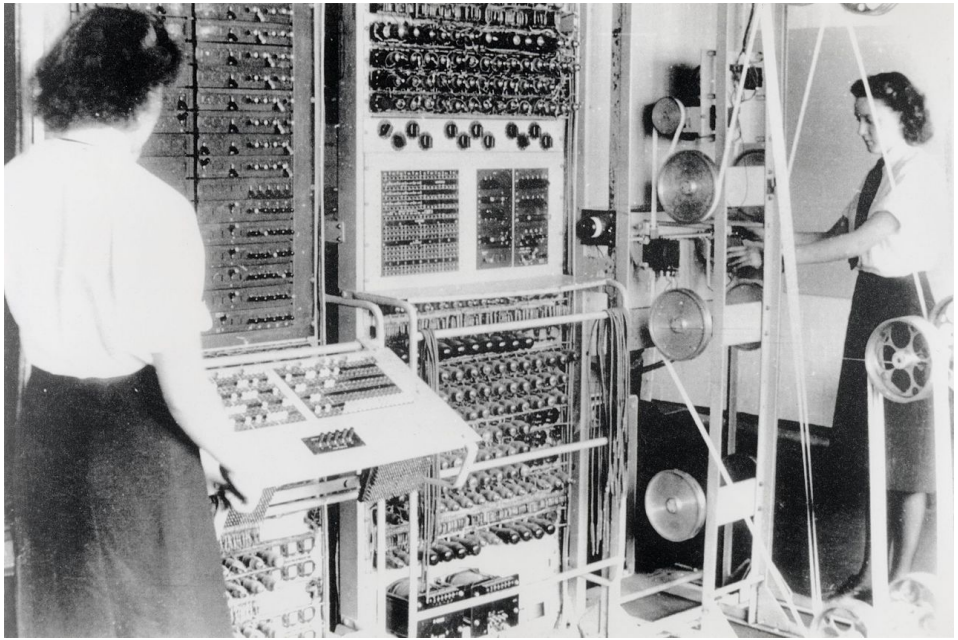



Replica of the Atanasoff–Berry computer (1939) at Iowa State University
Photo © Wikipedia user Manop
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# David Price: *Geniuses at War*



A Bletchley Park Bombe (1940)
Photo in public domain



A Colossus Mark 2 computer (1944) being operated by Wrens
Photo in public domain

# Neal Stephenson: *Cryptonomicon*



Military Model Enigma I (1930–)
Photo in public domain



Captured German U-boats outside their pen at Trondheim in Norway, May 1945
Photo in public domain

# David Kahn: *The Codebreakers – The Story of Secret Writing*

Comprehensive history of cryptography from ancient Egypt to the time of its writing (1967)

Also see James Bamford's *The Puzzle Palace* and its sequels

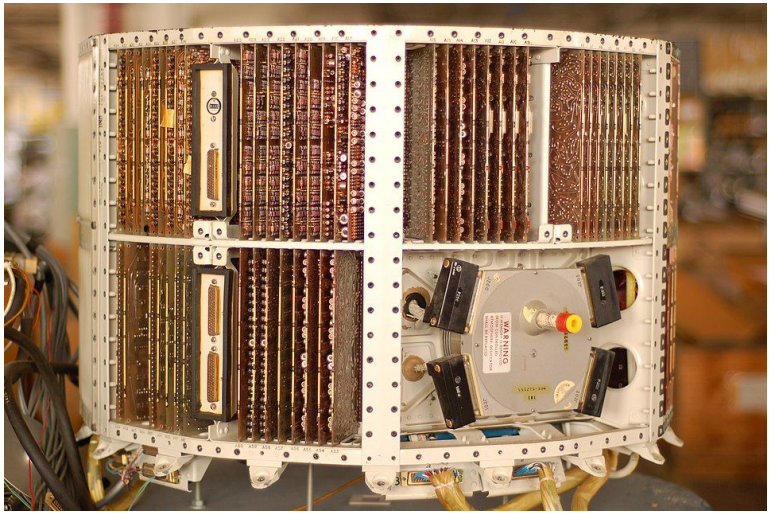


Purple analog equipment in use (~1944)
at the U.S. Army Signal Intelligence Service during WWII
Photo in public domain

# John Alderman: *Core Memory: A Visual Survey of Vintage Computers*




Semi-Automatic Ground Environment (SAGE) console (1958 –)
Photo © Joi Ito
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Minuteman guidance computer (1962)
Photo © Wikipedia user Jnanna
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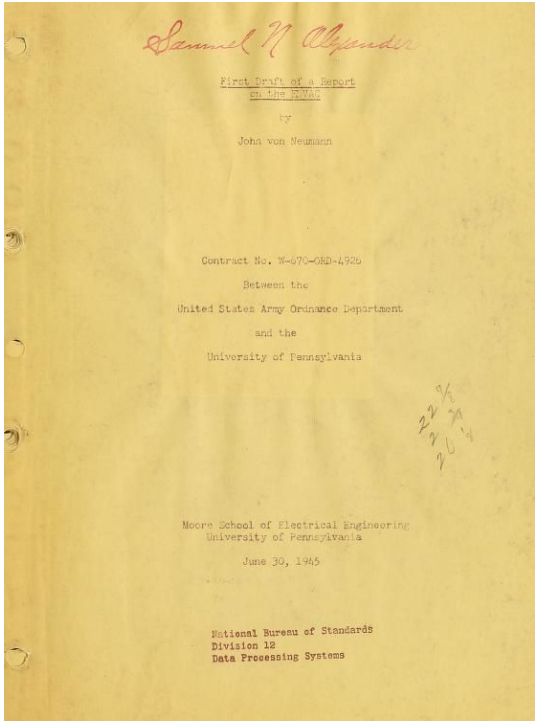
# Martin Campbell-Kelly, et al.: *Computer*

*Eckert's standards were the highest, his energies almost limitless, his ingenuity remarkable, and his intelligence extraordinary. From start to finish it was he who gave the project its integrity and ensured its success. This is of course not to say that the ENIAC development was a one-man show. It was most clearly not. But it was Eckert's omnipresence that drove everything forward at whatever cost to humans including himself.*



J. Presper Eckert (center), co-designer of the UNIVAC, and Harold Sweeny of the US Census Bureau at the console of the UNIVAC, with Walter Cronkite (r.) during Presidential election night, 1952
Photo in public domain

# William Aspray: *John von Neumann and the Origins of Modern Computing*



First Draft of a Report
on the EDVAC

by

John von Neumann

Contract No. W-670-ORD-4926

Between the

United States Army Ordnance Department

and the

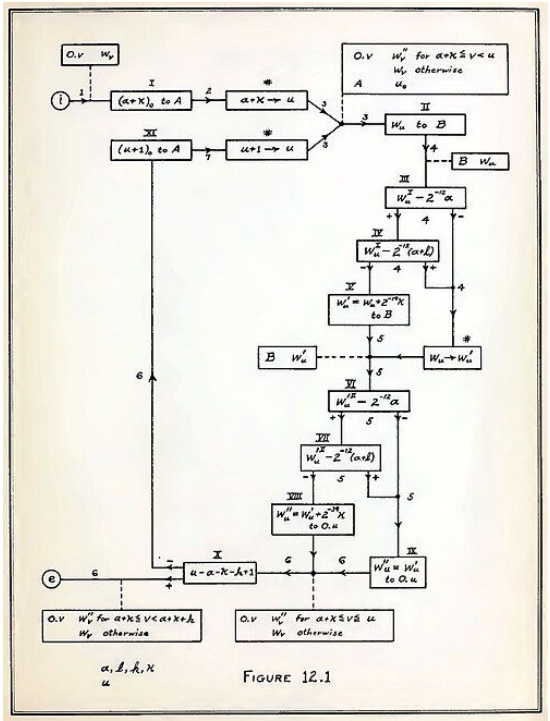
University of Pennsylvania

Moore School of Electrical Engineering
University of Pennsylvania

June 30, 1945

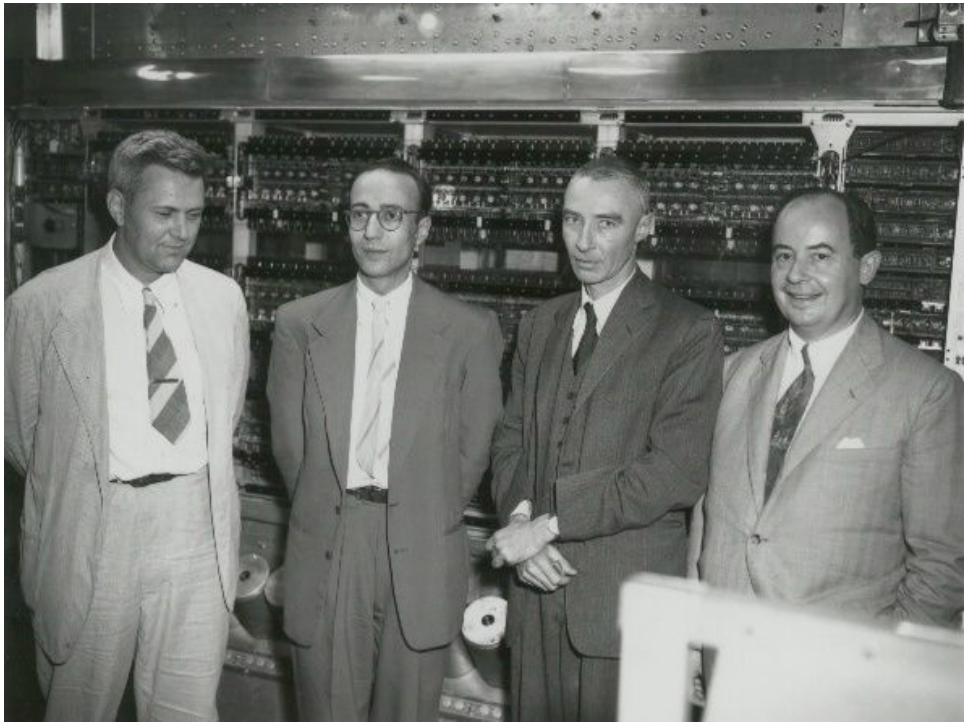
National Bureau of Standards
Division 12
Data Processing Systems

Hardware: title page of First Draft of a Report on the EDVAC (1945)
Photo in public domain




Software: Flow chart from von Neumann's "Planning and coding of problems for an electronic computing instrument" (1947)
Photo in public domain

# George Dyson: *Turing's Cathedral*



Julian Bigelow, Herman Goldstine, J. Robert Oppenheimer, and John von Neumann
at the Institute for Advanced Study in front of early computer MANIAC (1952)
Photo © Wikipedia user lbigelow CC BY-SA 3.0

# Joel Shurkin: *Broken Genius*



John Bardeen, William Shockley, and Walter Brattain (1948)
Photo in the public domain

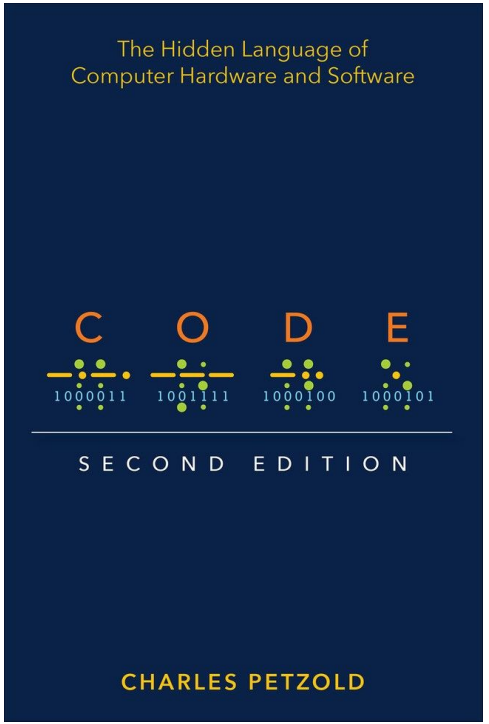
The traitorous eight (1957):

- Julius Blank
- Victor Grinich
- Jean Hoerni
- Eugene Kleiner
- Jay Last
- Gordon Moore
- Robert Noyce
- Sheldon Roberts

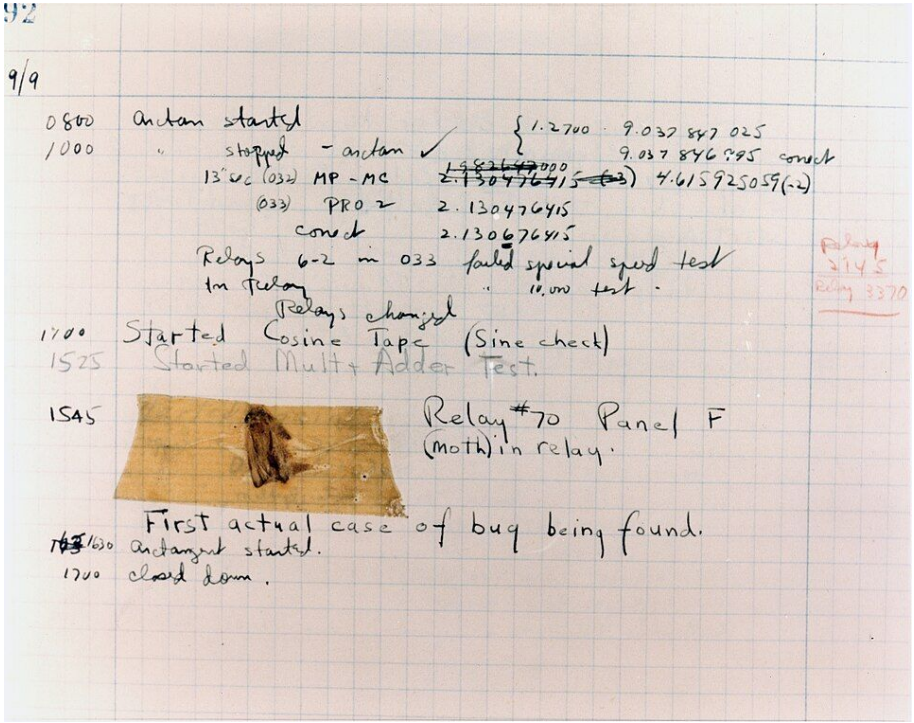
# Charles Petzold: *Code*

*The Hidden Language of Computer Hardware and Software*

The best single-volume introduction to what code is and how it works



# Kurt Beyer: *Grace Hopper and the Invention of the Information Age*




Log book showing the "bug" found caught in a Mark II relay
Photo in public domain



Grace Hopper at the UNIVAC I console, c. 1960
Photo © Wikipedia user Jan Arkesteijn
CC BY 2.0

# Martin Campbell-Kelly: *From Airline Reservations to Sonic the Hedgehog*

Best single-volume history of the software industry



Pre-computer PanAm reservation room

From D. G. Copeland, R. O. Mason and J. L. McKenney, "Sabre: the development of information-based competence and execution of information-based competition," in IEEE Annals of the History of Computing, vol. 17, no. 3, pp. 30-57, Fall 1995.

# Lance Fortnow: *The Golden Ticket*

*P, NP, and the Search for the Impossible*

An introduction to computational complexity theory and the history of its development




Traveling salesman problem
Image in public domain

# Margot Lee Shetterly: *Hidden Figures*



Katherine Johnson working at the
Spacecraft Controls Branch of NASA (1966)
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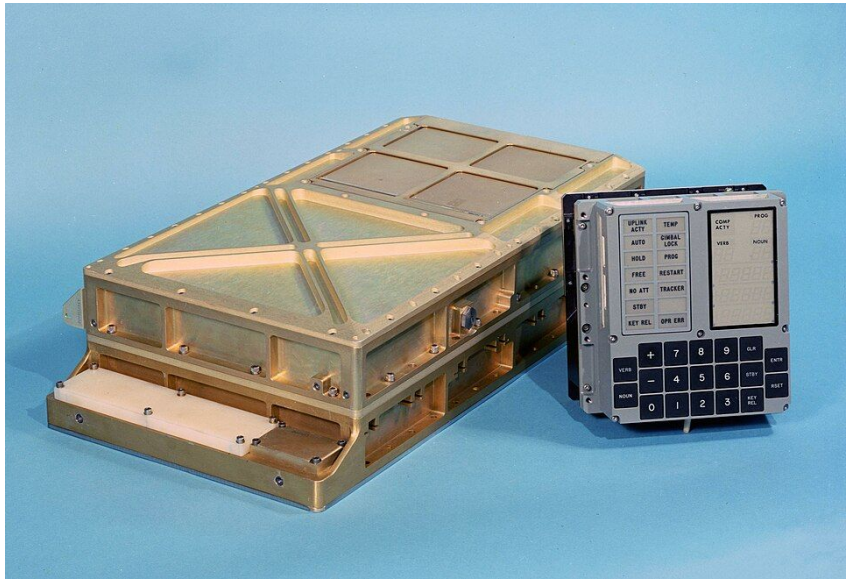


Mary Jackson working at the
Langley Research Center (1977)
Photo in public domain

# Dean Robbins: *Margaret and the Moon*



Margaret Hamilton, standing next to listings of the Apollo guidance software she and her MIT team produced (1969)
Photo in public domain



Apollo Guidance Computer and DSKY interface
Photo in public domain

# Charles Murray: *The Supermen*




Seymour Cray with a Cray-1 (1975)
Photo © Michael Hicks
CC BY 2.0



Cray X-MP (1982)
Photo © Wikipedia user Vcarceler
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# Tracy Kidder: *The Soul of a New Machine*



Data General Eclipse C/330 (1974)
Photo © Computer History Museum
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VAX 11/780 (1977)
Photo in the public domain

# Mitchell Waldrop: *The Dream Machine*

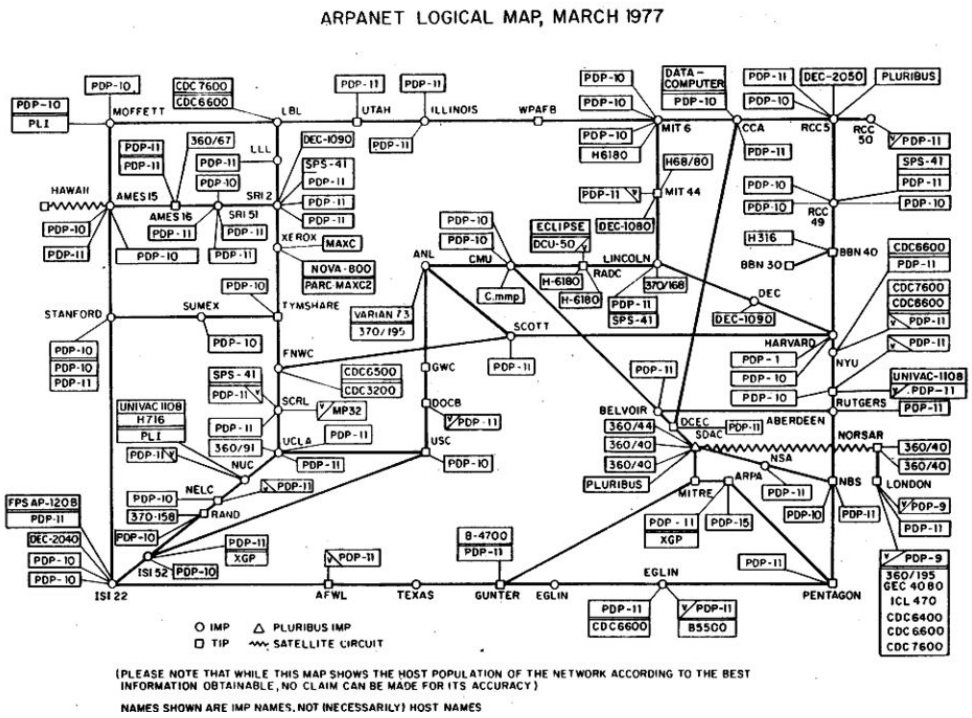


J. C. R. Licklider
Photo in the public domain

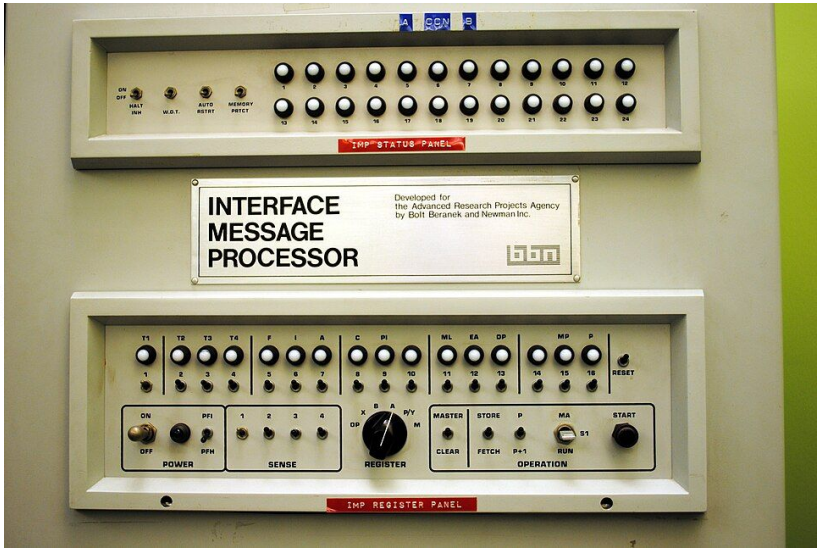
- SAGE system
- “Man-Computer Symbiosis”
- Director of ARPA Information Processing Techniques Office (1962)
  - SRI/Engelbart
  - Time-sharing systems
  - “Intergalactic Computer Network”

*Insofar as today’s interactive style of computing can be said to have a single parent, that parent was Licklider. The reason for his achievement was that he was a psychologist first and a computer scientist second.* (Campbell-Kelly et al., *Computer)*

# Katie Hafner: *Where Wizards Stay Up Late*




ARPANET logical map 3/1977
Image in the public domain




Interface Message Processor front panel
Photo © Wikipedia user FastLizard4
CC BY-SA 3.0

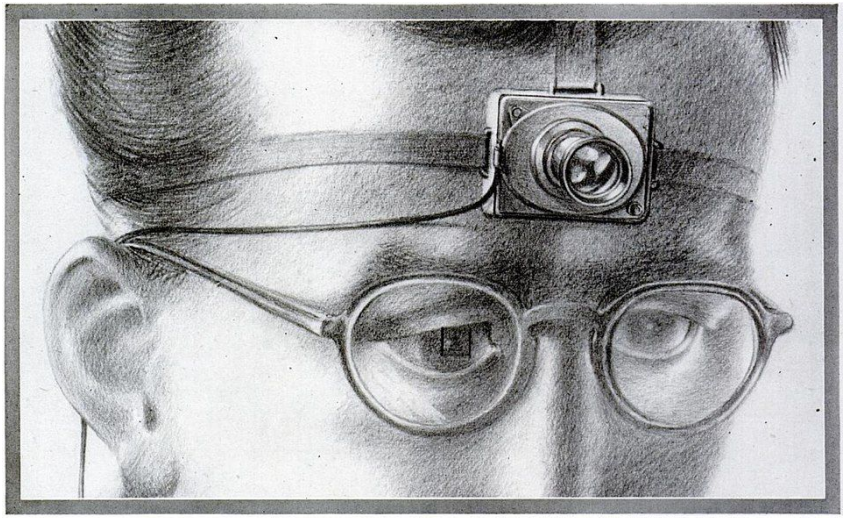
# John Markoff: *What the Dormouse Said*

*How the Sixties Counterculture Shaped the Personal Computer Industry*



Stewart Brand in 2020
Photo © Christopher Michel
CC BY 2.0

# Ted Nelson: *Possiplex*

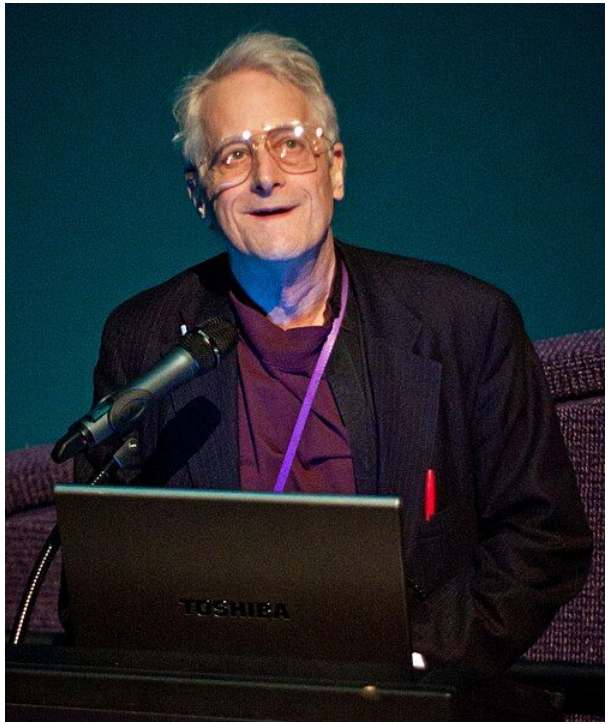


A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE IN THE EYEGLASS AT THE LEFT SIGHTS THE OBJECT

**AS WE MAY THINK**

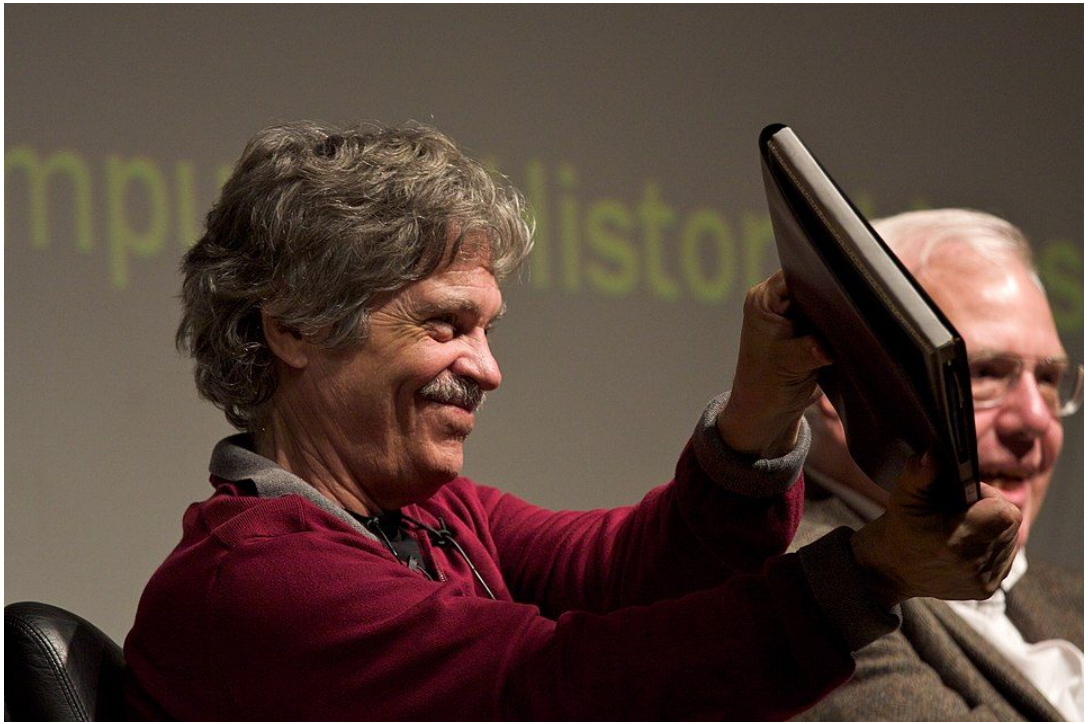
**A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD IN WHICH MAN-MADE MACHINES WILL START TO THINK**

Illustration and title of Vannevar Bush's article "As We May Think" (1945)
Image in the public domain




Ted Nelson in 2011
Photo © Wikipedia user Dgies
CC BY-SA 3.0

# Michael Hiltzik: *Dealers of Lightning*



Alan Kay holding a prototype of the Dynabook
Photo © Marcin Wichary
CC BY 2.0



Xerox Alto computer (1973)
Photo in the public domain

# Steven Levy: *Insanely Great*




Apple IIe (1977)
Photo © All About Apple museum
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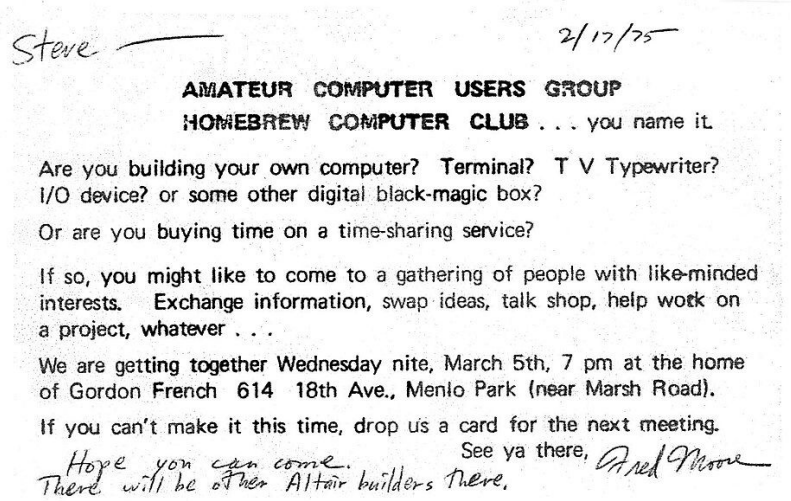



Apple Lisa (1983)
Photo © Timothy Colegrove
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Apple Macintosh (1984)
Photo © All About Apple museum
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# Steven Levy: *Hackers*



Steve — 2/17/75

**AMATEUR COMPUTER USERS GROUP**
**HOMEBREW COMPUTER CLUB** . . . you name it.

Are you building your own computer? Terminal? T V Typewriter? I/O device? or some other digital black-magic box?

Or are you buying time on a time-sharing service?

If so, you might like to come to a gathering of people with like-minded interests. Exchange information, swap ideas, talk shop, help work on a project, whatever . . .

We are getting together Wednesday nite, March 5th, 7 pm at the home of Gordon French 614 18th Ave., Menlo Park (near Marsh Road).

If you can't make it this time, drop us a card for the next meeting.

See ya there, Fred Moore

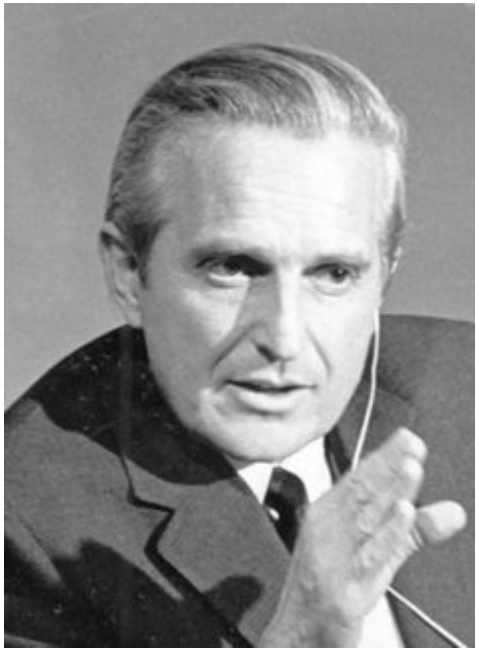
Hope you can come. There will be other Altair builders there.

Invitation to the Homebrew Computer Club (1975)
Photo © Wikipedia user Gotanero
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Steve Wozniak and Andy Hertzfeld (1985)
Photo © Tony Wills
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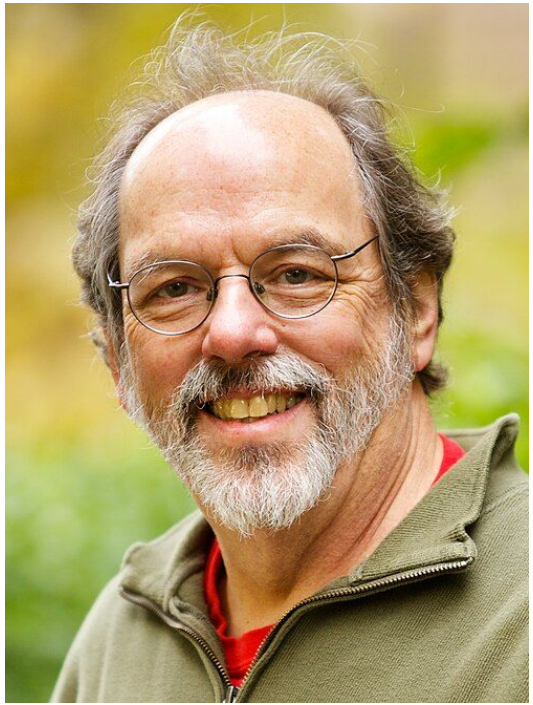
# Walter Isaacson: *The Innovators*



Douglas Engelbart (1968)
Photo © SRI International
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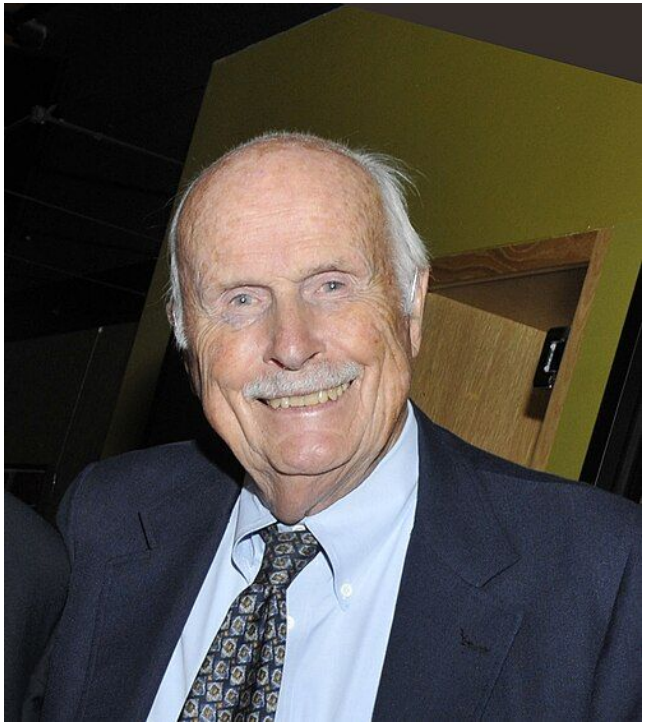


Leonard Kleinrock in 2023
Photo © Wikipedia user TippyZora
CC BY-SA 4.0



Ward Cunningham in 2011
Photo © Carrigg Photography
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# Leslie Berlin: *Troublemakers*

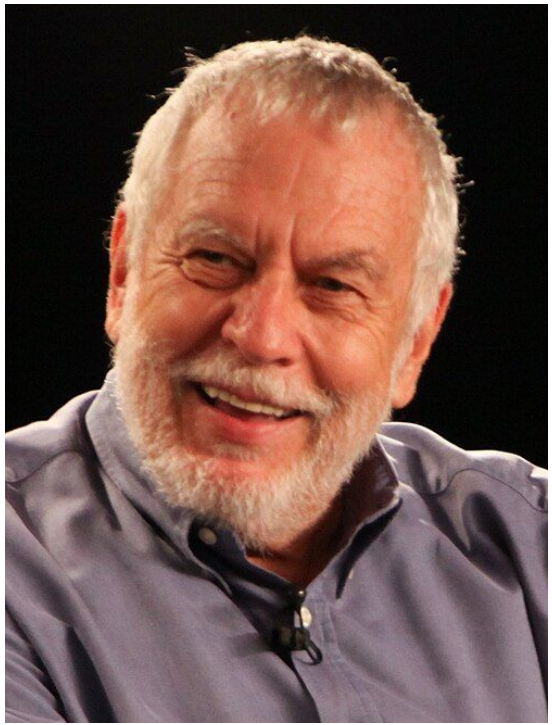


Niels Reimers in 2016
Photo © Science History Institute
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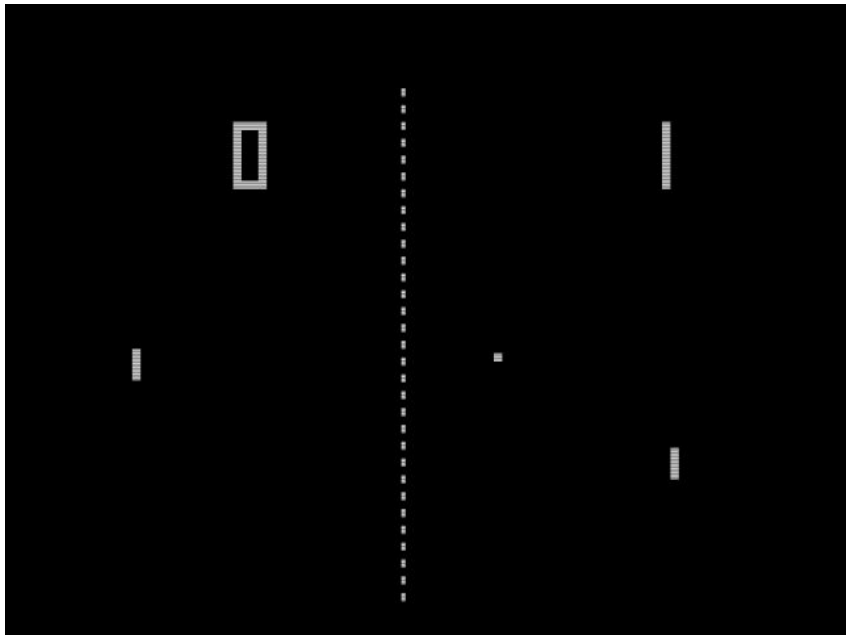


Steve Jobs receives a $250,000 check from Mike Markkula,
Apple's first angel investor (1977)
Photo © Apple Wiki
CC BY-SA

# David Kushner: *Easy to Learn, Difficult to Master*

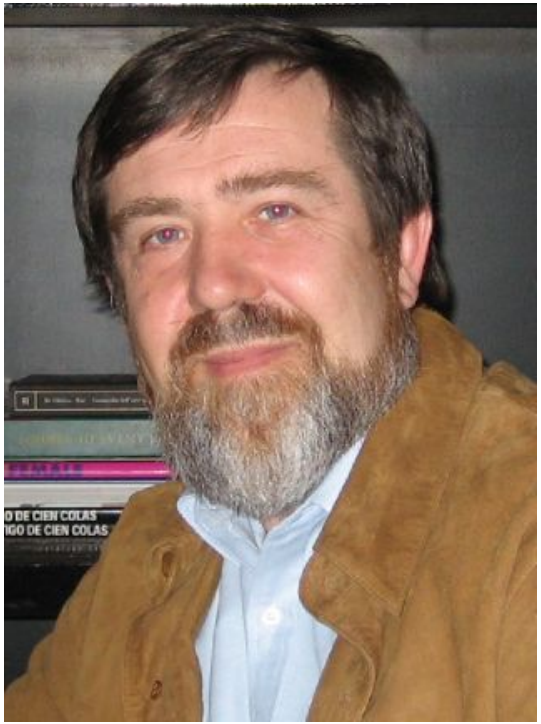


Nolan Bushnell in 2013
Photo © Tech Cocktail
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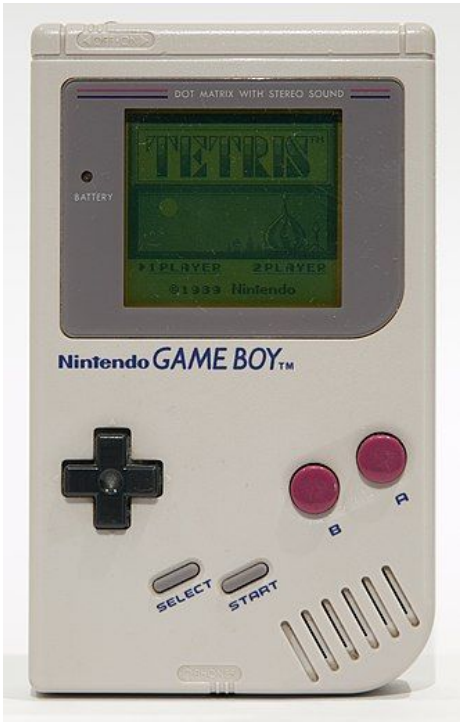


Pong, designed by Al Alcorn for Atari (1972)
Image in public domain

# Box Brown: *Tetris: The Games People Play*



Alexey Pajitnov in 2008
Photo © Jordi Sabaté
CC BY 2.0




Tetris on a Nintendo Game Boy (1989)
Photo © William Warby
CC BY 2.0

# Brian Bagnall: *Commodore: A Company on the Edge*




Commodore Educator 64 (1984)
Photo © Marcin Wachary
CC BY 2.0




Amiga 500 (1987)
Photo © Bill Bertram
CC BY 2.5

# Jaron Lanier: *Dawn of the New Everything*



Jaron Lanier in 2010
Photo © JD Lasica
CC BY 2.0




VPL Research DataSuit (1989)
Photo in public domain



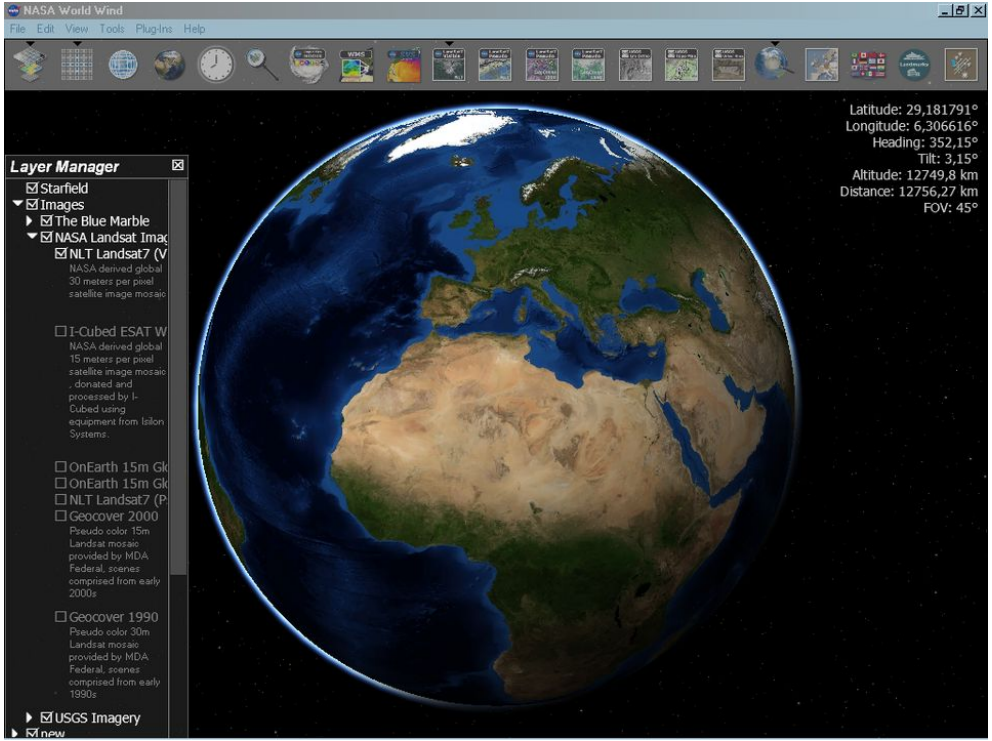

Nintendo Power Glove (1989)
"It's so bad"
Photo in public domain

# Cyberpunk novels

John Brunner:
*The Shockwave Rider* (1975)

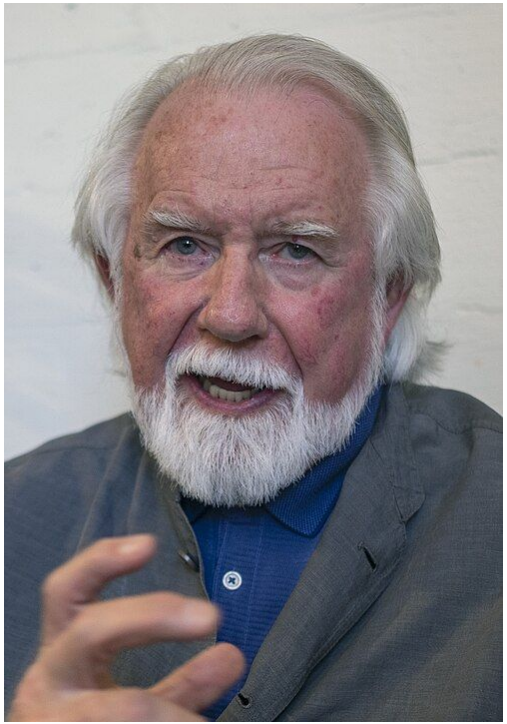
William Gibson:
*Neuromancer* (1984)

Neal Stephenson:
*Snow Crash* (1992)

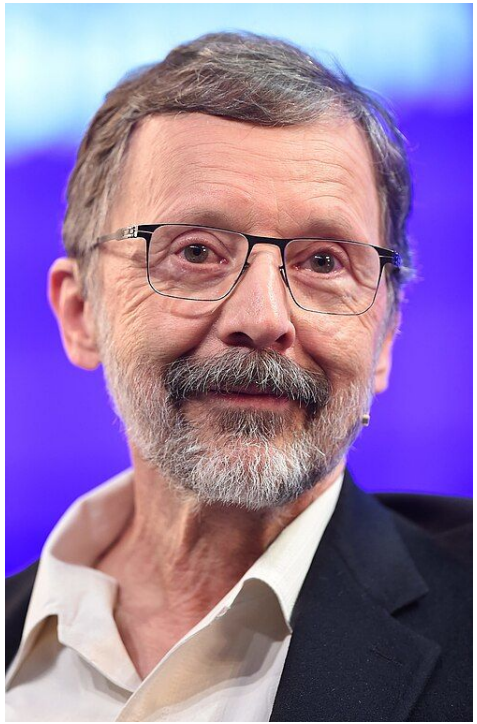



NASA WorldWind (2003), a virtual globe inspired by *Snow Crash*
Image in public domain

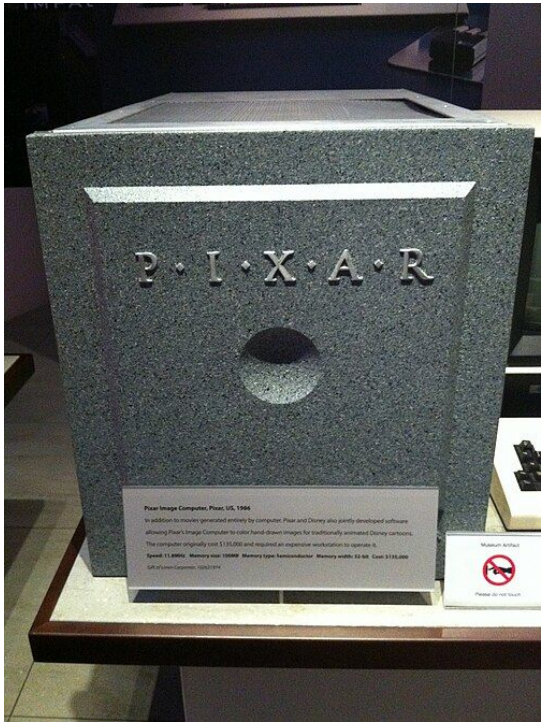
# Adam Fisher: *Valley of Genius*



Alvy Ray Smith in 2019
Photo © Christopher Michel
CC BY-SA 4.0



Edwin Catmull in 2015
Photo © Web Summit
CC BY 2.0




Pixar Image Computer (1983)
Photo © Wikipedia user Victorgrigas
CC BY-SA 3.0

# Michael Lewis: *The New New Thing*



Jim Clark in 2013
Photo © Wikipedia user Knnkanda
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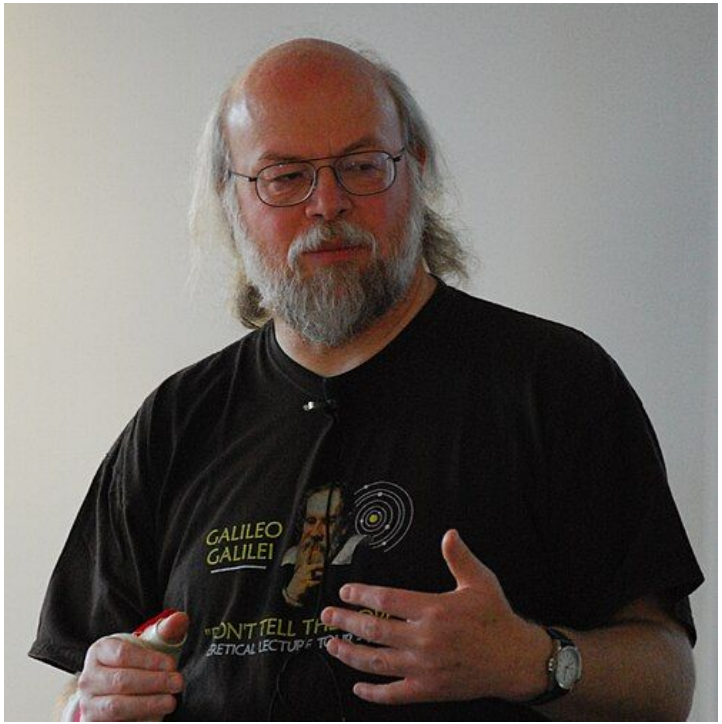


Marc Andreessen in 2004
Photo © JD Lasica
CC BY 2.0

# Christopher Tozzi: *For Fun and Profit*



Richard Stallman in 2009
Photo © Gisle Hannemyr
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James Gosling in 2008
Photo © Peter Campbell
CC BY-SA 4.0

# Q&A

Minor Gordon, PhD
mail@minorgordon.net
minorgordon.net/hc50b




Bret Victor, “Roots” book collection