

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 Stephendickson
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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	Differentia	Logarithmi	i Sinus	44 Gr.
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	69814	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	7071069	3465735	0	3465735	7071068	0

Page from [John Napier's](#) *Mirifici logarithmorum canonis descriptio* (1614)
Photo in public domain

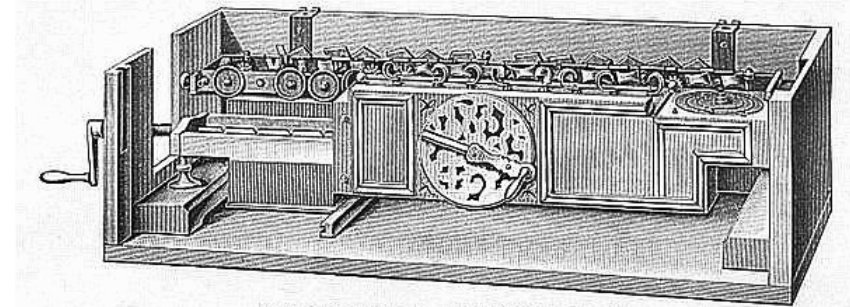


Buzz Aldrin with [slide rule](#) and pipe during Gemini 12 mission (1966)
Photo in public domain

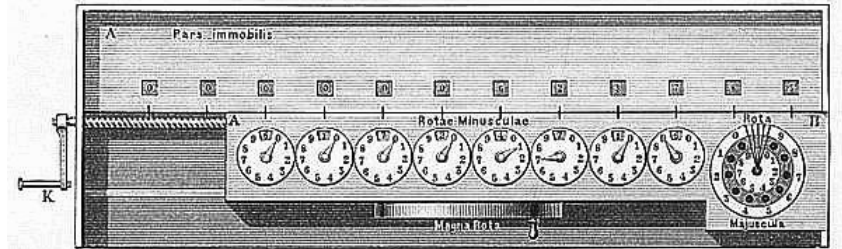
Neal Stephenson: the Baroque Cycle

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



2. Rechenmaschine von Leibniz (1673, Hannover).



3. Leibnizsche Rechenmaschine, geometrische Zeichnung.

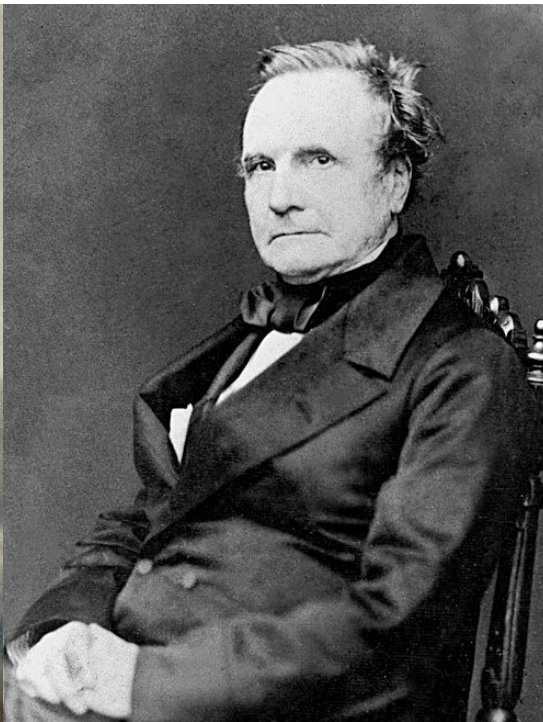
[Stepped Reckoner](#) (replica, original 1694)
Photo in public domain

Sydney Padua: Thrilling Adventures of Lovelace and Babbage



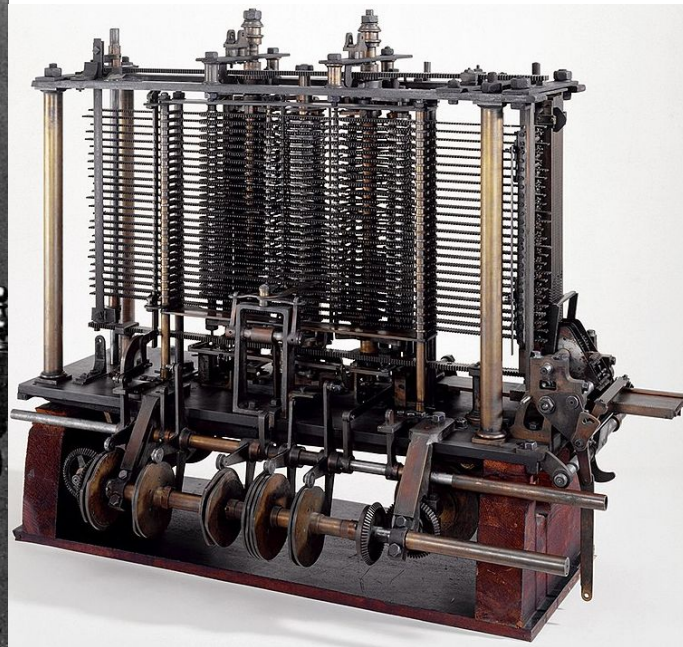
[Ada Lovelace](#)

Photo in public domain



[Charles Babbage](#)

Photo in public domain



[Analytical engine](#)

Photo © Wikipedia user Mrjohncumings
CC BY-SA 2.0

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.



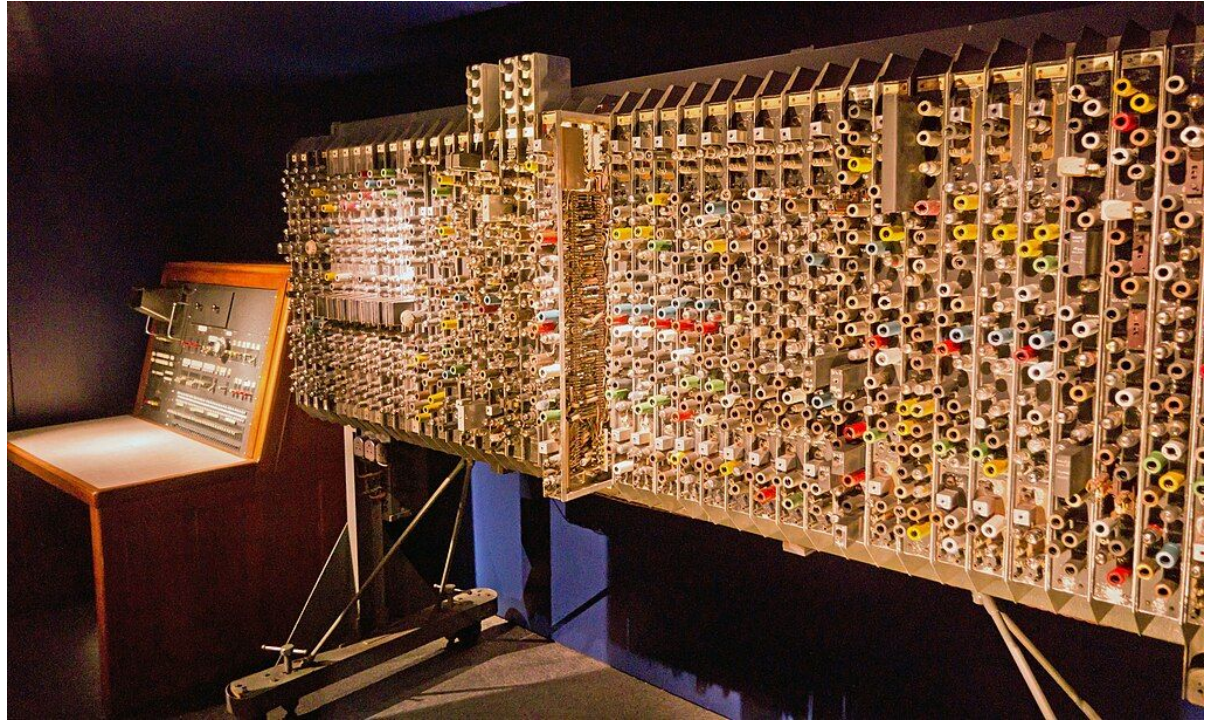
[Differential analyser](#) (1942-1945)

Photo in public domain

Andrew Hodges: Alan Turing: The Enigma



[Alan Turing](#) in 1951
Photo in public domain

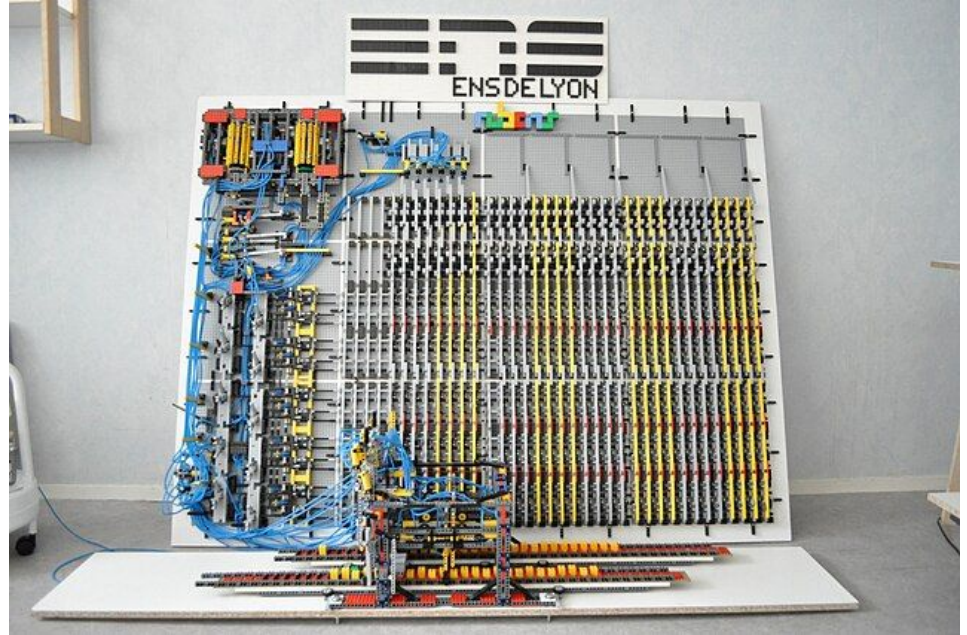


Pilot ACE ([Automatic Computing Engine](#)) at the National Physical Laboratory (1950)
Photo © Antoine Taveneaux
CC BY-SA 3.0

Charles Petzold: *The Annotated Turing*

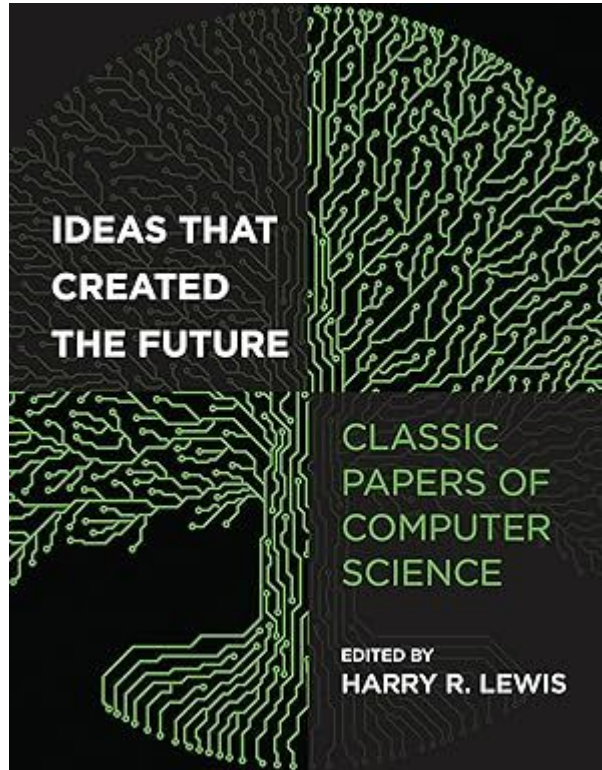
A Guided Tour Through Alan Turing's Historic Paper on Computability and the Turing Machine

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



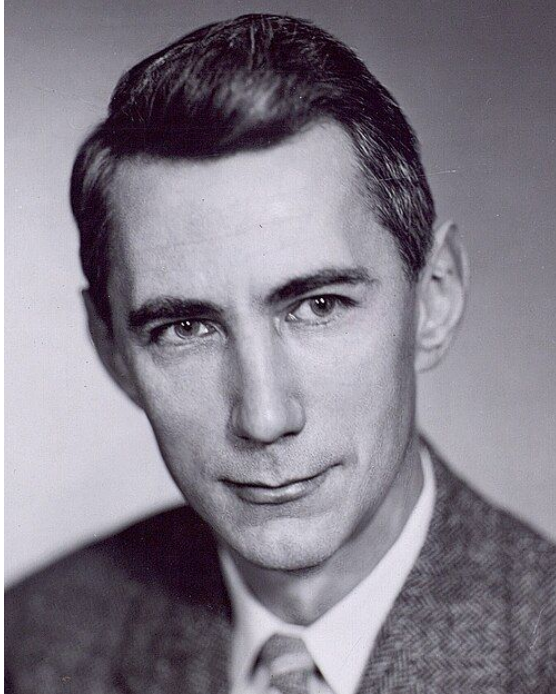
A [Turing machine](#) realization using Lego pieces
Photo © Project Rubens, ENS Lyon
CC BY 3.0

Harry R. Lewis (ed.): *Ideas That Created the Future*



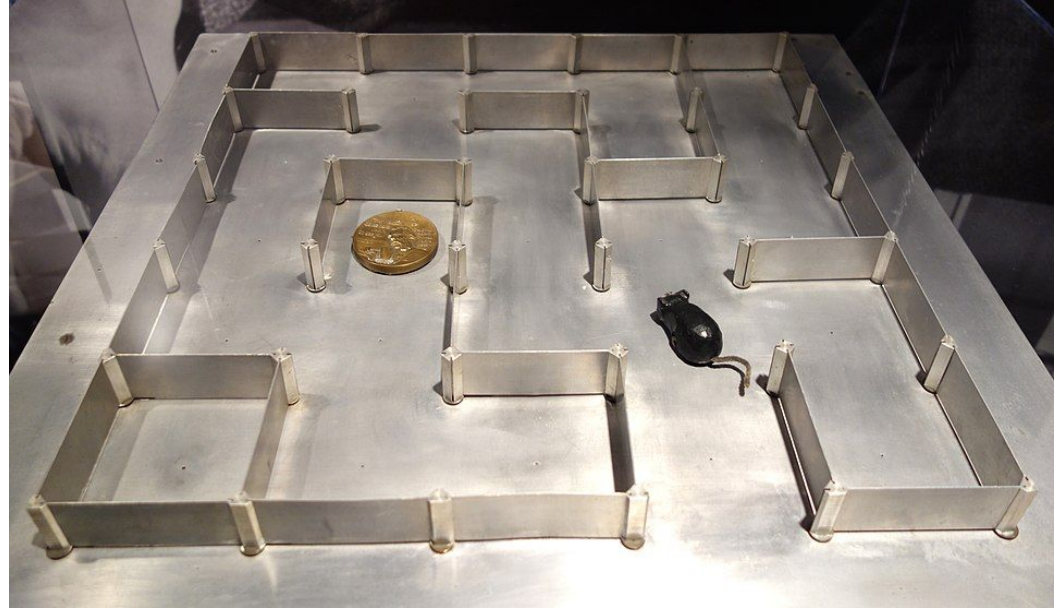
- Boole: “An Investigation of the Laws of Thought” (1854)
- Turing: “On Computable Numbers...” (1936)
- Shannon: “A Symbolic Analysis of Relay and Switching Circuits” (1936)
- McCulloch/Pitts: “A Logical Calculus of the Ideas Immanent in Nervous Activity” (1943)
- von Neumann: “First Draft of a Report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

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



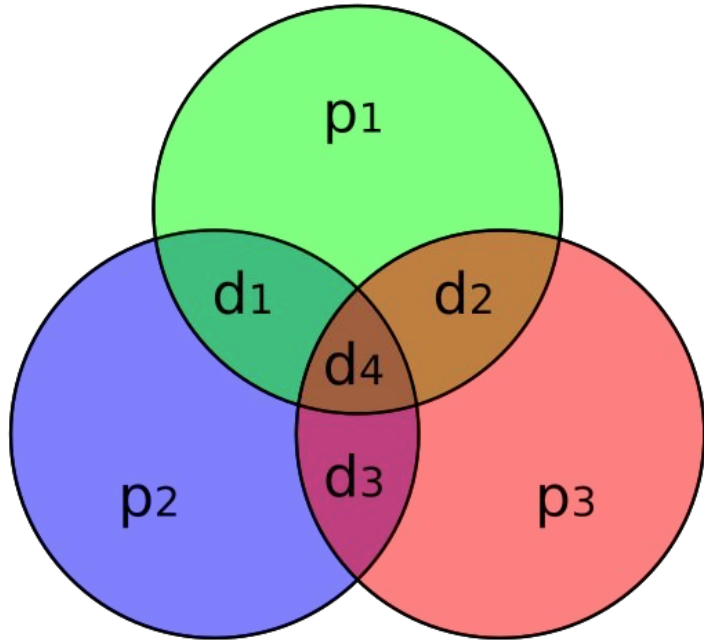
[Claude Shannon](#)

Photo © Tekniska Museet
CC BY 2.0

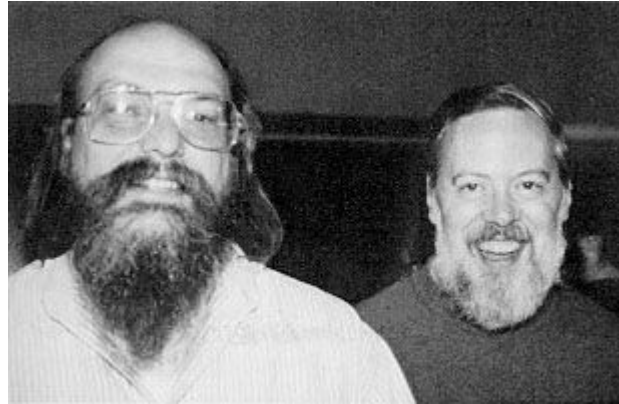


[Theseus Maze](#) (1952)
CC0

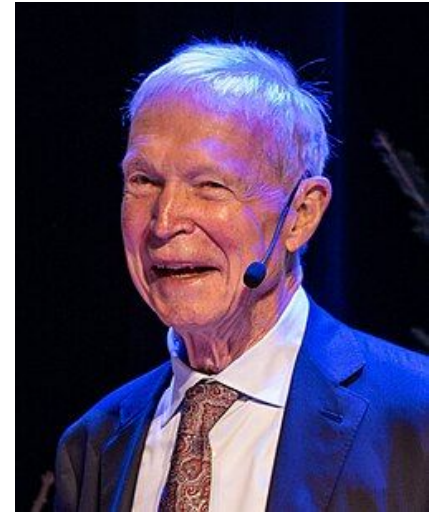
Jon Gertner: *The Idea Factory: the Bell Labs and the Great Age of American Innovation*



(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
CC BY-SA 4.0

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

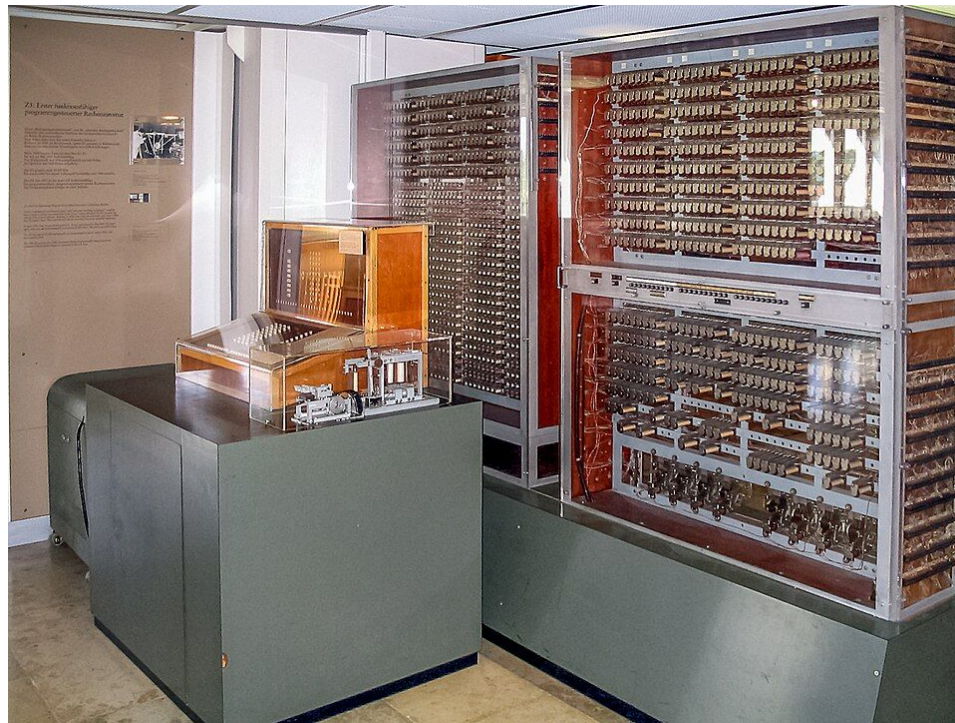
Photo © Computer Laboratory, University of Cambridge

CC BY 2.0

Raúl Rojas: *Konrad Zuse's Early Computers*

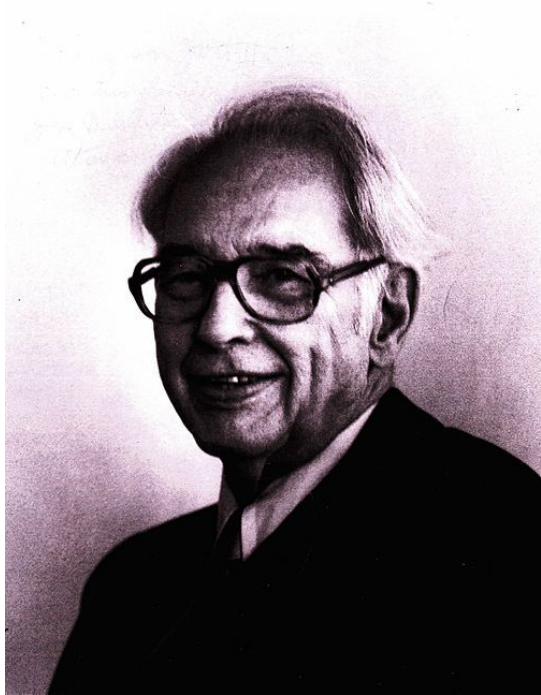


Konrad Zuse in 1992
Photo © Wolfgang Hunscher
CC BY-SA 3.0



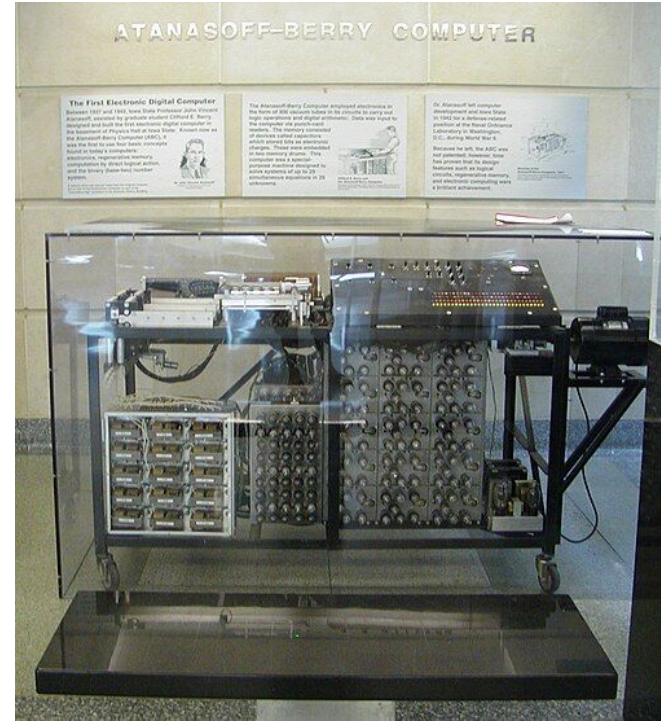
Replica of the [Zuse Z3](#) at the Deutsches Museum (original destroyed in 1943)
The world's first programmable, fully automatic digital computer (still electromechanical)
Photo © Wikipedia user Venusianer CC BY-SA 3.0

Jane Smiley: *The Man Who Invented the Computer*



[John Atanasoff](#)

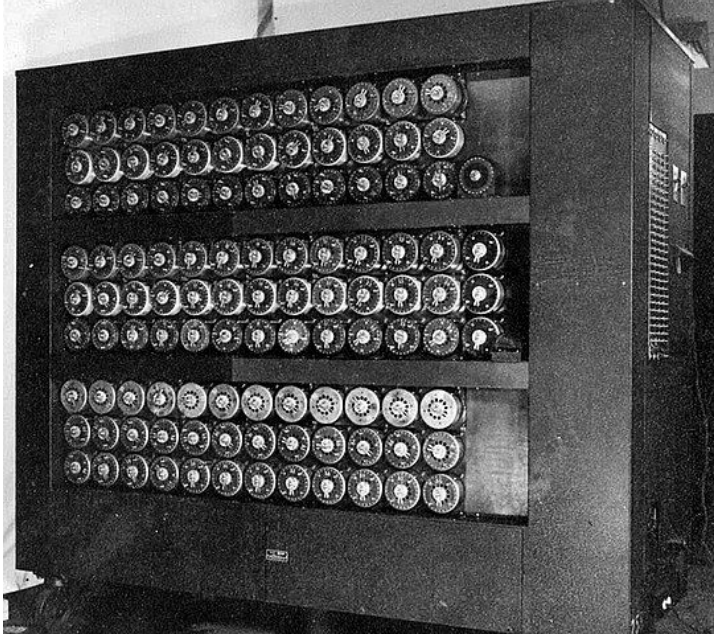
Photo © Eye Steel Film
CC BY 2.0



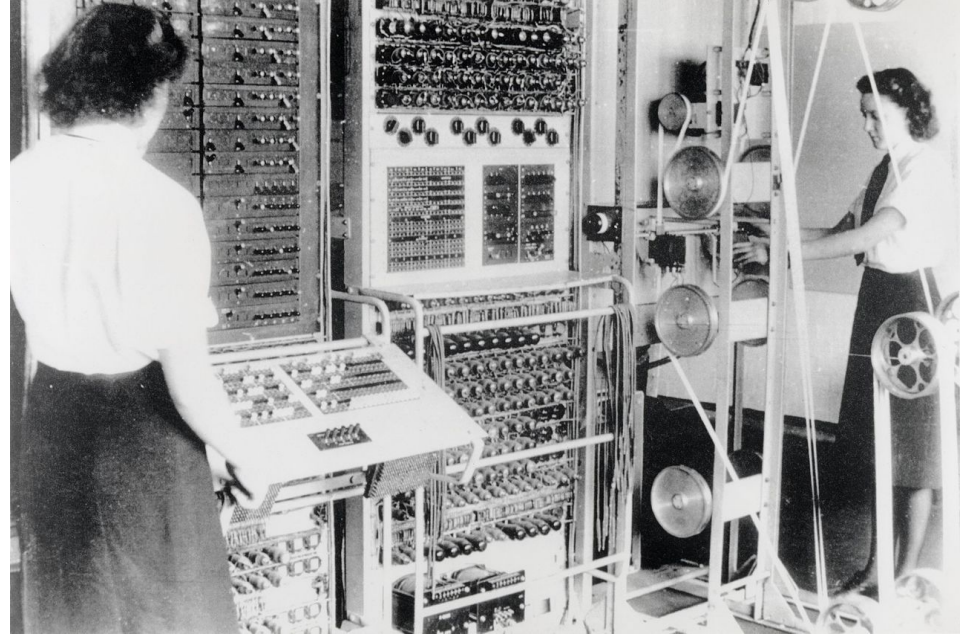
Replica of the [Atanasoff-Berry computer](#) (1939) at Iowa State University

Photo © Wikipedia user Manop
CC BY-SA 3.0

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



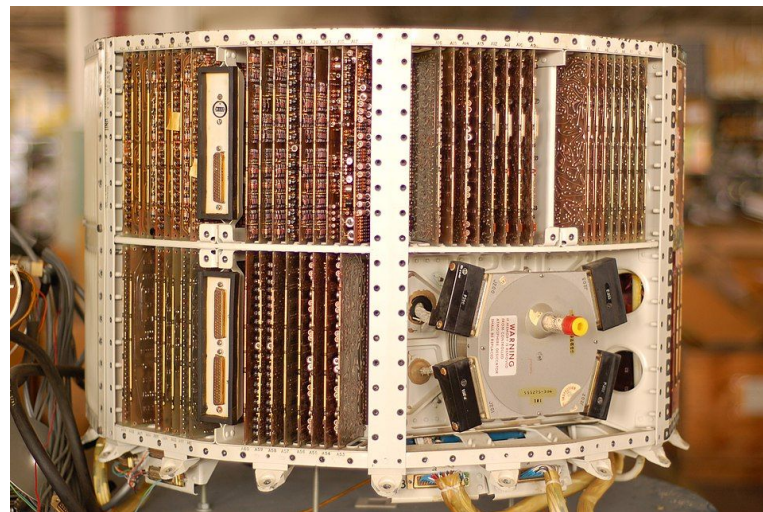
[Purple](#) analog equipment in use (~1944)
at the U.S. Army Signal Intelligence Service during WWII
Photo in public domain

[John Alderman: Core Memory: A Visual Survey of Vintage Computers](#)



[Semi-Automatic Ground Environment \(SAGE\)](#) console (1958 –)

Photo © Joi Ito
CC BY 2.0



[Minuteman guidance computer](#) (1962)

Photo © Wikipedia user Jnanna
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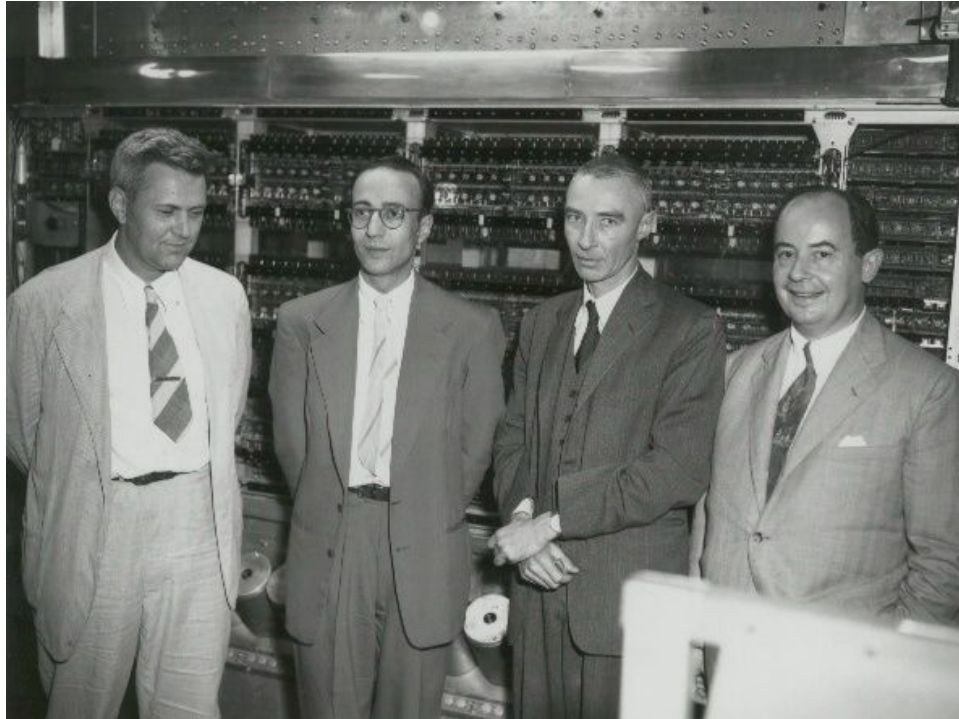
Martin Campbell-Kelly, et al.: Computer

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 Sweeney of the US Census Bureau at the console of the UNIVAC, with Walter Cronkite (r.) during Presidential election night, 1952
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 Ibigelow CC BY-SA 3.0

Joel Shurkin: *Broken Genius*



[John Bardeen](#), [William Shockley](#), and [Walter Brattain](#) (1948)

Photo in the public domain

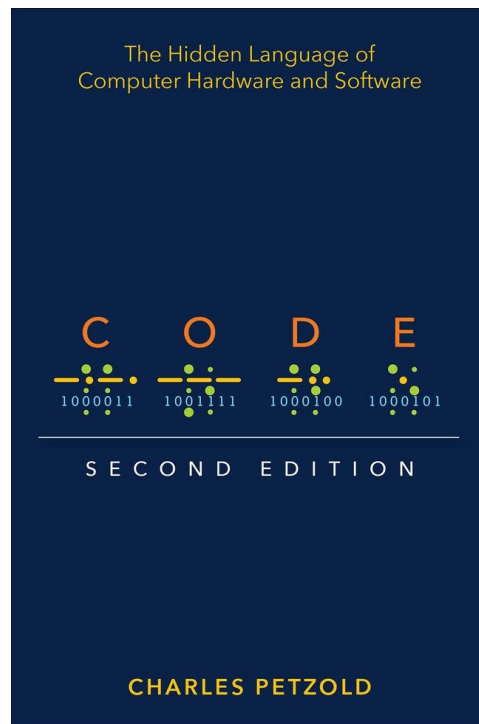
[The traitorous eight](#) (1957):

- Julius Blank
- Victor Grinich
- Jean Hoerni
- Eugene Kleiner
- Jay Last
- [Gordon Moore](#)
- [Robert Noyce](#)
- Sheldon Roberts

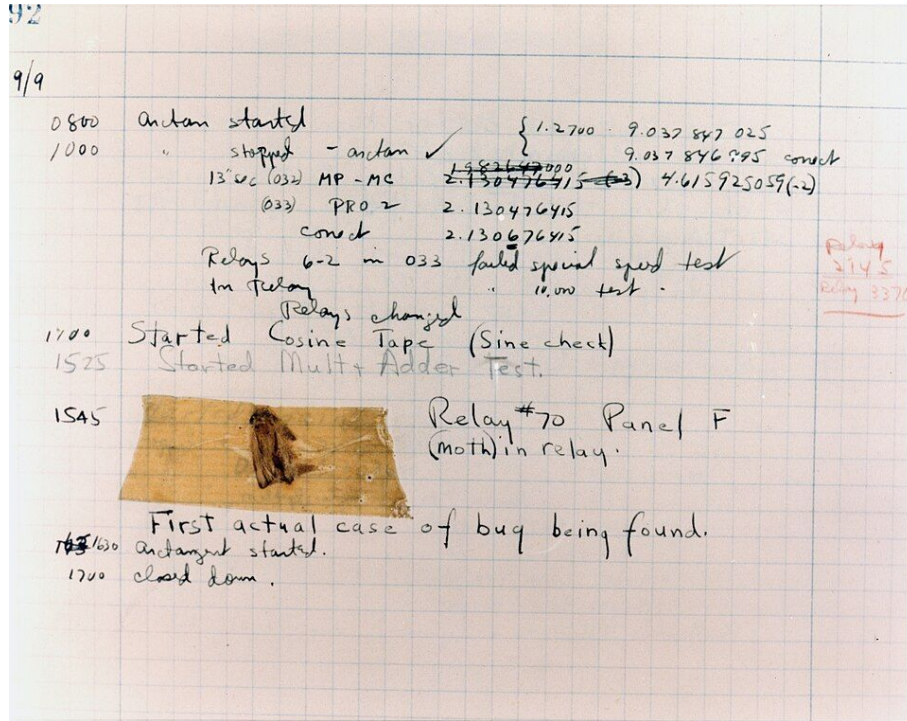
Charles Petzold: Code

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 27 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)
Photo in public domain

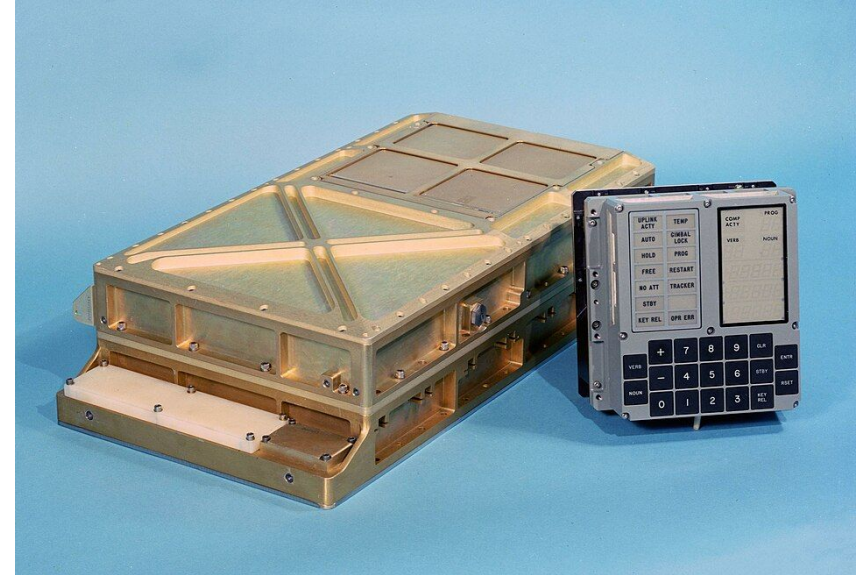


[Mary Jackson](#) working at the
Langley Research Center (1977)
Photo in public domain

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](#)

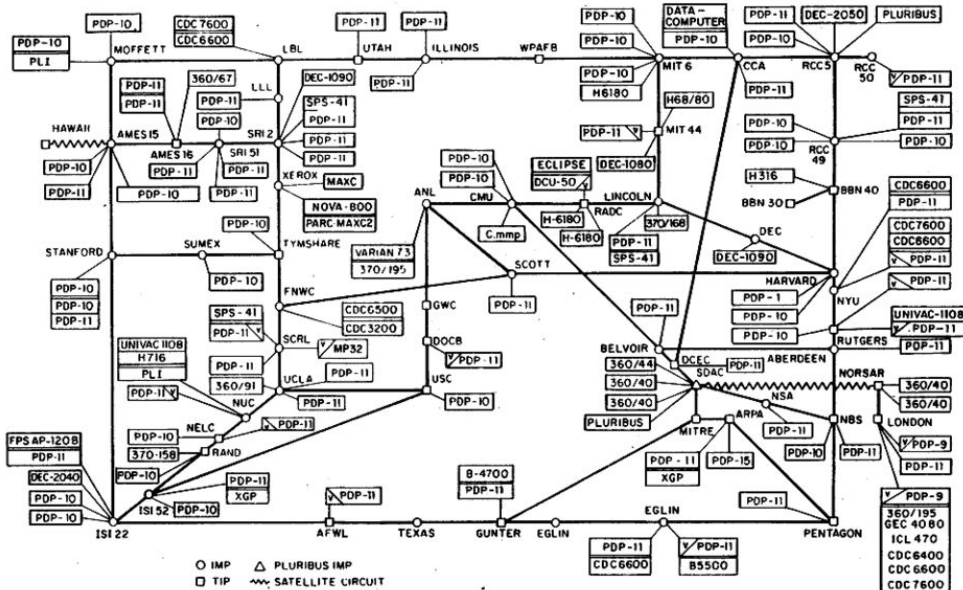
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- SAGE system
- “Man-Computer Symbiosis”
- Director of ARPA Information Processing Techniques Office (1962)
 - SRI/Engelbart
 - Time-sharing systems
 - “Intergalactic Computer Network”

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

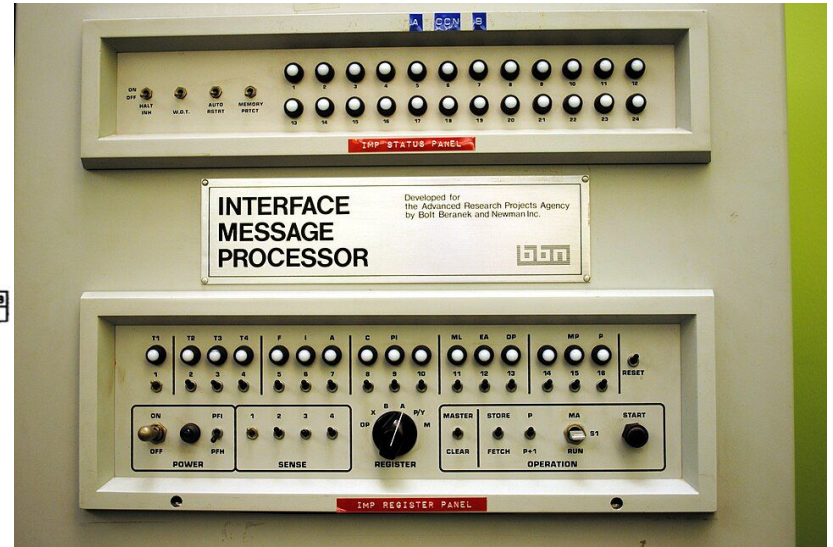
ARPANET LOGICAL MAP, MARCH 1977



(PLEASE NOTE THAT WHILE THIS MAP SHOWS THE HOST POPULATION OF THE NETWORK ACCORDING TO THE BEST INFORMATION OBTAINABLE, NO CLAIM CAN BE MADE FOR ITS ACCURACY.)

NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

ARPANET logical map 3/1977
Image in the public domain



Interface Message Processor front panel

Photo © Wikipedia user FastLizard4

CC BY-SA 3.0

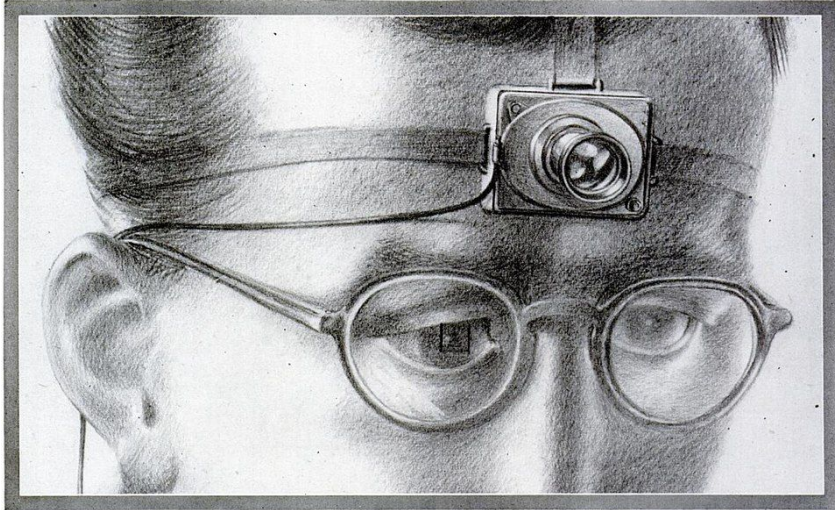
John Markoff: *What the Dormouse Said*

*How the Sixties
Counterculture
Shaped the Personal
Computer Industry*



[Stewart Brand](#) in 2020
Photo © Christopher Michel
CC BY 2.0

Ted Nelson: *Possiplex*

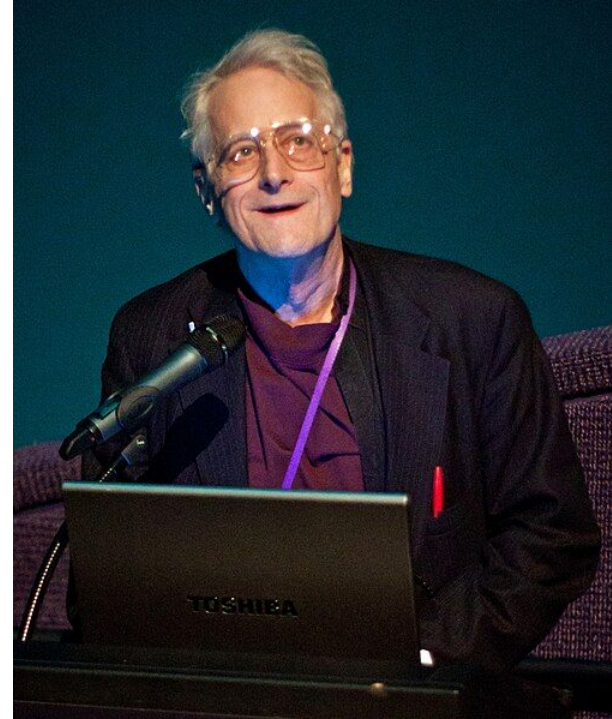


A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE IN THE EYEGASS AT THE LEFT SIGHTS THE OBJECT

AS WE MAY THINK

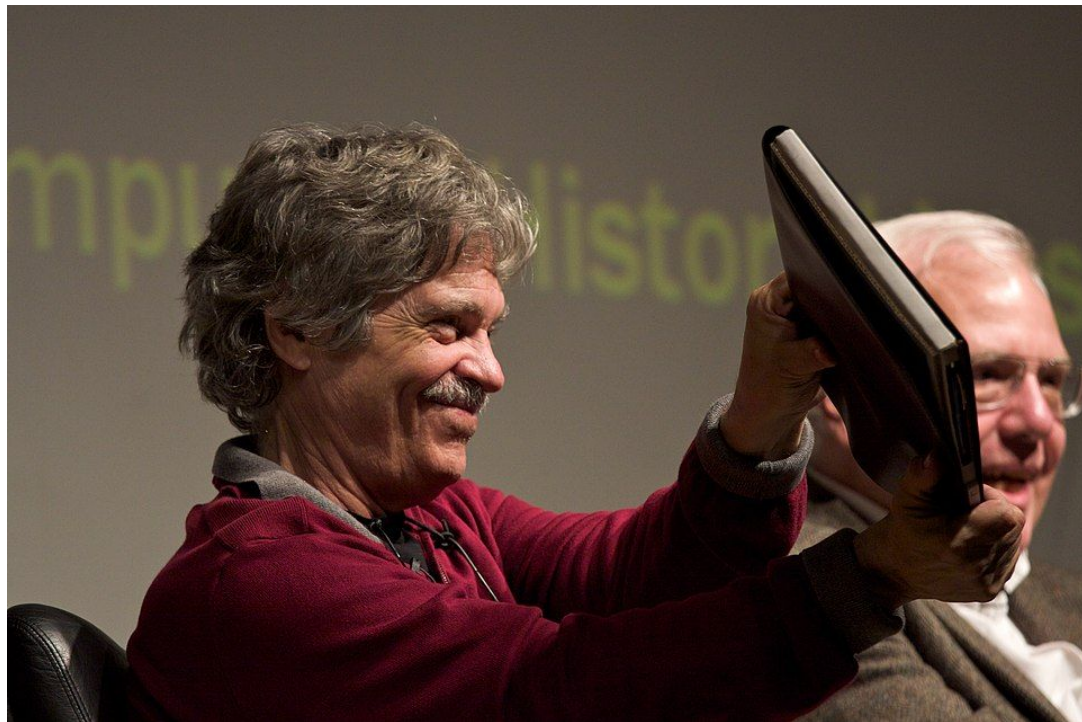
A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD
IN WHICH MAN-MADE MACHINES WILL START TO THINK

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
CC BY-SA 3.0



[Apple Lisa](#) (1983)

Photo © Timothy Colegrove
CC BY-SA 4.0



[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.

Hope you can come. See ya there, *Ard Moore*
There will be other Altair builders there.



Invitation to the [Homebrew Computer Club](#) (1975)

Photo © Wikipedia user Gotanero

CC BY-SA 3.0

[Steve Wozniak](#) and [Andy Hertzfeld](#) (1985)

Photo © Tony Wills

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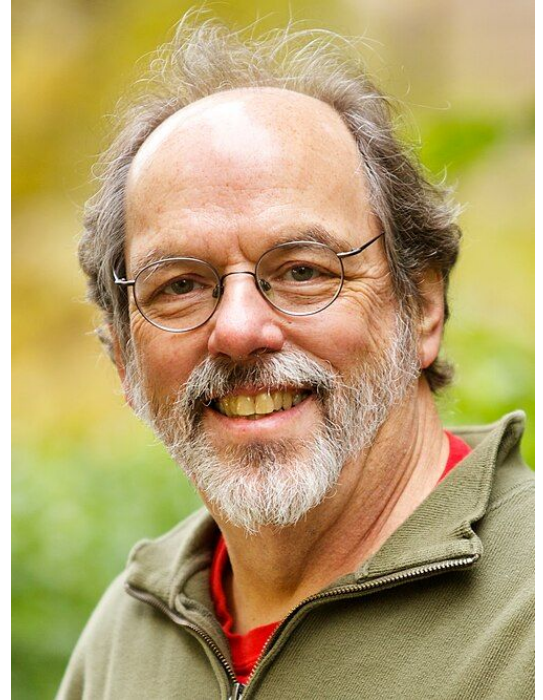
Walter Isaacson: *The Innovators*



[Douglas Engelbart](#) (1968)
Photo © SRI International
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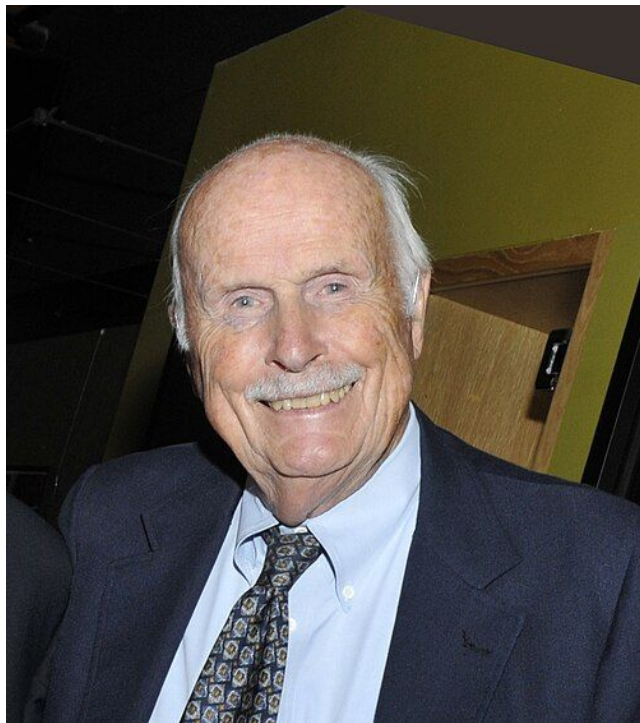


[Leonard Kleinrock](#) in 2023
Photo © Wikipedia user TippyZora
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[Ward Cunningham](#) in 2011
Photo © Carrigg Photography
CC BY-SA 3.0

Leslie Berlin: *Troublemakers*

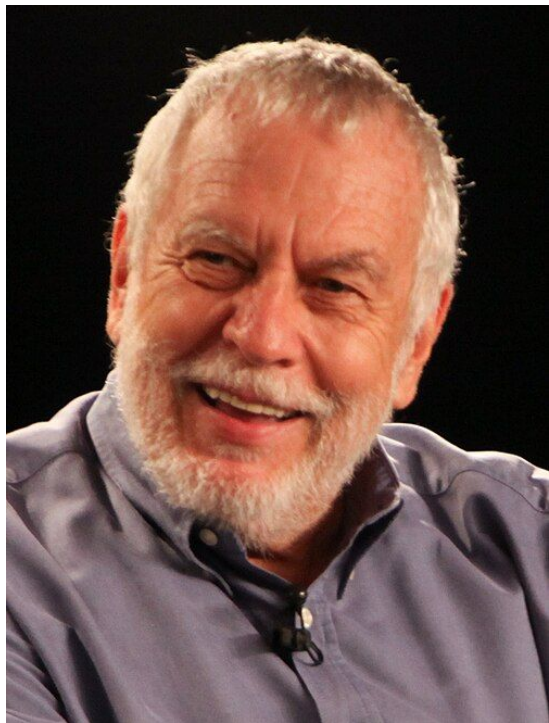


Niels Reimers in 2016
Photo © Science History Institute
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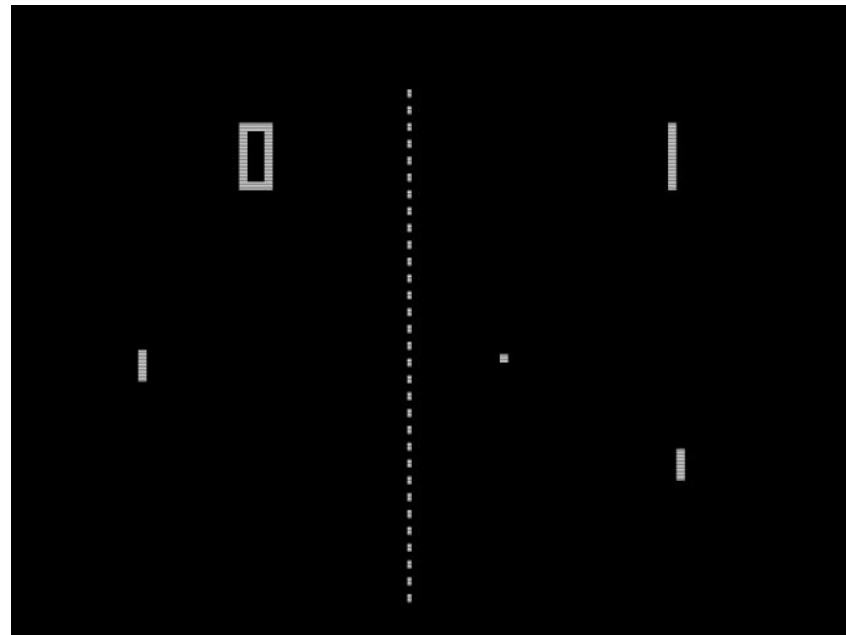


Steve Jobs receives a \$250,000 check from [Mike Markkula](#),
Apple's first angel investor (1977)
Photo © Apple Wiki
CC BY-SA

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



[Nolan Bushnell](#) in 2013
Photo © Tech Cocktail
CC BY-SA 2.0

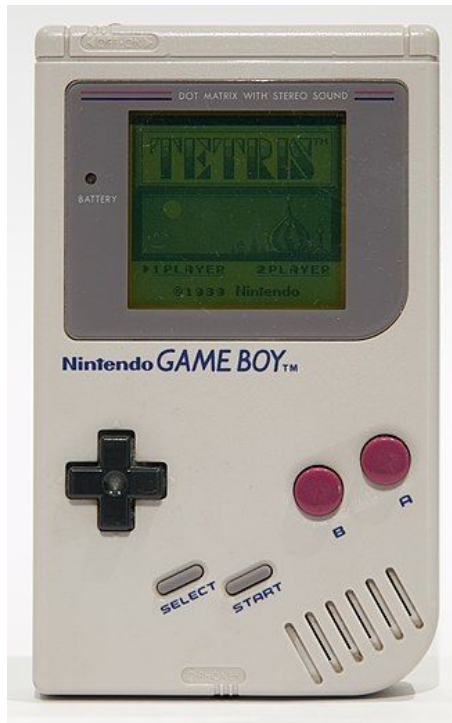


[Pong](#), designed by [Al Alcorn](#) for [Atari](#) (1972)
Image in public domain

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:

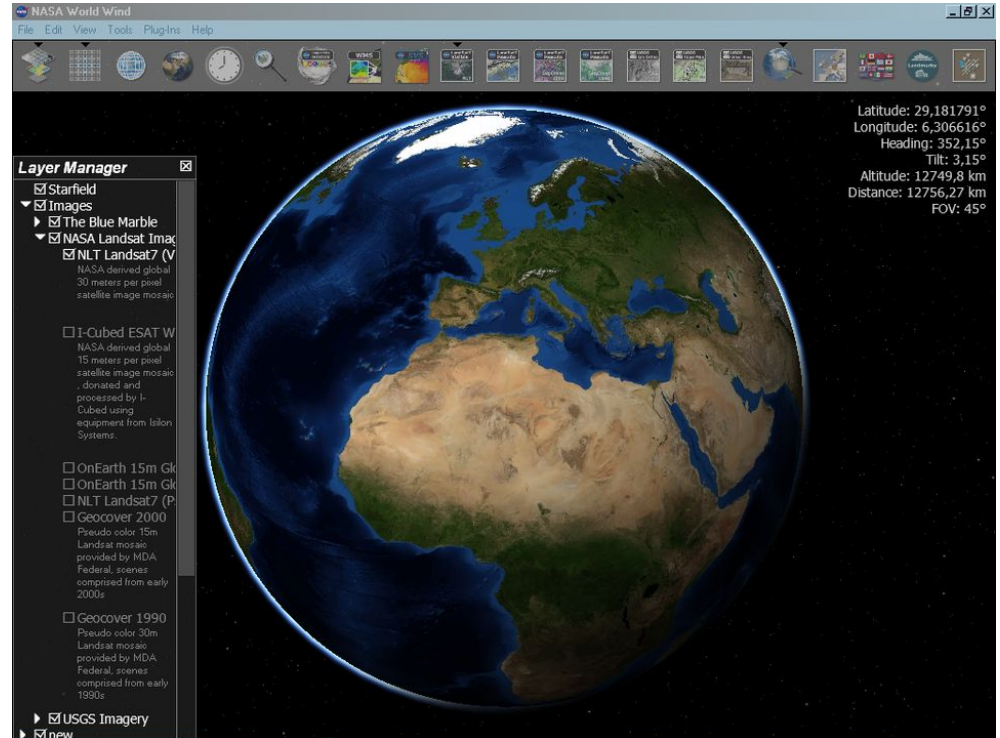
The Shockwave Rider (1975)

William Gibson:

[Neuromancer](#) (1984)

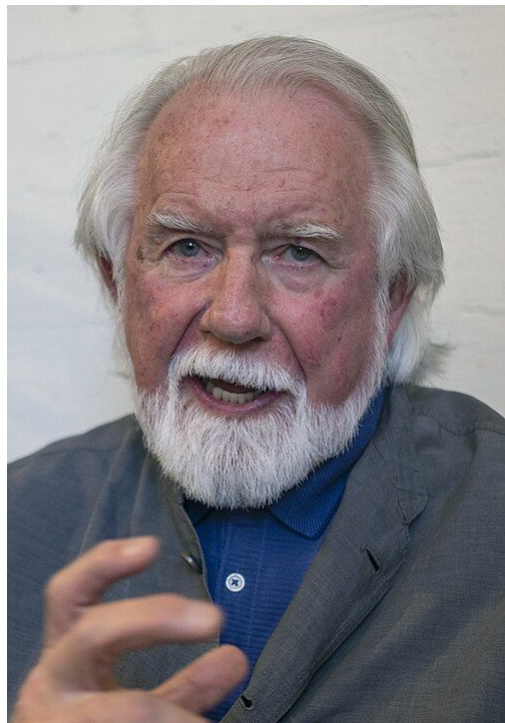
Neal Stephenson:

[Snow Crash](#) (1992)



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

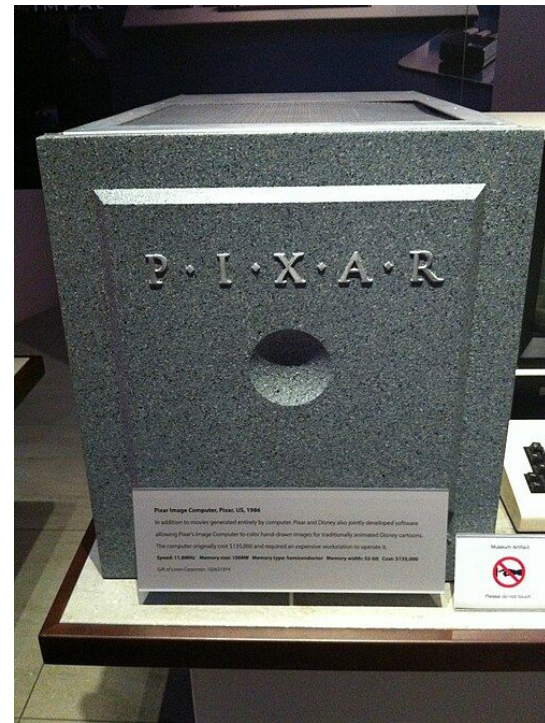
Adam Fisher: Valley of Genius



[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 47
CC BY-SA 3.0

Michael Lewis: *The New New Thing*



[Jim Clark](#) in 2013
Photo © Wikipedia user Knnkanda
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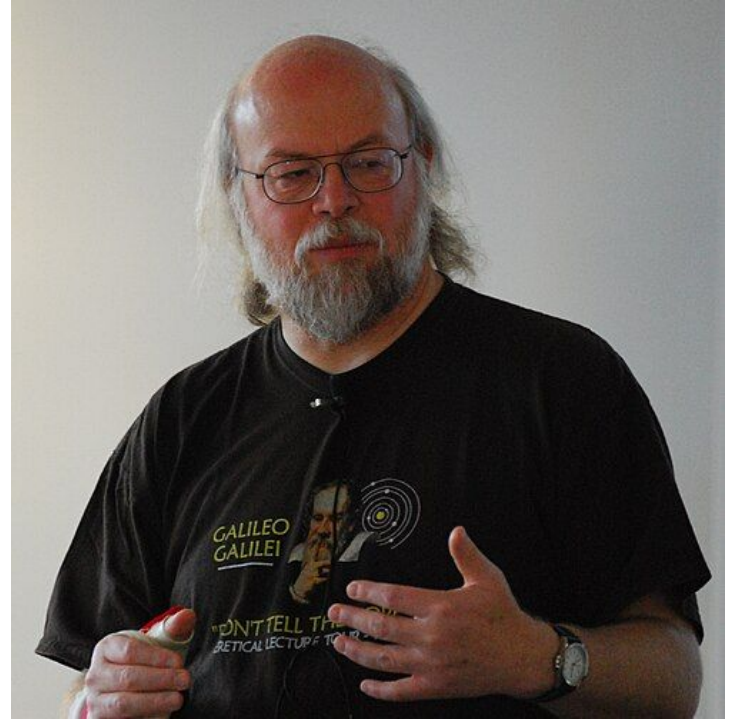


[Marc Andreessen](#) in 2004
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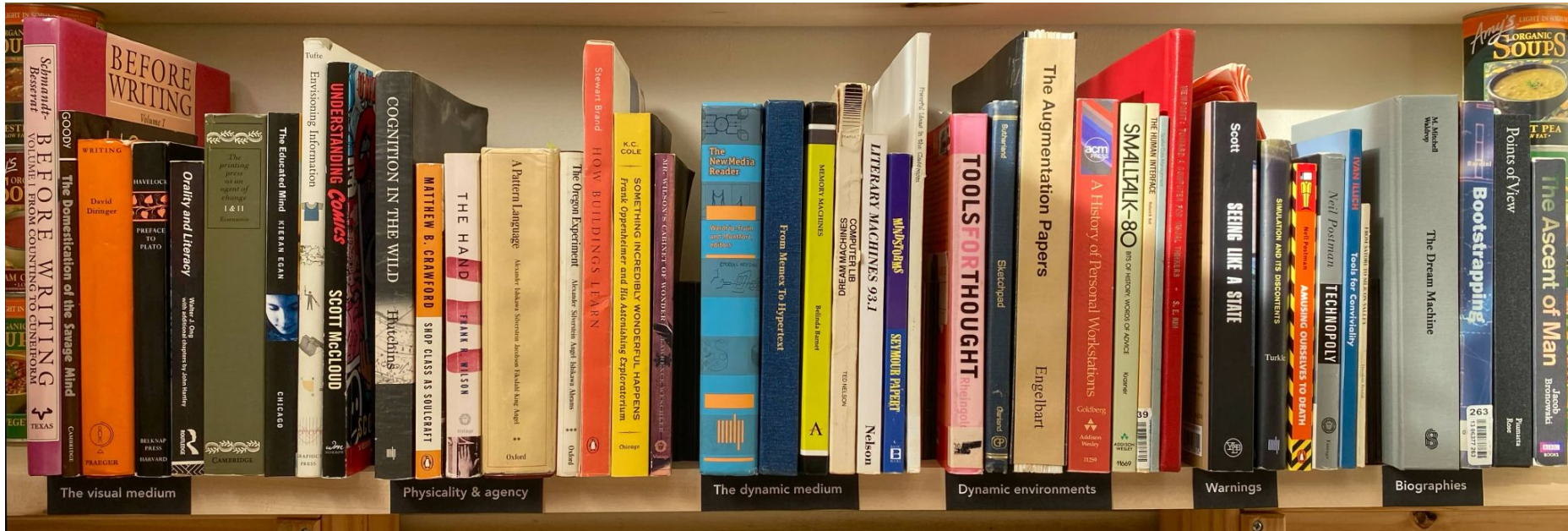
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Q&A

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



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