



LAMBDA LOUNGE

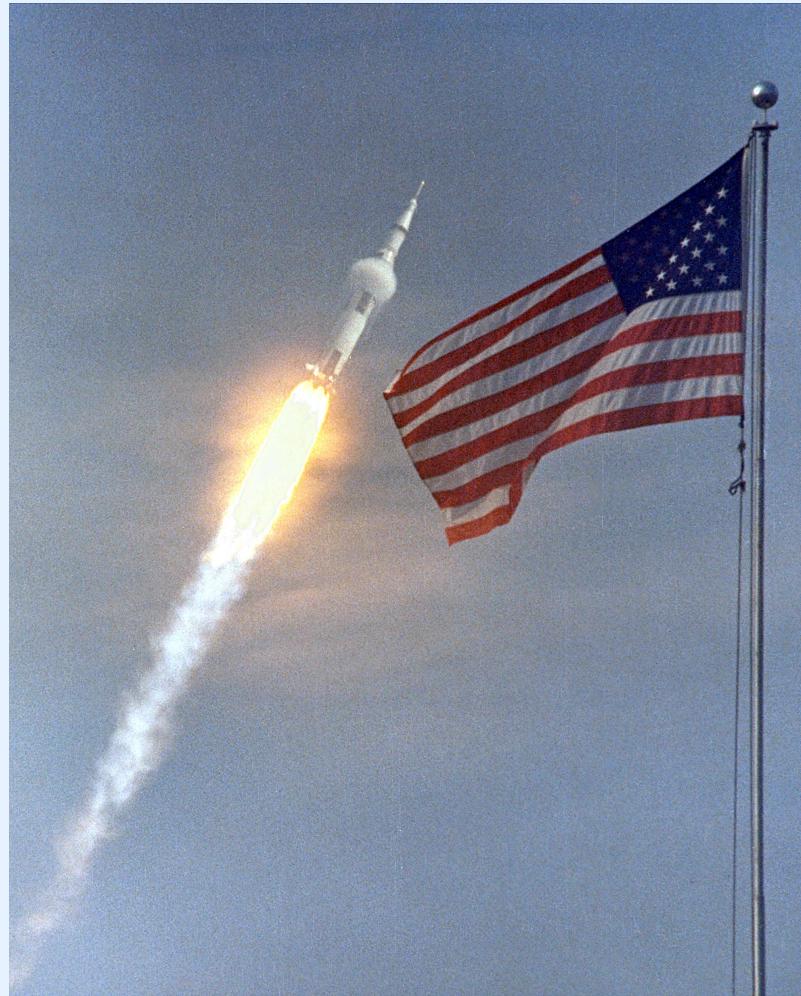
Computer History/Failure/Future

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1800's + Science Fiction = ???



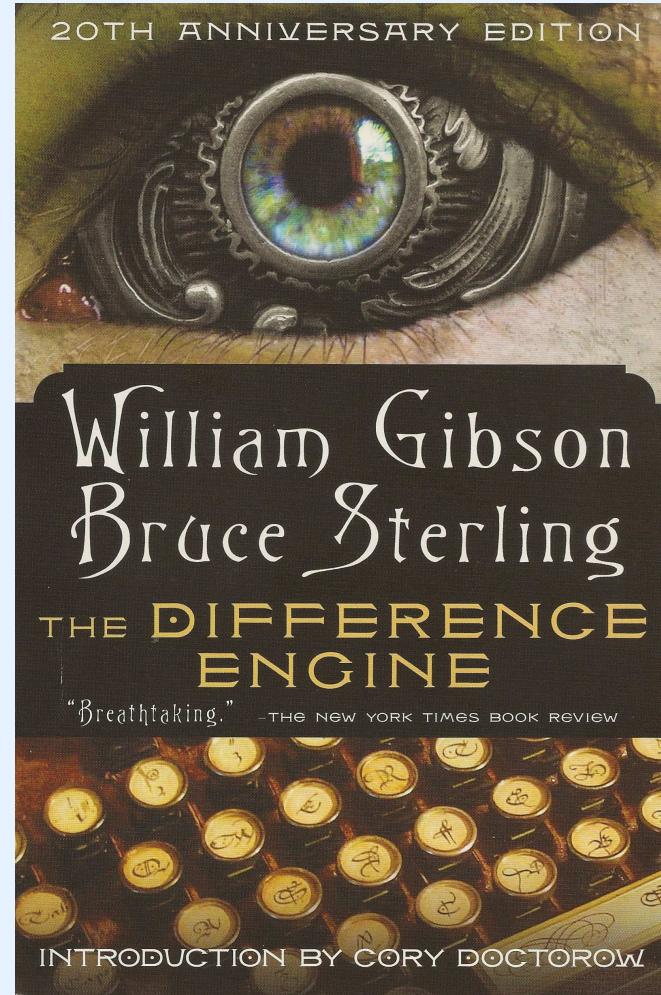
Steampunk!

- ✗ Practicality
- ✗ Reality
- ✗ Rationality
- ✓ Steam powered computers
- ✓ Steam powered layzers
- ✓ Steam powered rocket ships
- ✓ Steam powered clothing



The Difference Engine (Gibson and Sterling)

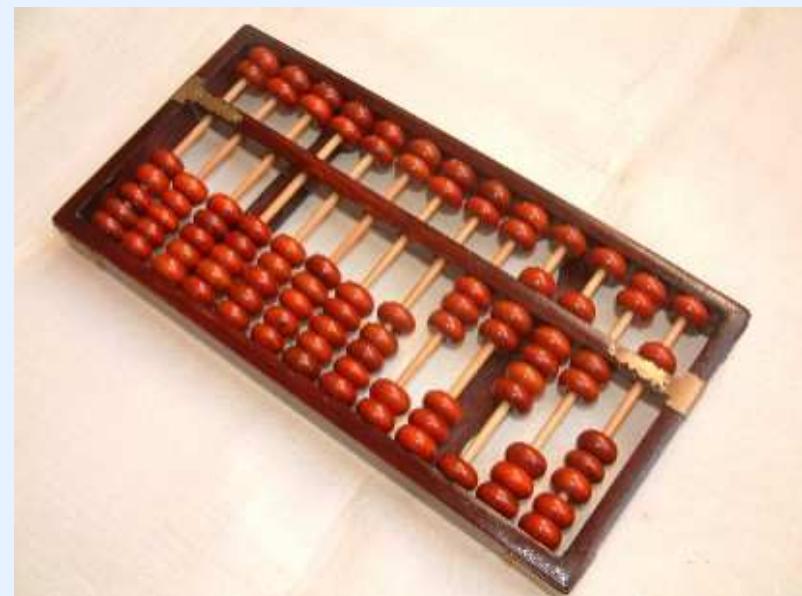
What if Charles Babbage actually built his Analytical Engine, sparking the computer revolution in Victorian England?



History

2700 BC: The Abacus

- First invented by the Ancient Sumerians.
- The ones everybody knows, like the one shown here, are the Chinese style (*Suanpan*), and are still used today even though electronic calculators can be had for \$0.99 or less.
- These are a really good way to count sheep without going to sleep.



205 BC: The Antikythera Mechanism

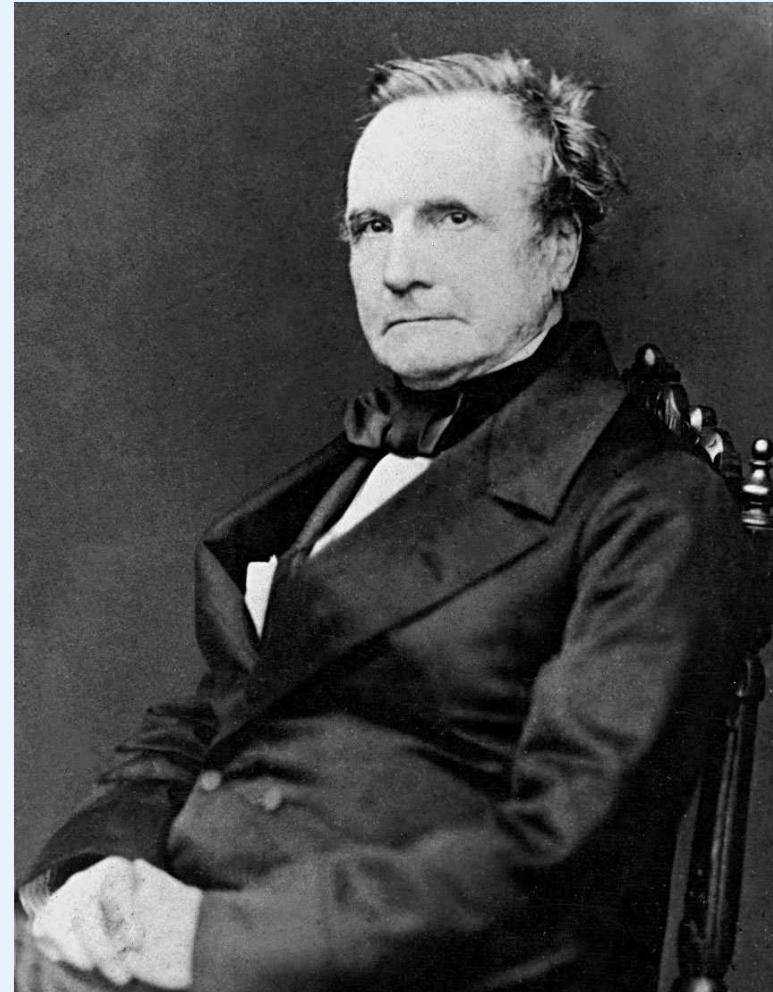
- The Greeks made analog computers (and mathematics, and philosophy, and baklava, ...)
- The device tracked the Metonic Cycle,
- Calculated solar eclipses,
- Timed the Ancient Olympic Games,
- and probably other stuff too.



AD 1791 – 1871: Charles Babbage

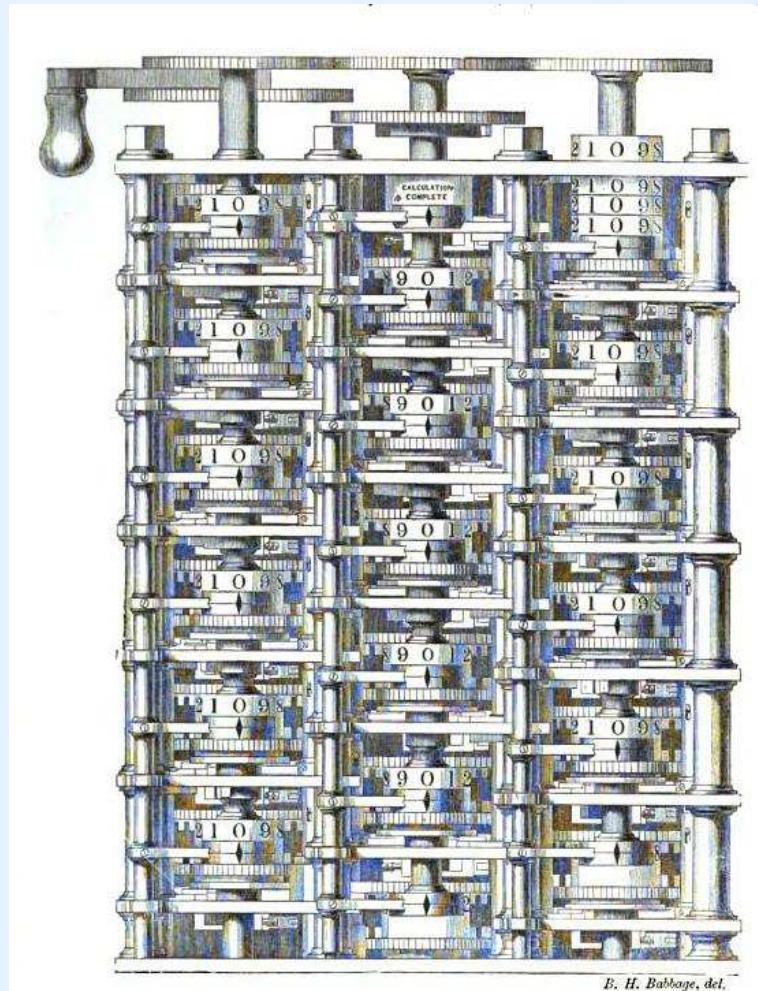
- “*Father^a of the computer.*”
- Mathematician, philosopher, inventor, engineer.
- Instrumental in founding the Astronomical Society.
- Instrumental in the founding of the modern concept of “Science.”

^a“Who’s your daddy? I am.” –
Babbage talking to your laptop.

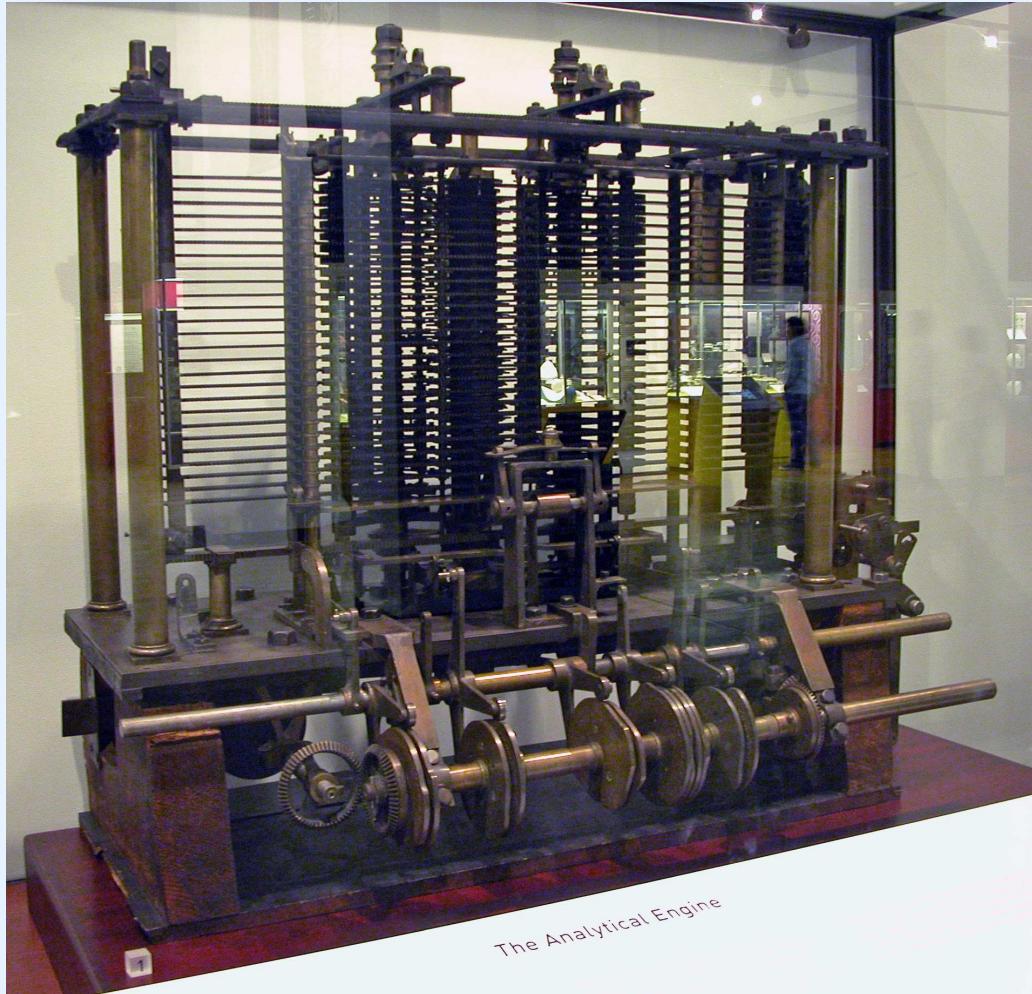


1822: The Difference Engine

- Large mechanical calculator.
- Calculates polynomial functions.
- Used to calculate tables of solutions for publishing.
- **Not** a general-purpose computer.
- Not built until the 1990's.



1837: The Analytical Engine



1837: The Analytical Engine

- Mechanical, fully general-purpose computer.
- Turing-complete (75 years before Turing was born.)
- Never built (yet.)
- Arithmetic logic unit, ALU: “*the mill.*”
- Control flow: conditional branching, loops.
- Integrated memory: 1000 numbers of 40 decimal digits each (16.7 kB.)
- Programming language similar to modern assembly.
- Punched cards.

1815 – 1852: Ada Lovelace

- *Augusta Ada King, Countess of Lovelace, née Byron.*
- Daughter of the poet Lord Byron.
- Mathematician and writer.
- Wrote the first computer algorithm.
- Described computer programming and computer science as “*poetical science.*”



She Walks in Beauty – Lord Byron

She walks in beauty, like the night
Of cloudless climes and starry skies;
And all that's best of dark and bright
Meet in her aspect and her eyes:
Thus mellow'd to that tender light
Which heaven to gaudy day denies.

One shade the more, one ray the less,
Had half impair'd the nameless grace
Which waves in every raven tress,
Or softly lightens o'er her face;
Where thoughts serenely sweet express
How pure, how dear their dwelling-place.

And on that cheek, and o'er that brow,
So soft, so calm, yet eloquent,
The smiles that win, the tints that glow,
But tell of days in goodness spent,
A mind at peace with all below,
A heart whose love is innocent!

1840 – 1843: The First Computer Algorithm

- Written by Ada Lovelace and Charles Babbage.
- Babbage toured Italy talking about the Analytical Engine.
- Luigi Menabrea published notes.
- Ada Lovelace translated and augmented the published notes.
- Note G: Computes Bernoulli numbers.

Number of operation. Name of operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value of Variable.	Statement of Results.	Data		Working Variables.								Result Variables.			
					v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_9	v_{10}	v_{11}	v_{12}	v_{13}	v_{14}
1	\times	$v_2 \times v_3$	$v_2 = v_3$	$v_2 = v_3$	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	$-$	$v_4 - v_1$	$v_4 = v_1$	$v_4 = v_1$														
3	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
4	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
5	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
6	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
7	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
8	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
9	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
10	\times	$v_2 \times v_3$	$v_2 = v_3$	$v_2 = v_3$														
11	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
12	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
13	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
14	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
15	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
16	$\times v_2 \times v_3$	v_1	$v_1 = v_2$	$v_1 = v_2$														
17	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
18	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
19	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
20	$\times v_2 \times v_3$	v_1	$v_1 = v_2$	$v_1 = v_2$														
21	$\times v_2 \times v_3$	v_1	$v_1 = v_2$	$v_1 = v_2$														
22	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
23	$-v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
24	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														
25	$+v_4 + v_1$	v_1	$v_1 = v_4$	$v_1 = v_4$														

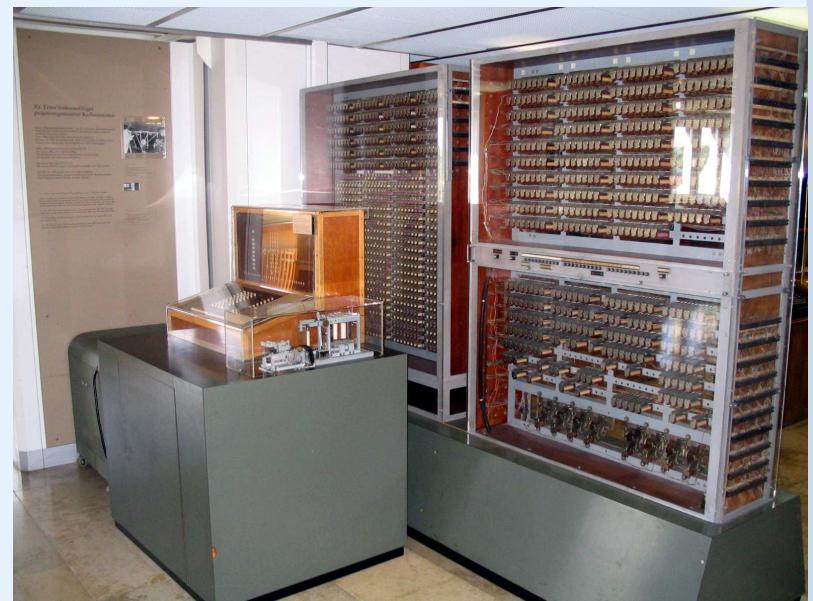
1910 – 1995: Konrad Zuse

- Built the world's first programmable computer, the Z3.
- Built the world's first commercial computer, the Z4.
- Designed world's first high-level programming language, *Plankalkül*.
- First suggested the concept of a “computation-based universe.”



1941: The Z3

- Electro-mechanical.
- World's first programmable, fully automatic digital computer.
- 2000 relays, 22-bit word length, clock frequency of 5–10 Hz.
- Program code and data on punched film.
- Further funding denied by the Nazis because it was “not war-important.”



1903 – 1957: John von Neumann

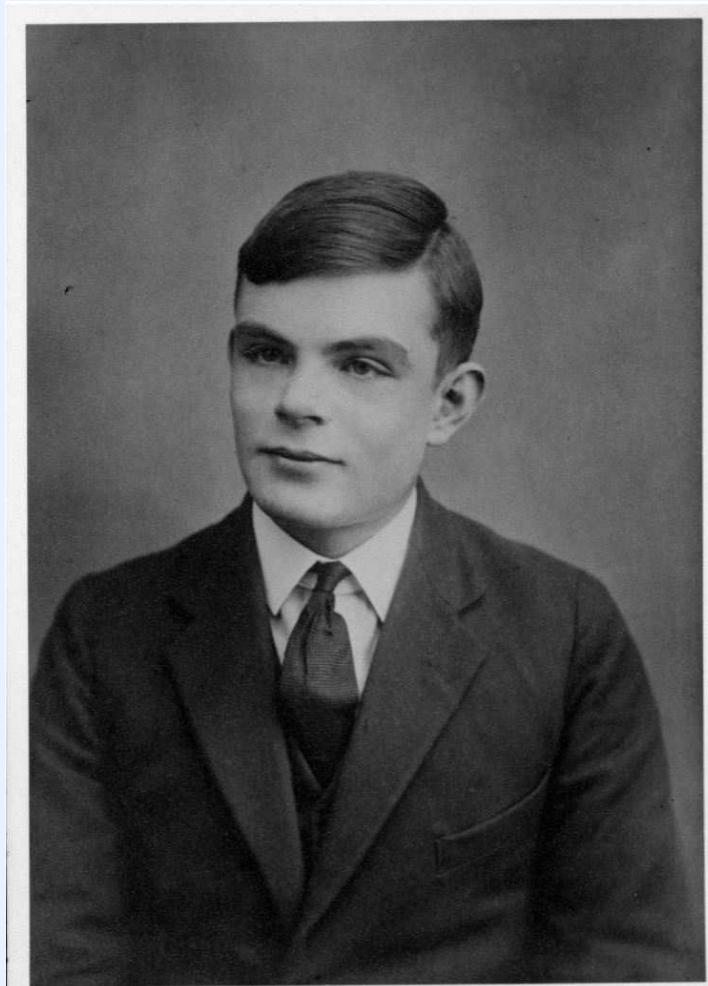
- Major contributions to mathematics, physics, economics, computing, and statistics.
- Simulated atomic bombs on computers.
- Von Neumann architecture: how most modern physical computers^a actually work.

^aincluding this MacBook Pro



1912 – 1954: Alan Turing

- Turing machines mathematically formalized the concepts of algorithms and computation.
- Helped defeat Nazi encryption with computers for the Allies.



Nazis!



The Enigma Machine

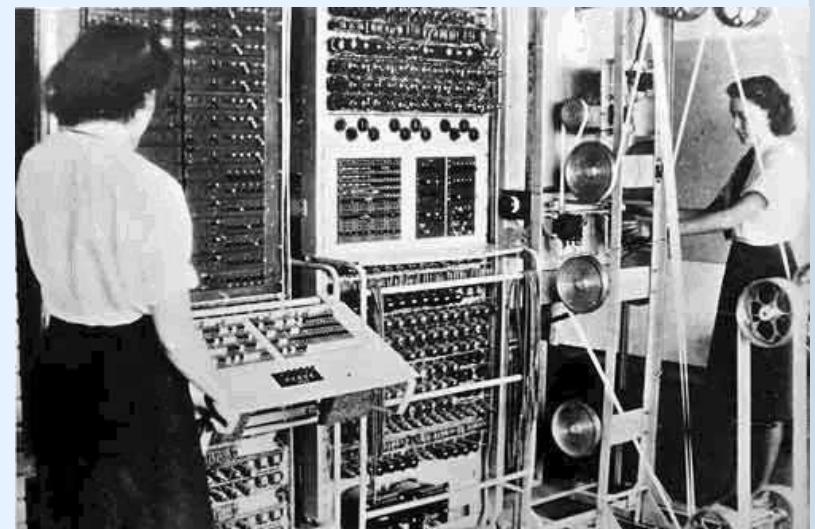
- Electro-mechanical roto-cypher machine.
- Encyphered and decrypted secret messages.
- First models from World War I.
- Most Nazi military communications were encrypted/decrypted via these.



1943 – 1945: The Colossus Computers

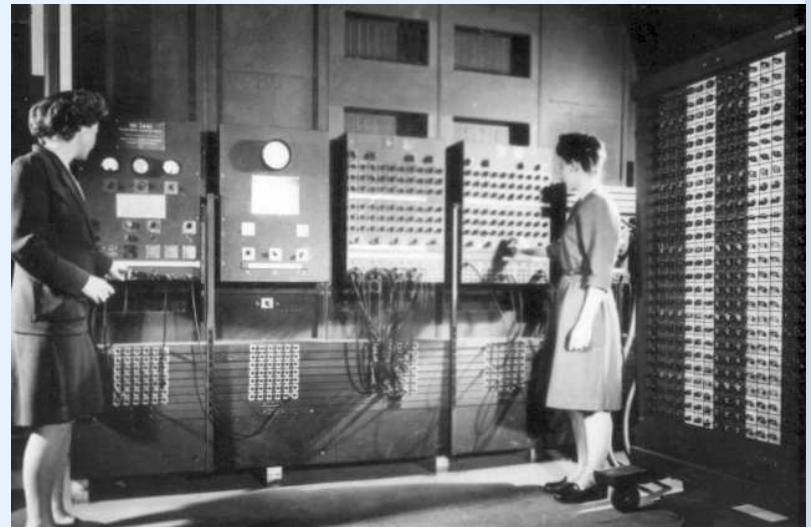
- Code breaking computers.
- Vacuum tubes and thyatron^as.
- Decrypted Nazi High Command and military intelligence dispatches daily.

^aI don't know what these are, but they look cool.



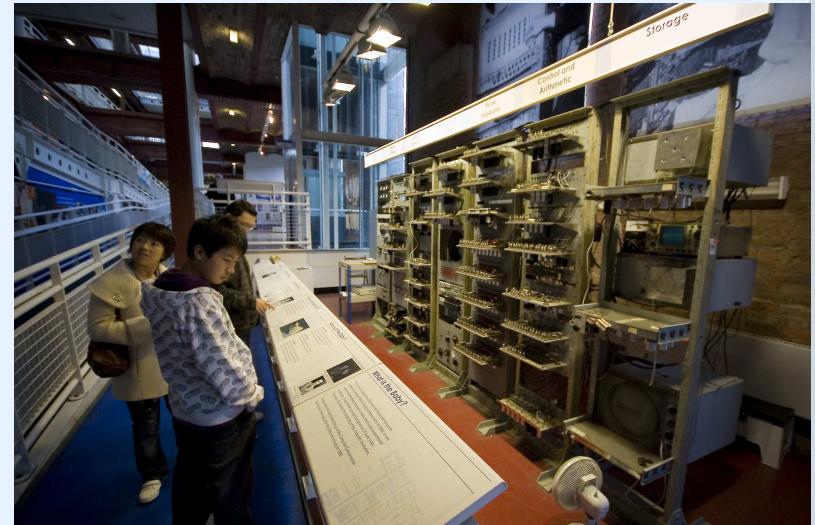
1946: The ENIAC

- First electronic general-purpose computer.
- Turing complete.
- 1000 times faster than electro-mechanical machines.
- Calculated artillery firing tables.
- Feasibility computations for the hydrogen bomb.



1948: Manchester SSEM, “Baby”

- World's first stored-program computer.
- Immediately followed by the Manchester Mark I, the prototype for:
- The Ferranti Mark I, the very first commercially available general purpose computer.



1954: The IBM 704

- First mass-produced computer with floating-point arithmetic hardware.
- 12,000 FLOPS.
- FORTRAN was developed on the IBM 704.
- Lisp^a was developed on the IBM 704.

^aCAR: contents of the address register; CDR: contents of the data register.



1957: FORTRAN

- Since it's the 1950's, we only use computers to calculate interesting scientific formulas for nuclear weapons.
- We need a *FORmula TRANslator* system!
- Oldest programming language still used.
- Modern versions are actually pretty nice.
- Fortran 2015 is almost out.

(λ)

1958: Lisp

- “*The greatest single programming language ever designed.*”
– Alan Kay.
- “*Lisp is worth learning for the profound enlightenment experience you will have when you finally get it; that experience will make you a better programmer for the rest of your days, even if you never actually use Lisp itself a lot.*”
– Eric Raymond (ESR.)
- “*One of the most important and fascinating of all computer languages is Lisp (standing for "List Processing"), which was invented by John McCarthy around the time Algol was invented.*” – Douglas Hofstadter.

1958: Lisp

- “*Within a couple weeks of learning Lisp I found programming in any other language unbearably constraining.*”
– Paul Graham.
- “*Greenspun’s Tenth Rule of Programming: any sufficiently complicated C or Fortran program contains an ad hoc informally-specified bug-ridden slow implementation of half of Common Lisp.*” – Philip Greenspun.
- “*Lisp has jokingly been called “the most intelligent way to misuse a computer.” I think that description is a great compliment because it transmits the full flavor of liberation: it has assisted a number of our most gifted fellow humans in thinking previously impossible thoughts.*” – Edsger Dijkstra.

*The Present
– also known as –
Failure*

Why Everything Sucks Now

- 1959: COBOL
- 1972: Unix and C
- 1981: MS-DOS
- 1983: C++
- 1990: Haskell
- 1995: Java
- 1995: ~~Mocha, LiveScript, JavaScript, ECMAScript~~

Future

Artificial Intelligence?



Artificial CRAZY?



Even Better Hunter/Killers than Man?



The Best Possible Future



You must talk to him. Tell him that he is a
good cat and a pretty cat.

Questions?