

COMPUTERS, THEN AND NOW

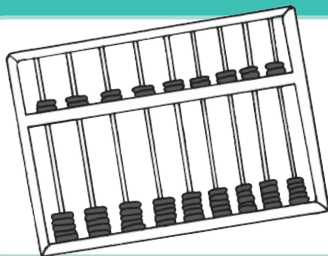
To see how fast technology has evolved, let's take a look at where computers came from. You might be surprised to discover that some of computer science's most important thinkers and inventors were women you don't read much about in history books!

The earliest computers were used, as you may have guessed from the name, to compute stuff—mostly numbers. Calculating and tabulating devices have been around for thousands of years. They were used by early civilizations to keep track of large numbers, navigate their ships, and study the night skies. But it took many centuries of innovation before anything resembling a modern computer began to take shape.

The first fully mechanized computer that could take input in the form of num-



COMPUTER HISTORY PART I: THE FIRST COMPUTERS



Abacus: Invented by the Babylonians, this beaded calculating tool spread throughout the ancient world and into China.

3000 BC

**YEAR
ZERO**

Quipu: This Incan mathematical recording system used knotted string to represent numbers.

1400

35,000–20,000 BC

Lebombo and Ishango bones: Discovered in Africa, these notched baboon bones are the oldest discovered calculating tools.

AD 79

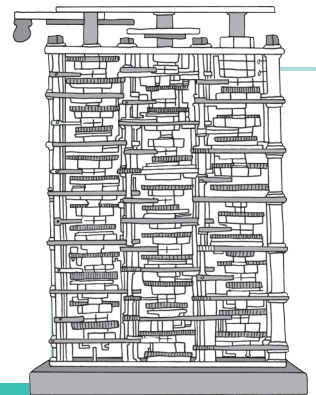
Antikythera mechanism: This was used in ancient Greece to calculate months and astronomical positions.

1622

Slide rule: Invented by William Oughtred, this device built on the theories of Scottish mathematician John Napier, who invented the logarithm, a system to speed up mathematical calculations. This device was used all the way until the invention of the electronic calculator, hundreds of years later!

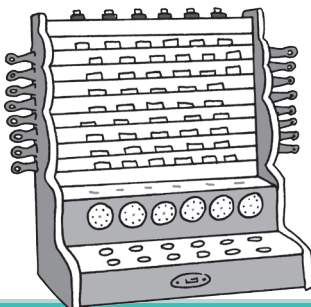
bers, process a calculation, and then output a result was created in 1822 by a British mathematician and engineer named Charles Babbage. His “Difference Engine” was made of metal gears and levers. At that time most people doing large calculations for shipping, manufacturing, and banking relied on printed tables that were slow to sort through and often full of errors—not something you want when you are calculating the weight of a shipping container or a large financial transaction. Babbage’s mechanical calculator was designed to solve this problem by being both fast and accurate.

Although the machine was never fully completed, the design was a breakthrough. Babbage used it to sketch out an even more advanced machine, the “Analytical Engine.” The design for the Analytical Engine laid the groundwork for what would become the modern computer. It also showed the world the need for an instrument that could perform calculations quickly, precisely, and without human error.



Calculating clock: Built by German thinker Wilhelm Schickard, this was the first mechanical calculator. It could add and subtract six-digit numbers and was used to calculate astronomical tables.

1623



Punched-card system: Invented by Joseph-Marie Jacquard, this system allowed different machines like music boxes, player pianos, counters, and looms to be automated.

1801

Difference Engine: Designed and partially built by Charles Babbage, this machine was the predecessor to the modern computer.

1822

1674

Stepped reckoner: Invented by German philosopher Gottfried Wilhelm Leibniz, this device could add, subtract, and divide.

1820

Arithmometer: Invented by Charles Xavier Thomas, this was the first mass produced calculator.



The world's first computer programmer **ADA LOVELACE**

Augusta “Ada” Byron Lovelace was the daughter of the renowned British romantic-era poet Lord Byron. But that’s not why she’s still famous today. She’s considered the world’s first programmer. Not only was she brilliant, she broke the mold for women of her era. At age twelve, Ada produced detailed blueprints for a steam-powered flying machine. At seventeen, she met Charles Babbage, who became her lifelong friend and mentor. In 1843, when she was twenty-seven, he asked her to publish a set of notes on his design for the Analytical Engine. In one of the notes describing how to use the machine, Lovelace included step-by-step operating instructions. Although no one realized it at the time, these instructions on how to “program” the engine to produce a calculation turned out to be the world’s first computer program. Today a programming language used to control space satellites is called ADA in her honor.

ELECTRONIC COMPUTERS

It took another 124 years of inspiration, invention, trial, error, and technological breakthroughs before a team created an electronic computer that could do what Babbage had dreamed of so many years before. The Electronic Numerical Integrator and Computer, or ENIAC, was the first fully functioning general-use electronic computer that did not rely on any moving mechanical parts. (Phew, that’s a mouthful!) J. Presper Eckert and John Mauchly at the University of Pennsylvania built it for the U.S. military during World War II. FUN FACT: Historians suspect that during the ten years it was in operation, the ENIAC performed more calculations

than mankind had in all of human history up to that point. Yeah, that's a whole lot of math.

WOMEN, THE REAL COMPUTERS

The invention of ENIAC was a breakthrough for computing, but what most people don't know is that a team of six women actually programmed it. For every series of calculations the computer produced, these highly skilled women had to manually input all of the **DATA** and program the operations by loading punched cards, setting switches, and connecting cables. This technology was uncharted territory, and these incredible women were inventing the process as they went. Like many great women throughout history, at the time they never received credit for their pioneering work.

So let's give them credit now! *Thank you to:*

Frances Bilas Spence (1922–2013)

Jean Jennings Bartik (1924–2011)

Marlyn Wescoff Meltzer (1922–2008)

Kathleen “Kay” McNulty Mauchly Antonelli (1921–2006)

Frances Elizabeth “Betty” Holberton (1917–2001)

Ruth Lichterman Teitelbaum (1924–1986)

WOW! IF IT TOOK SO MANY
WOMEN TO PROGRAM ONE
COMPUTER, THEY MUST
HAVE BEEN THE ONLY ONES
WHO COULD USE IT.



That's a good point. The fact that only highly trained programmers could use early computers revealed a problem. For computers to really be useful, they needed to be small enough to have in a home or business, and everyone needed to be able to talk to them.

MISSION TO THE MOON

In 1969, humans did something amazing. They traveled more than 230,000 miles through the vacuum of space and landed on the moon for the first time—and they did it with about as much computing power as a pocket calculator has! Regardless, the Apollo Guidance Computer built into NASA's lunar module was a huge breakthrough in computing technology. It was one of the smallest computers on (and off) the planet at the time. NASA and engineers from Massachusetts Institute of Technology (MIT) managed to take a computer the size of seven refrigerators and shrink it

COMPUTER HISTORY PART II: THE RISE OF PERSONAL COMPUTING

ENIAC: Widely believed to be the grandfather of digital computers, this machine filled a twenty-by-forty-foot room and had 18,000 vacuum tubes.

1943–1944

COBOL programming language: This was the first English-like computer programming language; it eventually evolved into FORTRAN.

1953

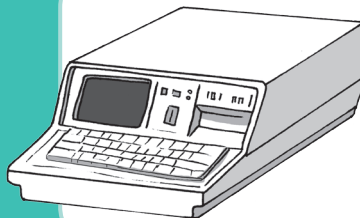
Apollo Guidance Computers: These machines sent computing to the moon.

Unix: This operating system was developed at Bell Labs.

1969

1947

Transistor: Scientists at Bell Telephone Laboratories invented the transistor. This allowed them to make smaller electronic circuits and paved the way for personal computers.

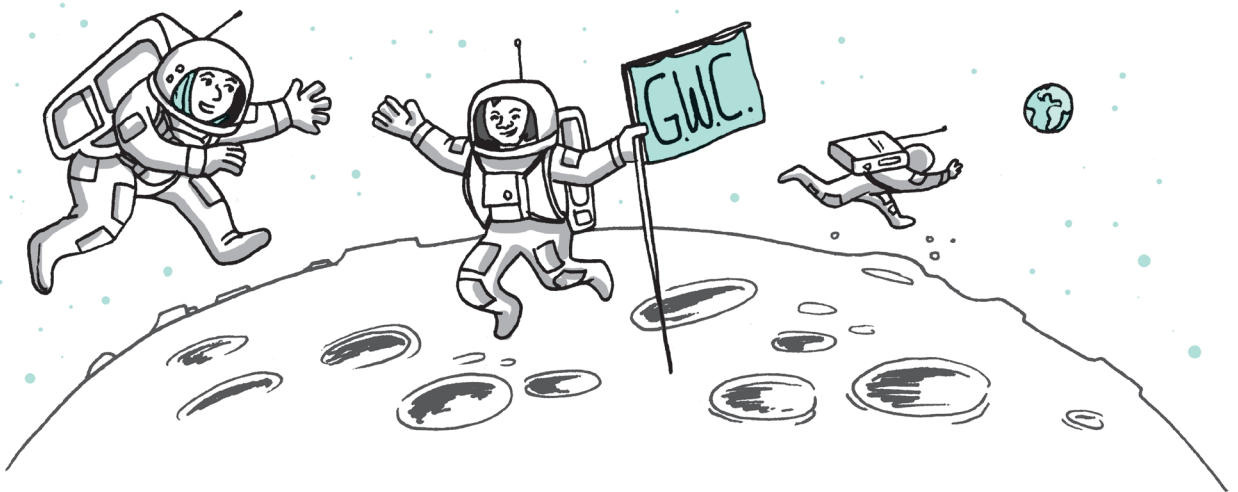


1975

IBM 5100: This was the first modern desktop model computer with a keyboard, display monitor, and built-in storage.

Microsoft: Bill Gates and Paul Allen founded the company.

into a machine that weighed only seventy pounds and was roughly the size of a microwave. More important, it was equipped with software that allowed astronauts to type in commands using simple combinations of nouns and verbs, without the need for a programmer. With this computer, a user could control the machine without knowing how to code.



Apple computer: Steve Jobs and Steve Wozniak founded the company and sold their first computers, the Apple I.

1976

IBM Personal Computer: IBM released this computer, which runs on Microsoft's DOS operating system.

1981

The World Wide Web is invented.

1990

1977

Apple II: This computer was released, bringing affordable mass-produced computers to mainstream consumers.



1985

Windows: Microsoft released this new operating system. America Online was founded.

1988

First foldable laptop: This device was released by Compaq.



*One small step for man,
one giant leap for womankind!*

MARGARET HAMILTON

Did you know that a female mathematician, Margaret Hamilton, created the software for the Apollo program's two portable computers? She also coined the term "software engineering" while she was inventing the job! When the United

States embarked on the Apollo lunar project in the 1960s, the field of computer science didn't really exist. Neither did the software to run the ship's onboard computers. Hamilton and her colleagues from MIT invented it. Their work was essential to safely landing the first humans on the moon, and it laid the groundwork for what would become a \$4 billion worldwide industry.

COMPUTER HISTORY PART III: THE DAWN OF THE INTERNET

Facebook was launched.

2004

eBay and Amazon
were founded.

1995

Camera phone: The first
of its kind was released
by Sony.

2000

YouTube was launched.

2005

iPad: Apple released
the first model.

2010

2017 ONWARD

*You invent something
amazing!*



1998

Google was founded.

2001

Wikipedia was founded.

2002

BlackBerry: This hand-
held device was launched,
making e-mail portable
and accessible 24/7.

2007

iPhone: Apple released
the first model.