THE WORLD WITH BABA · EPISODE 1 COMPANION

The Relay Race

How a pile of accidents carried one idea from rooms full of human "computers" to the machine you talk to today. Every event from the episode, in order. Print it, pin it up, quiz your grandkids.

ACCIDENT a lucky break that moved the story

DROPPED BATON years lost

Two lanes that never touch

1830s In London, a "computer" is a **job, not a machine**: clerks working out tables of numbers by hand, full of mistakes. Charles Babbage designs a room-sized machine of brass gears to do it instead. He never finishes it.

1843 **Ada Lovelace**, Lord Byron's daughter, writes out steps for Babbage's next machine: the first computer program, for a machine that doesn't exist. She sees it could work with anything turned into symbols, even music. But, she writes, it "cannot originate anything."

1849 **George Boole**, a shoemaker's son who never went to university, becomes the first professor of mathematics at the new college in Cork, Ireland.

1854 Boole publishes ***The Laws of Thought***: an arithmetic of true and false, AND and OR. For eighty years, nobody has any use for it.

1864 Boole walks three miles to class in a rainstorm, catches a fever and dies at 49.

1886 Philosopher **Charles Peirce** writes to a former student: build your logic machine with electricity and switches. A drawing gets made. Then nothing. DROPPED BATON

1891 A Kansas City undertaker, sure the operator is sending his customers to a rival, patents the **automatic telephone switch**. Soon the phone system runs on switches.

The lanes touch

1932 Freshman **Claude Shannon** needs one more class and picks philosophy. There he meets Boole's algebra. ACCIDENT

1936 Alan Turing imagines one machine that can do any job by changing its instructions: the computer, on paper. Shannon spots a postcard on a bulletin board and takes a job at MIT tending a room of switches. ACCIDENT

1937 Shannon, 21, realizes open/closed is the same as true/false. His master's thesis becomes the rulebook for every computer and chip. (An engineer in Tokyo and a young man in Moscow find the same idea.)

1939–45 Turing's team builds a machine of spinning drums that cracks the German **Enigma** code, which some historians say shortened the war by two years.

1943 Turing and Shannon share teatime at the same lab for two months. Forbidden to discuss their secret work, they talk about whether a machine could think.

1947 At Shannon's lab, three men invent the **transistor**: a switch with no moving parts.

1950 Turing asks in print, "Can machines think?", answers Ada by name, and proposes his test: can you tell a person from a machine? Shannon builds a **mechanical mouse** that learns its way through a maze.

1956 Shannon and three colleagues invite scientists to a summer workshop at Dartmouth. Their invitation names the field: **artificial intelligence**.

The summer of 1958

1958 New hire **Jack Kilby** has no vacation days, so he's alone in the Texas Instruments lab all summer. He builds the **first chip** and switches it on September 12. ACCIDENT A few months later a man in California makes a better one from silicon.

1958 The Navy shows off **Frank Rosenblatt**'s machine that learns from examples. The New York Times says it may one day walk, talk and see.

> **Baba's note, early 1970s:** I sneaked my father's first electronic calculator away and opened the back. Somewhere inside were the great-great-grandchildren of Kilby's chip. That's why I became an electrical engineer.

The long freeze

1969 Rosenblatt's old Bronx schoolmate co-writes a book saying learning machines won't amount to much. The money dries up for almost twenty years. DROPPED BATON

1971 Rosenblatt dies on Chesapeake Bay, on his 43rd birthday.

1979 The U.S. military names a programming language **Ada**. Its official number, 1815, is the year she was born.

1986 **Geoffrey Hinton**, told by his supervisor to work on something else, and two colleagues work out how a machine can learn by tiny adjustments. It needs billions of them. Computers are far too slow.

The lanes touch again

1993 Three engineers in a **Denny's** booth start a company to make video-game explosions look better: **Nvidia**. It nearly goes out of business.

2011–12 Over 100,000 people take Andrew Ng's free Stanford class online. His Google team teaches a computer to recognize cats using **16,000 processors**.

2012 Hinton's student **Alex Krizhevsky** trains a network in his bedroom on **two gaming cards**. His parents pay the electric bill. It recognizes pictures better than anything ever built. ACCIDENT

2017 Eight Google researchers publish ***Attention Is All You Need***, a far better way for machines to handle language.

2020 A machine cracks a fifty-year-old puzzle about how proteins fold.

2022 November 30: OpenAI puts a "low-key research preview" chat box online. The staff betting pool tops out at 100,000 users. It hits **one million in five days**.

2024 Hinton wins the **Nobel Prize in Physics** for the idea he was told to drop. The protein-puzzle team wins one too.

Next? The thinking moves out of giant buildings and into your phone, your glasses, your car. And somewhere, right now, an idea is waiting in a book nobody is reading.

Take the weird elective.

Watch the full story, "The Relay Race," on YouTube at youtube.com/@TheWorldWithBaba. New stories every Sunday.

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