

CLAUDE SHANNON

Claude Elwood Shannon was an engineer who established mathematical foundations of the information age, describing basics of communication, computation and cryptography.

BIRTH

Shannon was born in Michigan, USA during WWI, the son of a judge and a teacher. As a child, his hero was inventor Thomas Edison (a distant relative). He built a wireless telegraph, radio controlled boats, and model planes of various designs. He later learned to fly, with special permission from MIT's president, who feared losing his genius.

STUDIES

Shannon was an undergraduate student at the University of Michigan, earning degrees in both electrical engineering and mathematics. He then worked as Vannevar Bush's assistant at the Massachusetts Institute of Technology, operating an analog computer. His 1940 master's thesis, often said to be the most important of the century, pushed computing into the digital realm, by connecting the mathematics of Boolean algebra with the technology of switching circuits. His doctoral research, completed in one summer at Cold Spring Harbor, NY would provide a similar algebra for genetics.

Working further in computing, Shannon helped found the field of artificial intelligence by co-organizing the 1956 Dartmouth Conference, taking inspiration from computers he had built for playing chess and for solving mazes. He also built some of the earliest wearable computers, with applications in prediction and gambling.

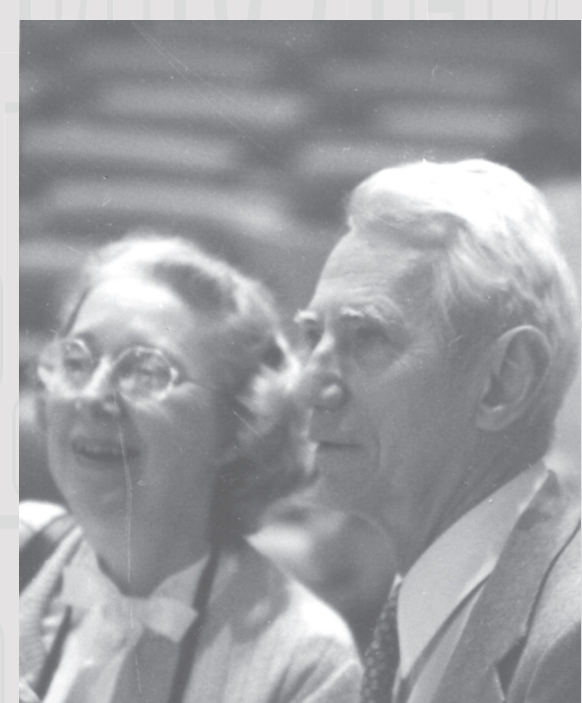
WORLD WAR II

During WWII, Shannon was a main contributor in building the System X that allowed Franklin Roosevelt and Winston Churchill to securely communicate over the Atlantic about war strategy. Securing the communication of the Allies was a key counterpoint to breaking Axis codes. In fact, Shannon came up with an encryption strategy (the one-time pad) that is provably unbreakable, no matter how much computational effort and ingenuity is brought to bear in trying to break it. That is, neither Alan Turing at the time nor modern intelligence agencies can break the code. This is perfect secrecy.

MATHEMATICAL THEORY OF COMMUNICATION

Shannon's master work, «A Mathematical Theory of Communication», appeared in two parts in the July and October 1948 issues of the Bell System Technical Journal. Some have said the work «came as a bomb, and something of a delayed action bomb» in that it was extremely novel, it laid the foundations for the information age, and its effects are still felt to this day. This paper founded the field of information theory, which studies the fundamental limits of reliable communication in the presence of noise, and of data compression. Shannon's theory allows us to talk about a common currency for information, bits. As noted, before information theory «we had been dealing with a commodity that we could never see or really define. We were in the situation petroleum engineers would be in if they didn't have a measuring unit like the gallon.» Shannon developed much of his theory at home on nights and weekends during 1940-1945, and only after much urging from his supervisor, Hendrik Bode, and colleagues did Shannon finally publish his work.

INFORMATION RATE OF ENGLISH TEXT



In a paper that stemmed from his initial work on information theory, Shannon characterized the information rate of English text. Experiments were done by playing a hangman-like guessing game with his wife Betty (a computer scientist at Bell Labs) and his friend Barney Oliver. This was initially presented at a Macy Conference on Cybernetics, where biologists, psychologists, anthropologists, economists and engineers all came together to discuss the nature of information.

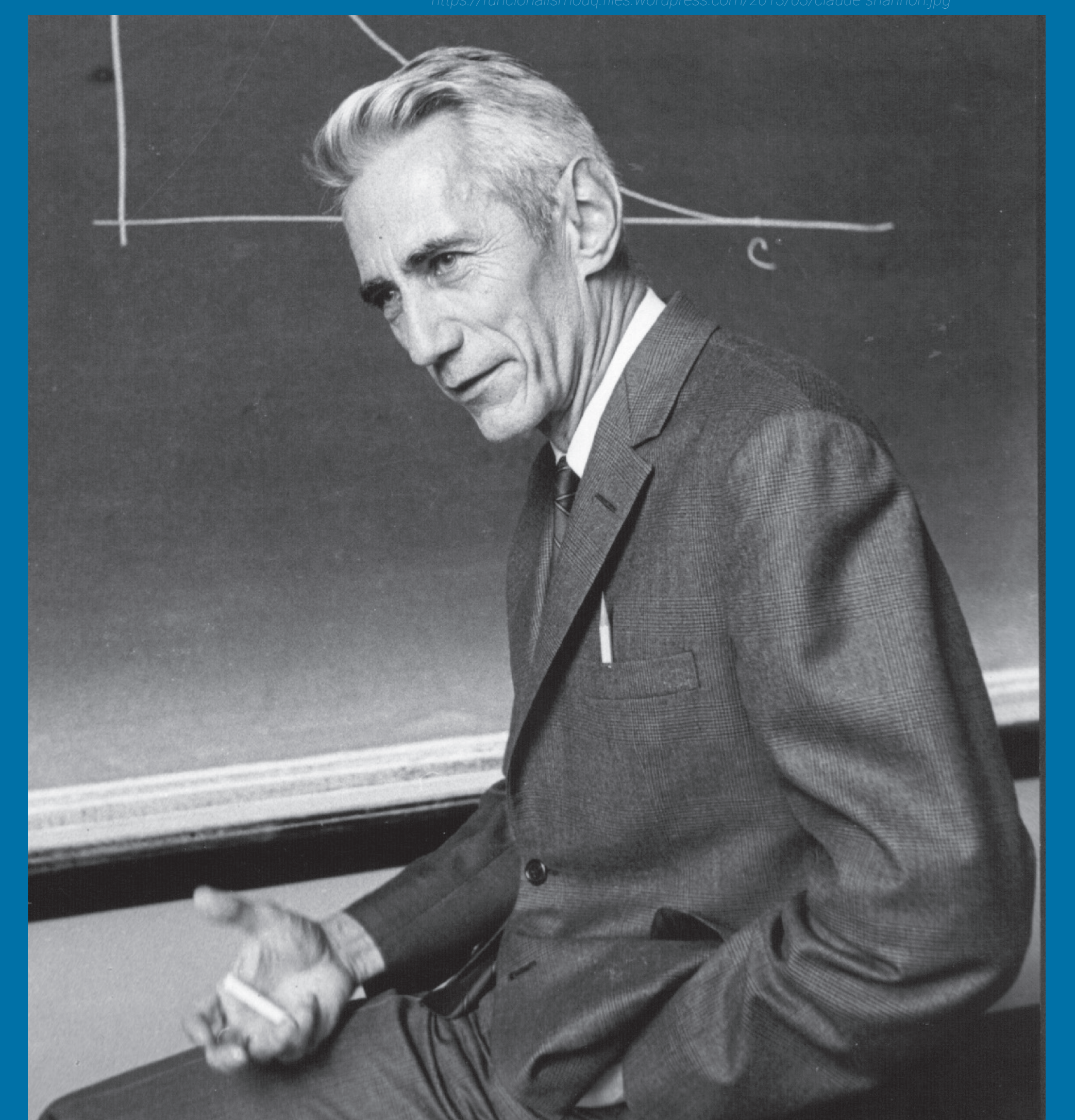
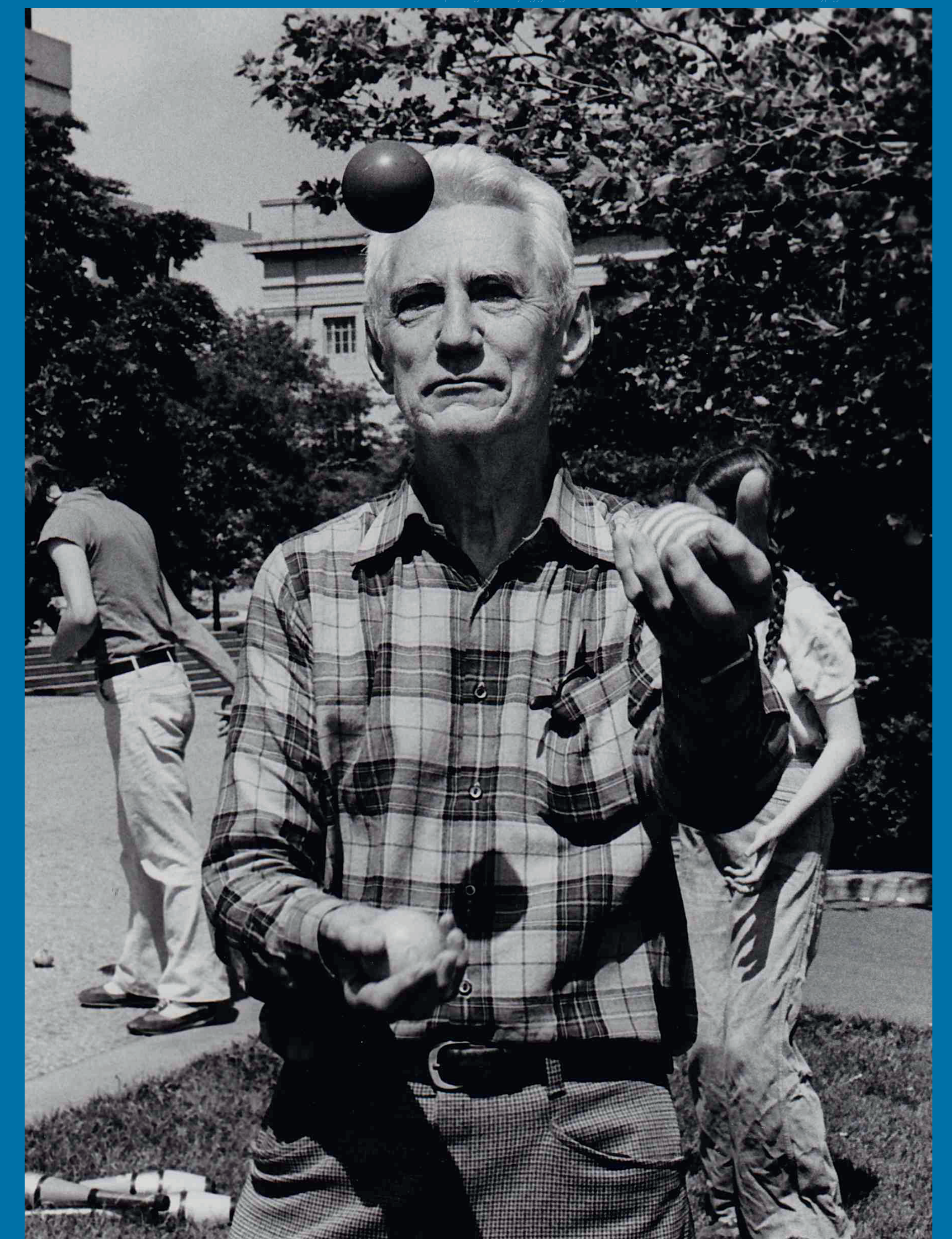
DEATH

Suffering from Alzheimer's disease in the last years of his life, Claude Shannon died at 84 years old February 24, 2001 in Medford, Massachusetts.



INTERESTS

Shannon's outside interests such as juggling also betrayed an active mind. He wound up building robots that could juggle and even proved a mathematical theorem on the fundamental limits of juggling. He also invented many devices, such as rocket-powered flying discs, a motorized pogo stick, and a flame-throwing trumpet. During a trip to Russia, he used his entire honorarium to purchase musical instruments, and during a stay in England he invented a device that would make it easy for Americans to drive on the left side of the road.



1916

1938

1942

1948

1951

2001