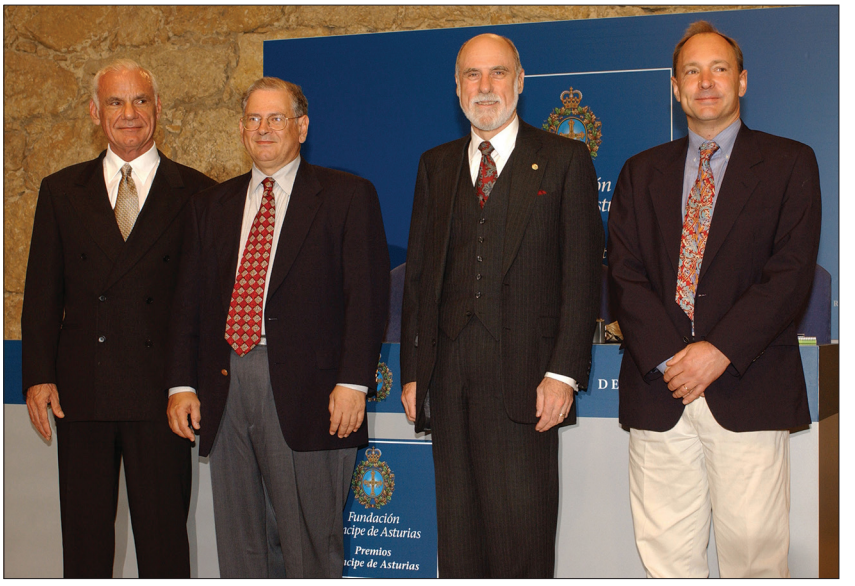
LAWRENCE ROBERTS, WHO HELPED DESIGN INTERNET'S PRECURSOR, DIES AT 81

BY KATIE HAFNER

In late 1966, a 29-year-old computer scientist drew a series of abstract figures on tracing paper and a quadrille pad. Some resembled a game of cat's cradle; others looked like heavenly constellations; still others like dress patterns. Those curious drawings were the earliest topological maps of what we now know as the Iinternet. The doodler, Lawrence G. Roberts, died on Dec. 26 at his home in Redwood City, Calif. He was 81. The cause was a heart attack, said his son Pasha.

As a manager at the Pentagon's Advanced Research Projects Agency, or ARPA, Dr. Roberts designed much of the Arpanet, the Internet's precursor, and oversaw its implementation in 1969. Dr. Roberts called upon a circle of colleagues who shared his interest in computer networking for help in creating the technical underpinnings of the Arpanet, integrating and refining many ideas for how data should flow.



Lawrence Roberts, far left, with other internet pioneers, from left, Robert Kahn, Vinton Cerf, and Tim Berners-Lee, at a conference in Spain in 2002. Dr. Roberts insisted that engineers look for practical uses for the Arpanet, the precursor to the Internet. (Carlos Alvarez/Getty Images)

Dr. Roberts was considered the decisive force behind packet switching, the technology that breaks data into discrete bundles that are then sent along various paths around a network and reassembled at their destination. He decided to use packet switching as the underlying technology of the Arpanet; it remains central to the function of the internet. And it was Dr. Roberts' decision to build a network that distributed control of the network across multiple computers. Distributed networking remains another foundation of today's Internet.

Dr. Roberts' interest in computer networking began when he was a graduate student at the Massachusetts Institute of Technology in the early 1960s. He paid close attention to the work of his longtime colleague, Leonard Kleinrock, who had done research on theoretical aspects of computer networks, analyzing the problem of data flow. Dr. Roberts also followed the ideas of J.C.R. Licklider, a prominent psychologist and predecessor of Dr. Roberts at ARPA, who envisioned what he called an "intergalactic computer network."

It was under Dr. Roberts' leadership at ARPA that the possibilities of computer networking began to grow clear to a community beyond the core of scientists who built the Arpanet. He long believed that a computer network was of little importance unless it was used in interesting ways. As early as 1968, he exhorted his colleagues to create applications for the nascent network. ARPA, for instance, was one of the largest early users of electronic mail.

"Larry led us to uncover potential that we never would have seen had he not pushed so hard for increased functionality," said Vinton G. Cerf, Google's chief Internet evangelist and a graduate student in computer science at the University of California, Los Angeles when Dr. Roberts was overseeing the building of the Arpanet. "He pushed all of us to find ways in which we could make good on the promise of resource sharing."

He was also a serial entrepreneur and corporate executive. After leaving ARPA in 1973, Dr. Roberts founded or co-founded a half-dozen companies focused on computer networking.

Lawrence Gilman Roberts was born on Dec. 21, 1937, in Westport, Conn., the youngest of three children. His parents, Elliott and Elizabeth, were both chemists who had met in the Yale University chemistry department while pursuing their doctorates.

As a young child, using his father's chemistry books and chemicals, Dr. Roberts built a series of rockets and bombs. He recalled that one of his youthful experiments produced a chlorine gas byproduct, "which put me in the hospital under an oxygen tent because I sniffed it to see what was happening," he said in an interview for this obituary in May.

When he was in sixth grade, he built an elevator to ascend an oak tree in his yard. He was sitting in it one day when a connector broke. He fell to the ground and broke his neck. "They were quite used to me in the hospital," he said. But it was electronics that eventually captured his attention. "I wanted something new, not old like chemistry," he said.

He received his bachelor's degree in electrical engineering from M.I.T. in 1959. That year he married June Stuller, a computer programmer. They divorced in 1974. Three subsequent marriages also ended in divorce.

By the time Dr. Roberts received his Ph.D. in 1963, also in electrical engineering, he was already working at M.I.T.'s Lincoln Laboratory, a government research facility. He soon encountered the TX-0, an early computer, and used it to build an optical character recognition program. He also did early work in computer graphics and virtual reality. He and a

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colleague, Ivan Sutherland, built an ultrasonic pointing device that could manipulate objects on a screen.

Initial attempts to recruit him to ARPA's Information Processing Techniques Office to oversee the technical structure of the Arpanet failed. He was reluctant to leave Lincoln Lab for a job he viewed as largely administrative. But eventually he agreed, and arrived at the Pentagon in December 1966.

Stephen Crocker, a computer scientist who worked for Dr. Roberts at ARPA, said his boss's dislike of wasted time was legendary. "Within a few weeks, he had the place memorized," recalled Dr. Crocker, referring to the labyrinthine Pentagon building. "As I've heard the story, Roberts obtained a stopwatch and began timing various routes to his frequent destinations." "'Larry's Route' soon became commonly known as the fastest distance between any two Pentagon points," Dr. Crocker said.

Dr. Kleinrock, who had shared an office with Dr. Roberts at Lincoln Lab, said that after Dr. Roberts arrived at ARPA, he showed Dr. Kleinrock and other colleagues his sketches of the network's topology and logic. Hundreds of drawings later, he chose a distributed network, rather than a centralized or star configuration, to serve as the backbone of the Arpanet. But even as he focused on the overall architecture, he remained committed to finding practical uses for the nascent network.

Email, an application that ARPA-sponsored researchers had spent a great deal of time developing, quickly became one of the most popular applications on the Arpanet. When asked about that at a technical conference in 1986, Dr. Roberts said he was not surprised. The ARPA director "decided it was a great thing, and he made everybody in ARPA use it," Dr. Roberts said. "So all these managers of ballistic missile technology, who didn't know what a computer was, had to start using electronic mail."

Dr. Roberts added that he had received a note years earlier from Paul Baran, another networking pioneer, warning against personal use of email. "It said, 'One thing you ought to watch out for is you can't send out personal message stuff, that's illegal. That's against the postal laws and you'll be in jail in no time.'" Mr. Baran's warning notwithstanding, there was no stopping the personal messages. "But we didn't happen to go to jail," Dr. Roberts told the audience.

Dr. Roberts left ARPA in 1973 to become the founding chief executive of Telenet, a networking company that used packet switching. Seven years later, Dr. Roberts and his co-founders sold Telenet to GTE for $60 million. The start-ups that followed focused on flow control algorithms for Internet traffic and did not achieve the same level of success. He ultimately failed to amass significant wealth from the Internet.

"It's like you created the Spider-Man character and it turned into a giant franchise, but you only got paid by the hour for drawing it," said Pasha Roberts. Yet Dr. Roberts remained philosophical about this aspect of his life. "It's sad that it didn't benefit me," he said in the 2018 interview. "But it's interesting, and I love the knowledge I gained from building it and using it and understanding it from the beginning." The interview took place in Dr. Roberts' modest house in Redwood City, a town in Silicon Valley, which he shared with his longtime partner, Dr. Tedde Rinker, a physician.

Dr. Roberts is survived by Dr. Rinker and his son Pasha, as well as two sisters, Mary Annis Arris and Ruth Esther Bennett. A second son, Kenny, died in 2013.

In 2018, the biggest problem he saw with the Internet was network security. "I envision some day getting software into the network that helps curb attacks, but that's going to take a lot of work," he said. "It's got to be distributed around the network in order to solve the problem. So that's the project I keep thinking about, but I don't have a solution."

He was quick to dismiss detractors who said the Internet had sparked the demise of brick-and-mortar retail stores. "I think it's wonderful, and I think they should go out of business, because going to the store is ridiculous," he said. The doorbell rang, and Dr. Roberts excused himself to take delivery of groceries he had ordered online.