Sir Maurice Wilkes obituary

Scientist who built the first practical digital computer


Wilkes with the Witch computer at the National Museum of Computing, Bletchley Park, in 2009. Photograph: John Robertson

Sir Maurice Wilkes, who has died aged 97, was the most important figure in the development of practical computing in the UK. Not only did he lead the development of EDSAC, the first stored-program digital computer to go into service in the 1940s, he and his colleagues at Cambridge University also made significant contributions to software development, and built one of the first high-speed distributed computing networks, the Cambridge Ring. His vision was less about producing bleeding-edge designs than about developing machines that could reliably do calculations for the university's scientists and engineers – people like himself. In the early 1950s, EDSAC, the Electronic Delay Storage Automatic Calculator, was the basis for the world's first business computer, LEO (the Lyons Electronic Office), which was used to run the operations of the eponymous tea-shop company.

Wilkes considered himself lucky to be in at the birth of the computer industry that grew out of the wartime development of ENIAC, the Electronic Numerical Integrator and Computer, which had calculated shell trajectories for the US army. The Americans planned to follow this with a more sophisticated machine that could run stored programs, and Wilkes was given an overnight loan of John von Neumann's seminal paper, First Draft of a Report on the EDVAC, the Electronic Discrete Variable Automatic Computer, which explained the concepts. Wilkes recognised that this approach was the future – computers became known as "Von Neumann machines".

In 1946, he was invited to lectures on the Theory and Techniques for Design of Electronic Digital Computers at the University of Pennsylvania, the birthplace of ENIAC. Wilkes got there late, but met many of the American computer pioneers, including Harvard University's Howard Aiken and ENIAC's developers, John Mauchly and Presper Eckert. He thus become one of relatively few people who had some idea how to build a computer, in theory, and began to sketch the design of EDSAC on the Queen Mary on the way home.

Building a stored-program computer was still a huge challenge, but Wilkes had the determination and the means to do it. After returning from his work on radar during the second world war, he had been made head of the Mathematical Laboratory, which later became the Cambridge Computer Laboratory. "I didn't have to ask anybody, 'Could I build a computer, please?'," he wrote later. "I didn't have to arrange any budget. I was in charge and I could go ahead. I was the only one who knew anything about building computers, so if I said, 'You build a computer this way', they said, 'Yes, right, that's the way.'"

By today's standards, EDSAC was amazingly primitive. It used valves – vacuum tubes – for computation, like ENIAC and Colossus, Bletchley Park's secret code-breaking machine. Its first memory units used sound beams traversing baths of mercury, which required very precise manufacturing. But EDSAC was up and running in 1949, and performed useful calculations for many years. "We never tried with the EDSAC to exploit to the full the technology of the time, because even a slow electronic computer would be so fast. You don't want to take a bigger jump than you need," he said. The jump from mechanical to electronic computation was the biggest jump there was.

In the days when computers were big, expensive things, they could earn their keep by taking on a small number of very large tasks. Wilkes had other ideas. He envisaged EDSAC performing relatively large numbers of smaller tasks for Cambridge researchers working in fields such as mechanics, economics, crystallography and radio astronomy. This led Wilkes and his team to develop ways to make computers easier to program and to use. In 1951, Wilkes and two colleagues published the first book on computer programming: The Preparation of Programs for an Electronic Digital Computer.

Wilkes also came up with the idea of microprogramming as a way of controlling the computer's operations, by building complex high-level instructions from small ones – microcode. The lab's second valve-based machine, EDSAC 2, which came into operation early in 1958, was the first computer to have a microprogrammed control unit. The technique was used later in the IBM 360 mainframe, and became a fundamental part of modern computing.

He also helped pioneer networking, having seen some early work in digital telephony at the telecommunications firm of Hasler in Berne, Switzerland. He immediately saw the potential for using the technology to connect computers instead, and started the Cambridge Ring project long before the idea of computer networking became fashionable. Some commercial Rings were installed, but the industry adopted Ethernet instead.

Wilkes was born in Dudley, Staffordshire, to Vincent and Ellen Wilkes. He was very proud of his father, who had started working for the Earl of Dudley's estate as a 16-year-old office boy and worked his way up. He attended the King Edward VI school, in Stourbridge, and in 1931 went to St John's College, Cambridge, where he studied mathematical physics. As a graduate student in the Cavendish Laboratory, he researched the propagation of radio waves in the ionosphere, gaining his PhD in 1938. After returning to Cambridge in 1945, he became head of the Mathematical Laboratory (1946-70), head of the Computer Laboratory (1970-80), and in 1985 published Memoirs of a Computer Pioneer.

After "retiring" from Cambridge University, he worked for DEC (Digital Equipment Corp), the US minicomputer giant, and was adjunct professor at MIT in Cambridge, Massachusetts. He enjoyed it a lot, and said he wished he had worked in industry sooner. Back in Cambridge, he worked at the Olivetti Research Laboratory before rejoining the Computer Laboratory in 2002 as

an emeritus professor. David Hartley – his former student, later colleague (as director of the university's Computing Service) and longtime friend – said he continued to go in to work there until his mid-90s.

Wilkes was the first president of the British Computer Society, a fellow of the Royal Society, and a fellow of the Royal Academy of Engineering. His numerous awards included the Faraday medal from the Institution of Electrical Engineers in London, and in 2000 he was knighted.

In 1947, Wilkes married Nina Twyman, a classicist he had met in Cambridge. She died in 2008. He is survived by his son, Anthony, and two daughters, Margaret and Helen.

• Maurice Vincent Wilkes, computer scientist, born 26 June 1913; died 29 November 2010

From IEEE Computer Society:

Microprogramming Pioneer Maurice V. Wilkes Remembered

LOS ALAMITOS, Calif., 29 November, 2010 – British computer scientist Sir Maurice V. Wilkes, an IEEE Computer Society 60th Anniversary Award recipient for his pioneering of microprogramming, has passed away at the age of 97.

Wilkes was the developer of the Electronic Delay Storage Automatic Calculator (EDSAC), the first practical stored-program electronic computer. The machine, inspired by John von Neumann's seminal *First Draft of a Report on the EDVAC*, was built by Wilkes and his team at the University of Cambridge Mathematical Laboratory (later renamed the Computing Laboratory) in the United Kingdom in the 1940s.

The author of five seminal books on computing, including "Memoirs of a Computer Pioneer" (MIT Press, 1985) and "Computing Perspectives" (Morgan-Kaufmann, 1995), in addition to hundreds of articles, Wilkes has received numerous professional recognitions for his pioneering accomplishments.

In 1951, he and two colleagues wrote the first book on computer programming, "The Preparation of Programs for an Electronic Digital Computer." In that book, they proposed a system that went on to be widely accepted by industry. In 1965, he published the first paper on cache memories, followed later by a book on time-sharing.

In 1975, Wilkes participated in the design study for what became known as the Cambridge Ring. The Cambridge Model Distributed System, a pioneering client-server system, was based on this ring.

A 1980 winner of the ACM/IEEE Computer Society Eckert-Mauchly Award, Wilkes was a frequent contributor to the *IEEE Annals of the History of Computing*.

He led the Cambridge Computing Laboratory and taught computer science at Cambridge until 1980. He worked as a senior consulting engineer at Digital Equipment Corp. from 1980-1986; an

adjunct professor of electrical engineering and computer science at Massachusetts Institute of Technology from 1981-1985; and an Olivetti research strategy member from 1986-1989. In 2002, Wilkes returned to Cambridge as an Emeritus Professor.

Among his honors and awards: He was named a Royal Society member in 1956 and served as the British Computer Society's first president from 1957-1960. He won an ACM Turing Award in 1967 and the Harry Goode Memorial Award the following year. In 1981, he received the IEEE Computer Society McDowell Award and the Faraday Medal from the Institution of Electrical Engineers, and in 1992 was the recipient of the Kyoto Prize for Advanced Technology.

He was a Distinguished Fellow of the British Computer Society, a Fellow of the Royal Society, and a Fellow of the Royal Academy of Engineering. He was a Foreign Associate of both the US National Academy of Sciences and the US National Academy of Engineering. He held honorary degrees from the universities of Newcastle, Hull, Kent, London, Amsterdam, Munich, and Bath.