

Microchip Pioneer Kilby Dies

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Four decades after inventing the integrated circuit ? the basis of every electronic device today ? Jack Kilby believed that the invention found him as much as the other way around.

Nobel Prize winner Jack Kilby was a leader in technology, paving the way for the digital age of personal computing.

"Humankind eventually would have solved the matter," he wrote upon accepting the Nobel Prize in 2000. "But I had the fortunate experience of being the first person with the right idea and the right resources at the right time in history."

Kilby, who died Monday at 81 after a brief battle with cancer, gave birth to one of the most dynamic industries in history. His integrated circuit, first demonstrated on Sept. 12, 1958, made possible computers, the space program, the Internet and such everyday items as digital watches and Furbys.

"Few people can say they really changed the world. Kilby would be one of them," says Gordon Eubanks, CEO of tech company Oblix.

Kilby began his career with a small electronics maker in Milwaukee in 1947, the same year the transistor was invented at Bell Laboratories. In 1958, he took a job with Texas Instruments in Dallas.

The company had been working on a problem: As engineers tried to make more complex devices, they kept adding individual transistors, capacitors and other components to circuit boards, soldering each of the tiny wires together. As the boards got more intricate, they were hard to make and unreliable.

That summer, new employee Kilby famously had no vacation time and had to work during TI's annual two-week summer shutdown. He used the time to work on his radical idea of building all the components into a single part.

"I was sitting at a desk, probably stayed there a little longer than usual," he said in an interview posted on TI's Web site. "Most of it formed pretty clearly during the course of that day. There was some slight skepticism (from his supervisors), but basically they realized its importance." Kilby put together a prototype ? one transistor and other components on a slice of germanium about half the size of a paperclip. On Sept. 12, he demonstrated his integrated circuit for TI management. It was publicly unveiled on March 6, 1959.

It must have been the right moment for the invention, because someone else had been working on it, too ? Robert Noyce, then of Fairchild Semiconductor. Noyce put his on silicon, solving some of the potential manufacturing problems of Kilby's design, and filed for a patent about six months after Kilby. Both patents, slightly different, were granted, which set off legal battles until the two agreed to cross-license to each other.

"As notable nowadays is the gentlemanly way Kilby and Noyce and their companies finally agreed to share the title of co-inventor and the royalties," says Harold Evans, author of *They Made America: Two Centuries of Innovators from the Steam Engine to the Search Engine*.

Noyce went on to co-found Intel. Atypical in tech history, Intel and TI both remain leaders in making the inventions they engendered.

In the early 1960s, TI challenged Kilby to create a product that would demonstrate to consumers the value of integrated circuits. So Kilby came up with the electronic calculator. It cost nearly \$500 when introduced. In his later years, Kilby would say he was amazed such calculators now cost around \$4.

"The cost decrease (of computer chips) has been a factor of millions to one," Kilby said in the interview.

Kilby won dozens of awards, including the Nobel Prize in 2000 and the National Medal of Technology in 1990. He also continued to inspire major players in technology.

"I only met him once or twice, but meeting him the first time left an impression," Andy Grove, former chairman of Intel, wrote in an e-mail Tuesday. "It was at an electrical engineering meeting. He was sitting at a table, having drinks, and I was invited to join by someone. I was maybe a year out of school (very junior) and Kilby was a towering figure, both metaphorically and physically. He reached out to me, was very friendly, down-to-earth, and best of all, he wore a pair of hearing aids, just like I did in those days. The combination worked to break the ice, and we had a good technical conversation."

"His death is a great loss to the engineering and scientific communities," says Gordon Bell, who helped invent the minicomputer while at Digital Equipment in the 1960s and now works at Microsoft Research. "As an engineer, the inspiration and my admiration comes from (Kilby) being the co-inventor of one of the greatest inventions of all time."

By Kevin Maney

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