



*Amotom D. Kurtz*

## ANTHONY D. KURTZ

1929–2010

Elected in 2008

*“For the conception, development, and commercialization of the silicon semiconductor pressure transducer.”*

BY ALAN EPSTEIN

ANTHONY DAVID KURTZ, founder and chief executive officer of Kulite Semiconductor Products, and a prolific inventor, innovator, and entrepreneur, died on February 9, 2010. He was 80 years old.

Kurtz started Kulite Semiconductor Products, Inc., in 1959 to manufacture silicon strain gauges. He was among the first to demonstrate the piezo-resistive silicon pressure transducer (1961) and to bring the silicon transducer to market (1964). Kurtz and Kulite have continued as the technology leader in this business such that over the past 50 years “Kulite” has become synonymous with miniature high frequency response transducers. Kurtz grew Kulite to about 700 people and \$100 million per year in sales. His product innovations include the first silicon accelerometer, the first silicon-on-oxide transducer, the first acceleration-compensated transducer, and the first high-temperature (>500°C) silicon transducer. His last work was on silicon carbide, porous silicon, and diamond-based transducers. His record of inventions is apparent in his more than 200 patents and 60 papers. His patent combining a micromechanical sensor with electronic computation was among the most frequently cited of the 1980s. His pioneering contributions were recognized by *Industrial Research* magazine with an IR 100 award in 1968 and by awards from the

Instrument Society of America in 1978 and 2005. Tony was elected to the National Academy of Engineering in 2008.

Anthony David Kurtz was born on May 3, 1929, in Brooklyn, New York. His father was a metallurgist, a pioneer in powder metallurgy, and a founder of Callite Tungsten. His mother was a member of the 1924 U.S. Olympic swim team. Together, his parents later started Kulite Tungsten. Tony attended high school in Teaneck, New Jersey. He enrolled at the Massachusetts Institute of Technology (MIT), playing club rugby and swimming, and received a B.S. and an M.S. in physics in 1951 and 1952, respectively. He worked at MIT's Lincoln Laboratory while pursuing an Sc.D. in physical metallurgy. He graduated in 1955. His thesis topic was the mechanical properties of a newly promising element—silicon. Upon graduation from MIT, Kurtz became manager of diffused device research at Cleavite Transistor Products. In 1957 he set up an applied semiconductor research laboratory for Honeywell and served as its director until 1960.

Kurtz wanted to own his own company and looked for a niche in which he would not need to compete with large established players in the semiconductor business (which meant transistor and diode manufacturers in those days). He found his niche in silicon semiconductor strain gauges. In 1959 he set up Kulite Semiconductor Products in an unused loft of his parents' company in Ridgefield, New Jersey. Kulite negotiated a license from Western Electric for its patent on the piezo-resistive properties of silicon. Kulite teamed with Bytrex (an established strain gauge manufacturer) to form Kulite-Bytrex to bring the first semiconductor strain gauge to market. Semiconductor strain gauges offered 100 times the sensitivity of conventional metal foil and wire gauges. Their initial customers were established pressure transducer manufacturers. The Kulite-Bytrex marketing partnership came to an end when Schaevitz, an established transducer manufacturer, acquired Bytrex, leaving Kulite free to develop and promote its own gauges and transducers.

Kulite soon brought the silicon diaphragm pressure transducer to market. Silicon is an excellent material for

pressure transducer diaphragms because of its high stiffness-to-mass ratio, which enables very high frequency response with low acceleration response. These Kulite transducers were among the first micromachined products to enter the market, a field now known as MEMS (microelectromechanical systems). Small enough to fit through the eye of a needle (albeit a large one), the first Kulite miniature semiconductor diaphragm transducer was a technical marvel of its time. It quickly became the backbone of aerospace dynamic testing in the 1960s. It was extensively used in aircraft and spacecraft development—an application that continues to be important to this day.

The early Kulite transducers had excellent sensitivity and acceleration resistance but relatively poor thermal stability, so they were mainly used in dynamic applications. Over the next few decades, Tony's innovative spirit, combined with his deep understanding of solid state physics, spurred numerous design and manufacturing innovations. Today's Kulite transducers are among the most stable available and operate over an enormous temperature range. This stability was gained without sacrificing other desirable qualities, such as small size and high-frequency response. This greatly expanded the market for silicon transducers, which now encompasses medical, oil exploration, and automotive applications. As is often the case with pioneers, Kulite spawned several spinoffs and competitors.

Learning from his father's tungsten business in which the profit was in collecting the dust from the saw kerfs when cutting vacuum tube filaments, Tony Kurtz eschewed commodity businesses with low margins—such as those that developed for disposable medical transducers and production automobiles. For 50 years he kept Kulite on the cutting edge of technology, which allowed him to indulge his love of invention and innovation as well as get premium prices for premium products. His focus on the pressure transducer market and its technology served Kulite well as competitors were acquired by diversified corporations and often lost the innovation and drive that are characteristic of many enterprise founders.

Over the decades, Tony maintained close relations with MIT, Columbia University, the New Jersey Institute of Technology, and Oxford University in many ways. He was a generous benefactor, a research collaborator, and a direct sponsor of graduate students and their research. At Columbia he was an adjunct professor and served on the dean's council of the engineering school for many years.

Athletics was an important part of Tony's life. As an undergraduate at MIT, he was a founding member of the Rugby Club. This club team included an amazing assortment of young men who went on to become leading engineers, architects, executives, generals, professors, Central Intelligence Agency leaders—and two national Academy of Engineering members. Tony learned his love of swimming from his mother and swam daily for most of his life.

Tony remained as chief executive officer and chief scientist of Kulite until his death. As a closely held, privately owned company, Kulite reflected the values of its leader and is best described as having a family atmosphere. A significant number of its employees have been there for essentially their entire working lives, and more than 50 percent of the employees have one or more family members in the company. Walking through the company was like a trip to the United Nations, with an amazing cross section of the world's peoples and their languages represented.

Tony Kurtz always placed great value on education. In addition to being a generous benefactor to universities, he strongly encouraged members of the Kulite family to further their education and funded college for a very large number of employees and their families. This commitment reflected two sides of this interesting man: a compassion for people and a shrewd business sense. As Tony liked to say, "I always felt the real capital is in the brains of the people."

