



ALFRED E. MANN

1925–2016

Elected in 2001

“For innovations and entrepreneurship in cardiac pacing technology, insulin delivery, and neural prostheses.”

BY PAUL CITRON

ALFRED EUGENE MANN, an indefatigable entrepreneur, inventor, and philanthropist, died February 25, 2016, at age 90 in Las Vegas.

He was born November 6, 1925, in Portland, Oregon, to immigrant parents. His father, Charles, was a grocer who immigrated from England; his mother, Anna, a singer and pianist, was from Poland. After serving in the Army Air Corps during World War II, Al obtained both his bachelor’s and master’s degrees in physics in 1949 from the University of California, Los Angeles.

His entrepreneurial career began in 1956 when he founded Spectrolab, an electrooptical company serving the aerospace industry. His next enterprise, Heliotek (established in 1960 while he was still at Spectrolab), was a semiconductor company that supplied solar cells to power spacecraft and was a vital technology contributor to the then-nascent US space program. Both companies were sold to Textron in 1960, although Mann continued to manage them until 1972.

The 1960s saw the emergence of a new engineering-based industry sector: implantable therapeutic devices. The first electronic implant was the cardiac pacemaker to treat dangerously slow heart rhythms, called bradycardia, which can be debilitating and even lead to death because the slow heart rate

pumps insufficient amounts of oxygenated blood to meet the body's requirements. Early generations of cardiac pacemakers employed encapsulated mercury-zinc batteries to power the stimulation circuitry that caused the heart to beat at a more physiologically appropriate rate. Implanted pacemakers were a breakthrough medical innovation.

But the early pacemakers had a relatively short battery life—approximately 18 months and sometimes even less. When the battery was depleted, the pacemaker needed to be surgically removed and a new one implanted. Mann recognized this as an opportunity and founded Pacesetter Systems in 1972 around the concept of a rechargeable pacemaker. The patient would periodically don a line-powered vest that would recharge the implanted device's batteries via radio frequency coupling as the patient sat in a chair. Rechargeability was a unique feature in the marketplace and established Pacesetter as a credible and innovative cardiac pacing provider.

As is common in high tech, the advantages of rechargeability were soon eclipsed by a series of improvements to implantable primary batteries and the simultaneous development of much more efficient circuitry, which together markedly improved pacemaker service life and mitigated the need for rechargeability. But under Mann's leadership, Pacesetter proved to be an adaptable company with a loyal following. It was able to sustain a significant market share using the improved battery chemistries that had become the industry standard. Siemens Corporation acquired Pacesetter in 1985, and Mann continued as chair and CEO of the new entity, Siemens Pacesetter Inc., until 1992.

While running Pacesetter, Mann developed an interest in treating type 1 diabetes. In 1993 he formed MiniMed Inc., which developed, manufactured, and distributed belt-worn microinfusion pumps for the programmed delivery of insulin. The company also conducted research toward the development of subcutaneously placed continuous glucose monitors that, when used in conjunction with an insulin pump, could modulate the delivery of insulin in accordance with the body's

varying needs. In 2001 Medtronic acquired MiniMed and became the dominant insulin delivery company.

Still in pursuit of his vision to improve the lives of diabetics, he established Medical Research Group (MRG) to work on developing an artificial pancreas, and for more than a decade he sought to develop a delivery system for inhaled rapid-action insulin. After years of tests and federal rejections, in 2014 his MannKind Corporation received FDA approval for just such a product, Afrezza, reducing the number of insulin injections patients require each day.

The decade-long development of Afrezza illustrates Mann's tenacity and doggedness in pursuing a concept he believed in, even in the face of many naysayers. He allocated MannKind's resources to the project, spending an estimated \$1.8 billion on Afrezza's development, of which he personally provided \$1 billion. Thus at age 88 he brought a new medical innovation to the marketplace.

Al Mann was a visionary, inventor, and prolific entrepreneur. He started 17 companies in 50 years. Over and above the technologies mentioned, his companies developed a retinal prosthesis for people with severe vision loss, cochlear implants, and a device that permits patients with a prosthetic hand to move and control its fingers under the control of their brain.

In addition to his business activities, he was a research professor at the University of Southern California in 2002 and an adjunct professor in the Department of Bioengineering at UCLA in 2005.

He held the view that academic institutions were good at research but relatively ineffective in translating research into useful products. To address this perceived shortcoming, in 1985 he created the Alfred Mann Foundation (AMF), which he chaired until 2006. Among its initiatives was the endowment of Alfred Mann Institutes (AMIs), whose mission was to close the gap between fruitful academic research and the translation of that work into commercial innovations by providing researchers with information and guidance regarding the commercialization process. The first AMI was established

in 1998 at the University of Southern California (initially funded at \$100 million, with subsequent growth to a cumulative \$162 million), followed by AMIs at Purdue University (\$100 million) and the Technion–Israel Institute of Technology (\$104 million).

Al Mann's technological and philanthropic contributions led to many honors and recognitions. In addition to membership in the National Academy of Engineering, he was elected fellow of the American Institute of Medical and Biological Engineering. Among prizes too numerous to mention, he received NASA's Exceptional Public Service Award (1984), the Arthur Anderson Award for Fostering Innovation (1996), Eleanor Roosevelt Humanitarian Award (1998; League for the Hard of Hearing), Reynolds Society Achievement Award (1999; Harvard University), Business Person of the Year (2003; *Los Angeles Business Journal*), Diabetes Innovator Award (2004), Lifetime Achievement Award in the Medical Devices Industry (2005), Distinguished Achievement Award (2007; Biomedical Engineering Society), and Distinguished Humanitarian Award (2008; B'nai B'rith International).

He was also frequently invited as a panelist (White House Forum on Disabilities, 2004), presenter (International Conference on Aging, 2006), keynote speaker—including at the National Institutes of Health (2006) and Global Harmonization Task Force (2007)—or lecturer, candidly sharing his life experiences, perspectives, and wisdom.

Perhaps influenced by his mother's musicality, he played the cello, oboe, and piano (and his older brother Robert was an accomplished concert violinist).

He is survived by his wife Claude P. Girault (married in 2004) and children Brian Michael, Howard Thomas, Richard, Carla Melanie Woods, Alfred E. Jr., Kevin Patrick, and Cassandra Georgette. His earlier marriages to Susan Gail Kendall, Linda J. Miller Buchalter, and Beverly ended in divorce.

