



GEORGE E. KELLER II

1933–2019

Elected in 1988

“For invention and insightful analysis of novel separation processes.”

BY STEVEN B. HEDRICK
SUBMITTED BY THE NAE HOME SECRETARY

GEORGE ERNEST KELLER II, a leader and pioneer in chemical engineering discovery, died October 7, 2019, in Charleston, West Virginia, at the age of 86.

He was an accomplished chemical engineer, often described as “an engineer’s engineer.” Recognized as an industry giant, he fully engaged his prodigious mind to produce innovations in separations and deliver technologies that improved the lives of people around the world. In all his efforts—from the development of portable oxygen concentration units to help for a senior at Virginia Tech learning the fundamentals of engineering—with his humility he believed his contributions and achievements were simply common. But common they were not.

Born June 4, 1933, and raised in Charleston, he earned his BS (1955) from Virginia Polytechnic Institute, and then from Pennsylvania State University his MS (1958) and PhD (1964), all in chemical engineering.

At the start of his career, Dr. Keller served as a lecturer in President Dwight Eisenhower’s Atoms for Peace Program in 1958 and 1959.

In 1961 he went to work at Union Carbide Corporation (UCC) in South Charleston, where over the next 36 years he achieved national and international accolades for pioneering

contributions in separation science, reaction engineering, catalysis, and novel process technology development. His expertise in membranes, adsorption, distillation, and extraction operations led to reductions in the generation of process wastes, development of more cost-effective ways to treat industrial waste streams, and, in some cases, recovery of valuable coproducts from traditional waste streams.

He was a pioneer in discovering ways to convert methane to hydrocarbon feedstock for the chemical industry. Conducted about 10 years before Carbide management finally approved publication of this groundbreaking research in 1982, this work by Dr. Keller is among the most cited papers in the history of catalysis. The American Institute of Chemists (AIC) honored him with the Chemical Pioneer Award (1996) for this work. With the advent of the shale gas revolution, the technology is gaining renewed attention globally and still offers the potential for low-cost petrochemical raw materials.

Dr. Keller provided strong leadership for Carbide's Separations & Process Fundamentals Skill Center, arguably the highest-profile industrial separation group in the United States and perhaps the world. He rose to the highest levels of the corporate technical ladder in 1987 with his promotion to senior corporate fellow. The advances that he pioneered and enabled enhanced UCC's technological dominance in the petrochemical industry for decades, as well as the chemical engineering profession more broadly.

After he retired from Union Carbide in 1997, he and others founded the Mid-Atlantic Technology Research & Innovation Center (MATRIC) in 2003, and he served both on the board of directors and as chief engineer until 2014. He considered the founding of MATRIC to be among his greatest accomplishments.

Dr. Keller always strived to be a difference maker and was a relentless advocate for outside-the-box research ideas and projects. He had an uncommon gift for solving complex and difficult problems (although he'd say it was luck). This ability led to his significant patent portfolio and made him a sought-after speaker at technical meetings.

He was especially known for mentoring junior scientists and recruiting top-notch engineering graduates. His humility was such that perhaps his most beneficial invention, the oxygen concentrator that separates oxygen from air for treatment of respiratory diseases, lists the junior scientists on the patent before him. The invention helped in the treatment of his beloved wife of nearly 59 years, Judy (née Blackmon), before her death in May 2017.

Dr. Keller coauthored and edited more than 35 publications in referenced journals as well as two major books in the area of industrial separations, *Separation Process Technology* (with Jimmy L. Humphrey; McGraw-Hill, 1997) and *New Directions in Sorption Technology* (with Ralph T. Yang; Butterworth-Heinemann, 1989). With colleagues, he held 21 US patents encompassing diverse areas of key technologies.

His far-reaching influence and service included roles on the National Research Council's Board on Chemical Sciences and Technology and several technical committees (1984–2008); adjunct professor of chemical engineering at West Virginia University (WVU) and Virginia Tech; chair of the visiting committee of WVU's College of Engineering and Mineral Resources; and longtime member of the visiting committees of the chemical engineering departments at WVU, Virginia Tech, Penn State, and the universities of Wisconsin, Texas, and Virginia.

His contributions were recognized with a number of awards and honors. In addition to his election as an NAE member, he was a fellow of the AIC and the American Institute of Chemical Engineers, which recognized him as one of the top 100 chemical engineers of the modern era and bestowed on him the Institute Lecture Award, the Clarence Gerhold Award in Separation Science and Technology, and the Institute Award for Excellence in Industrial Gases Technology. He led a team that was selected for the Kirkpatrick Honor Award, sponsored by *Chemical Engineering Magazine*, for the most innovative chemical technology successfully commercialized in the world—development of highly efficient, pressure-swing parametric pumping for gas-gas separations.

In April 2017 he was presented with the Distinguished West Virginian award by Governor Jim Justice, and the following month he was recognized in the US Senate with a resolution sponsored by Senator Shelley Moore Capito.

As in so many other areas of life, Dr. Keller was ahead of his time in embracing and championing all forms of diversity in the workplace, starting in the 1960s. He knew, and taught, that diversity creates opportunities for incredible innovation when people are brought together for a common cause.

As a devout Christian, he was passionate about connecting the dots between science and religion. He never felt the two were in conflict with each other; rather, he helped clarify many of the mysteries of how religion and science explain one another.

He enjoyed classical music and played piano by ear—and he was an accomplished sousaphone player in the Highty Tights at Virginia Tech. He was also an avid tennis and badminton player.

While his career led him to speak in China, Australia, and a number of European countries, his greatest enjoyment came from spending time with his family at Capon Springs and Farms resort in West Virginia. He is survived by children George III (Cindy), Perry (Alanna), Karen Holbrook (Tim), and Amy; seven grandchildren; and three great-grandchildren.

