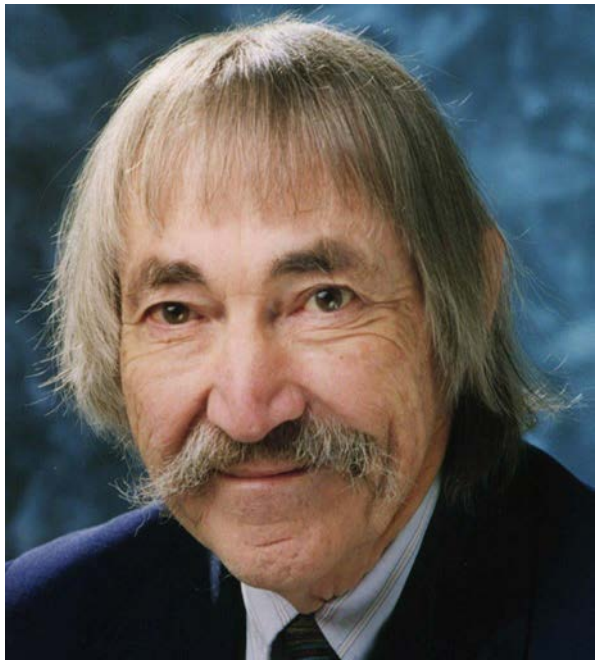

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STUART W. CHURCHILL

1920–2016

Elected in 1974

"Contributions to chemical engineering, specifically heat transfer and combustion."

BY WARREN D. SEIDER
SUBMITTED BY THE NAE HOME SECRETARY

STUART WINSTON CHURCHILL, professor emeritus in the Department of Chemical and Biomolecular Engineering at the University of Pennsylvania, passed away March 24, 2016, at age 95. He was born June 13, 1920, in Imlay City, Michigan, the son of Howard and Faye Churchill.

Dr. Churchill was a force in the fields of combustion, heat transfer, and fluid dynamics for over 60 years. He conceived and developed a thermally stabilized burner that resulted in much quieter and cleaner combustion, greatly reducing the size of heaters and furnaces. He also invented a heat exchanger/catalytic reactor that incinerates cigarette smoke, toxic compounds, and microorganisms in living and working spaces.

He was a pioneer in the use of digital computers to solve engineering problems and in the development of improved models for representing engineering data during conditions of turbulent flow and convection. In the mid-1950s, he carried out light scattering calculations, using one of the first major programs on the world's first digital computer, the ENIAC, which was designed and built at Penn. In addition, he contributed to nuclear safety, the safe handling of liquefied natural gas, the space program, and national defense.

He received bachelor's degrees in both chemical engineering and mathematics from the University of Michigan in 1942

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and went to work at Shell Oil Company. There he helped design, operate, and analyze new processes such as fluidized-bed catalytic cracking for the production of aviation gasoline during World War II. At the end of the war he joined a small startup company, Frontier Chemical, where he helped create a new process for the manufacture of the important industrial chemicals hydrochloric acid and caustic soda.

He returned to the University of Michigan in 1947 and became a member of the faculty after receiving his PhD in 1952. He began teaching as an instructor in 1950 while doing his doctoral research, was promoted to full professor in 1957, and chaired the Department of Chemical and Metallurgical Engineering from 1962 to 1967. He was noted for his mathematical approach to teaching transport phenomena, actively involving his students with instantaneous derivations at the blackboard.

In parallel, he served as director, vice president, and president of the American Institute of Chemical Engineers (AIChE). He was credited as having reversed the Engineers' Council for Professional Development (ECPD) Goals Report recommendations to create the first professional engineering degree as a five-year master's degree and to change from specific curricular accreditation to accreditation of the overall engineering college. He also served on the Senate Advisory Committee on University Affairs, and was vice chair (1964–1967) of the Board of Control of Intercollegiate Athletics at the University of Michigan.

In 1967 he accepted the Carl V.S. Patterson Scholarly Chair at the University of Pennsylvania, which permitted him to focus almost entirely on research and teaching. In 1993 he earned one of Penn's first Medals for Distinguished Service. He also served as a visiting professor at Iowa State University, the University of Utah, Pennsylvania State University, and Okayama University in Japan, and was on the advisory committees of many other institutions.

In addition to his 25 doctoral students at the University of Michigan, he advised 20 doctoral students at the University of Pennsylvania. With heavy emphasis on mathematics, often

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involving digital computers in their early stages of development, every doctoral thesis involved a significant experimental component.

To augment his teaching and research, he authored several textbooks: *Interpretation and Use of Rate Data: The Rate Concept* (McGraw-Hill, 1974; revised printing, Hemispheres Publishing, 1979), *The Practical Use of Theory in Fluid Flow: Inertial Flows* (Etaner Press, 1980), and *Viscous Flows: The Practical Use of Theory* (Butterworths, 1988).

In recognition of his contributions and achievements, Dr. Churchill was elected a member of the National Academy of Engineering in 1974 and in 2002 he won the NAE Founders Award for "outstanding leadership in research, education, and professional service, and for continuing contributions in combustion, heat transfer, and fluid dynamics for over a half century." Among his other awards were AIChE's Professional Progress Award (1964), William H. Walker Award (1969), and Warren K. Lewis Award (1978), and the ASME/AIChE Max Jakob Memorial Award in Heat Transfer (1979). In 1985 the Center for the History of Chemistry (now the Chemical Heritage Foundation) prepared an oral history on his career.

He formally retired in 1990 but remained active in teaching, research, and scholarly work. During his professional career, he authored 215 papers and six books. After retirement he added more than 110 papers.

Dr. Churchill was honored with a Festschrift on the occasion of his 90th birthday in the August 2011 issue (vol. 50, no. 15) of *Industrial and Engineering Chemistry Research*, a leading archival journal in chemical engineering. The Festschrift noted,

> Stuart's breadth extends far beyond that of most engineering science researchers. His enthusiasm for design, research and teaching has increasingly suggested interactions for us in recent years. Also, for the last 30 years, even in retirement, Stuart enthusiastically continues to advise one of our senior design groups. He understands the importance of teaching students how to translate engineering science principles into process and product designs that satisfy consumer needs

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and to seek designs that optimize profitability in the face of uncertainty.

A gifted teacher and mentor, Dr. Churchill often mused that one of the greatest rewards of an academic career was the opportunity to work and learn with graduate students who were attracted by the opportunity to work on problems of obvious importance to society, and who were willing to share the risks of exploratory research and accept the burden of carrying out both numerical and experimental work. He received the S. Reid Warren Jr. Award for Distinguished Teaching in 1978.

Through decades of scholarly mentorship of colleagues and students, Dr. Churchill brought distinction to the University of Pennsylvania and its Department of Chemical and Biomolecular Engineering and to the University of Michigan and its Department of Chemical and Metallurgical Engineering. In 2008 the AIChE designated him one of the 100 most distinguished chemical engineers of the modern era. His accomplishments have been far reaching and have changed the way average Americans live.

In addition to his great love of science and technology, all encounters with Dr. Churchill exposed his comparable love of music, art, literature, nature, gardening, long walks (and runs), travel, fine food and wine, health, fitness, tennis, skiing, and intercollegiate athletics—as well as political discourse.

Dr. Churchill is survived by his wife of 41 years, Renate; his brother James Paul Churchill; children Stuart Lewis Churchill, Diana Zajic, Catherine Fraser, and Emily Sanders; grandchildren Lara Zajic Barron and Stefan Zajic, Madeline and Sylvia Fraser, Elizabeth and Zachary Sanders; and great-grandchildren Tomas and Halina Zajic.

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