



G. Bankoff

S. GEORGE BANKOFF

1921–2011

Elected to NAE in 1996

“For contributions to the field of two-phase flow and heat transfer and its application to nuclear-reactor thermohydraulics.”

BY JULIO M. OTTINO AND STEPHEN DAVIS

S. GEORGE BANKOFF, professor emeritus of chemical engineering at Northwestern University, whose research into the fundamentals of heat transfer and two-phase flow won him recognition in the fields of chemical and nuclear engineering, died July 13, 2011. He was 89.

George was born on October 7, 1921, in Brooklyn. Three years later his father was killed in a robbery, leaving his mother to raise him and his siblings alone. Nevertheless, he excelled in academics, finishing high school with honors and entering Columbia University at age 16. He went on to receive his B.S. and M.S. degrees in mineral dressing in 1940 and 1941, respectively.

George worked briefly for DuPont before becoming a subleader team member on the Manhattan Project, where he worked on pile heat transfer and fluid flow. He eventually returned to DuPont, where his work on plastics, specifically his patent on polytetrafluoroethylene suspensoids, made commercial production of Teflon feasible at the time.

George began his academic career at Rose Polytechnic Institute (now Rose-Hulman) as an assistant professor while he commuted twice a week to simultaneously pursue his Ph.D. at Purdue University, which he received in 1952. He became

department chair at Rose before spending a year at the California Institute of Technology as a National Science Foundation fellow. In 1959 he became a faculty member at Northwestern University.

During his 33 years at Northwestern, George conducted research on a wide variety of topics in multiphase heat transfer and fluid mechanics, many of which are related to nuclear reactor safety, including bubble nucleation and growth in boiling, heat conduction and diffusion with phase changes, vapor explosions, and stability of thin liquid films under heating. He established that surface cavities, rather than projections, were the sites for bubble nucleation in boiling, and he developed the necessary conditions for their stability. His variable-density single-fluid model was the first to consider radial distribution effects in gas-liquid flow and was the forerunner of the drift flux model.

He was elected to the National Academy of Engineering in 1996 for his "contributions to the field of two-phase flow and heat transfer and its application to nuclear-reactor thermohydraulics."

George published more than 200 papers and served as thesis adviser to more than 70 graduate students. He took his research around the world, as a visiting scientist at Technion (Israel Institute of Technology) in Haifa, Israel; at CENG (Centre d'Études Nucléaires de Grenoble), in France; and as a visiting scholar at Imperial College in London. He was a member of the U.S. team for the Japan-U.S. Seminar on Two-Phase Flow Dynamics in Kobe, Japan, in 1979 and again in Kyoto in 1988.

George received many awards, including the Ernest W. Thiele Award in 1999, the Heat Transfer and Energy Conversion Division Award from the American Institute of Chemical Engineers in 1995, and the Institute's Robert E. Wilson Award in Nuclear Chemical Engineering in 1994. He was also named an Outstanding Chemical Engineer by Purdue University in 1993. In 1987 he was awarded the Max Jakob Memorial Award, given in recognition of eminent achievement in the area of heat transfer.

In addition, he was a fellow of the American Institute of Chemical Engineers, the American Society of Mechanical Engineers, and the International Centre for Heat and Mass Transfer, in Belgrade. He served as chairman of the advisory committee of Oak Ridge National Laboratory, Engineering Technology Division, and as a member of the U.S.-USSR Cooperative Program in Heat and Mass Transfer.

George's children said that they first learned about their father's work in "boiling heat transfer" when they spent a summer in Pasadena when he was working at the Jet Propulsion Laboratory, but it was not until 10 years later that they learned he had worked on the design of the reentry heat shield on the Mercury space capsule. They also spent time with him at Oak Ridge National Laboratory but again did not know that their father was working on nuclear power.

In fact, nuclear power as an alternative energy source was one of George's passions. In a letter published in the *Chicago Tribune* in November 1993, he wrote: "This nation cannot afford to burden itself with high energy costs; too many jobs are lost as a result. It is up to the media to initiate a realistic re-examination of nuclear energy, which is, in fact, the least environmentally damaging and most reliable of all energy sources."

George Bankoff is survived by his wife, Elaine Bankoff; his three children—Joseph Bankoff, Elizabeth Bankoff, and Jay Bankoff; his six grandchildren; and a sister, Eleanor Stein.