



E. R. Gilliland

Edwin Richard Gilliland

1909-1973

By P. L. Thibaut Brian

Edwin Richard Gilliland died suddenly on March 10, 1973, at his home in Belmont, Massachusetts. He was Institute Professor and Warren K. Lewis Professor of Chemical Engineering at the Massachusetts Institute of Technology (MIT), where he had shaped his career among the early builders of the chemical engineering profession. Dr. Gilliland's inspirational teaching, imaginative research, authoritative writing, and administrative leadership were acclaimed throughout MIT and throughout the chemical engineering world. He was also a highly sought-after and very successful industrial consultant and entrepreneur, and throughout his professional life he gave generously and very effectively of his talents in the service of his government. He was probably the most able and the most renowned chemical engineer of his generation.

Ed Gilliland was born in El Reno, Oklahoma, on July 10, 1909. When he was nine years old, his family moved to Little Rock, Arkansas, where he lived until he entered the University of Illinois to begin his career in chemical engineering. He graduated in 1930 with his Bachelor of Science degree and then went to Pennsylvania State College where he obtained a Master of Science degree in 1931. From there he went to MIT, where he was to spend his entire professional career except for a leave of absence to serve the U.S. Government during World War II. His doctoral research, under the direction of Professor Thomas K. Sherwood, was accomplished in approximately eighteen months, and it developed the wetted-

wall column technique that became widely used for studying mass transfer phenomena. He received the Doctor of Science degree in 1933.

After receiving his doctorate, Dr. Gilliland worked briefly as an assistant to Professor Sherwood, studying the drying of solids. He was planning to leave MIT to accept employment with a major industrial firm, but Professor Lewis was so impressed with him that he urged him to remain. He decided to stay as an assistant to Professor Lewis and began working on the mathematical analysis of fractional distillation columns. This initiated his long and continuing interest in the field of distillation, and his work in this field propelled him at a very early age to the pinnacle of his profession. Dr. Gilliland was appointed Instructor in 1934, Assistant Professor in 1936, Associate Professor in 1939, and Professor of Chemical Engineering in 1944. He was Head of the Department of Chemical Engineering from 1961 to 1969. He was named Warren K. Lewis Professor in 1969 and Institute Professor in 1971.

In 1934 Dr. Gilliland joined Professor Lewis as a consultant to the Standard Oil Development Company (later Esso, and now Exxon). That consulting relationship, which began when Dr. Gilliland was just twenty-five years old, grew and strengthened and continued throughout his life. Stimulated by their consulting work at Esso, Professors Lewis and Gilliland began experimenting at MIT with fluidized beds of solid particles, and they are given much of the credit for the development of the fluidized catalyst technique for catalytic cracking of petroleum fractions. The process was very important to the production of high-octane aviation gasoline during World War II, and it has remained at the heart of world petroleum technology and economics ever since.

In 1942 Dr. Gilliland went to Washington, D.C., where he was Assistant Rubber Director in charge of research and development for the War Production Board until 1944. Despite his administrative duties, he devoted much of his energy to the solution of the technical problems of producing synthetic rubber and made important contributions to the development of extractive distillation techniques for the recovery of butadiene. He then became a Member and Deputy Chief of Division 11, National Defense Re

search Committee, Office of Scientific Research and Development. The following year he became Deputy Chairman of the Joint Chiefs of Staff, Guided Missiles Committee, and a Member of the Industrial Disarmament Committee. After the war and throughout his life, Ed Gilliland continued to serve his government in many important assignments, culminating in his appointment in 1961 to serve four years on the President's Science Advisory Committee under Presidents Kennedy and Johnson.

When Dr. Gilliland returned to MIT after the war, he resumed his academic career as a thirty-five-year-old full Professor of Chemical Engineering with a very bright future indeed. His research interests and professional publications, which had already ranged over heat transfer, mass transfer, distillation, fluidization of solids, polymerization kinetics, and high-pressure thermodynamics, continued to broaden. He had that very rare ability to penetrate deeply into a field, master it, make unique and lasting original contributions that would inspire many workers to follow him for years, and then to go to another field and repeat the process. He continued to develop an understanding of the mechanics of fluidized beds of solids, and he began research programs in electrochemistry, ion exchange, and electro dialysis. He initiated a series of fundamental investigations into adsorption phenomena, developing a unique understanding of the mobility of molecules in adsorbed layers. His publications also included fundamental advances in heterogeneous catalysis, properties of polymers, water desalination, and the rheology of human blood. He became a coauthor in 1937 of the third edition of the classic textbook *Principles of Chemical Engineering*, by Walker, Lewis, McAdams, and Gilliland. In 1939 he collaborated with C. S. Robinson on the third edition of *Elements of Fractional Distillation*, a fourth edition of which was published in 1950.

Edwin Gilliland's work was highly acclaimed in the chemical engineering profession. In 1944, at age thirty-five, he received the Bakeland Medal and Award for Achievement in Chemistry, presented by the American Chemical Society (ACS). The ACS also awarded him the Industrial and Engineering Chemistry Award in 1959. The American Institute of Chemical Engineers (AIChE) presented Dr. Gilliland the Professional Progress Award in Chemi

cal Engineering in 1950, the William H. Walker Award for outstanding publications in 1954, the Warren K. Lewis Award in Chemical Engineering Education in 1965, and the Founders Award in 1971. He was elected a Fellow of AIChE in 1971. Northeastern University awarded him an honorary doctorate in 1948.

Dr. Gilliland was elected a Member of the National Academy of Sciences (NAS) in 1948, where he served as Chairman of both the Section of Engineering and of Class III from 1966 to 1969. He also served the NAS on the Nominating Committee (1965-66) and the Finance Committee (from 1966 until his death). He was elected a Member of the National Academy of Engineering in 1965 and was a Member of the Committee on the Patent System (1968-70) and the Projects Committee (1968-71). He was a Member of the Division of Engineering of the National Research Council and a Member of the Executive Committee (1969-73).

Ed Gilliland was a highly successful industrial consultant who derived great stimulation from the challenge of applying scientific and engineering principles to the solution of the real problems of the chemical industry. His consulting relationship with Exxon was noted earlier. In 1946 he became a Member of the Board of Advisors of the American Research and Development Company (AR&D) and as such he became intimately involved in the affairs of several high technology companies that were provided venture capital by AR&D. One of these was Ionics, Inc., where Dr. Gilliland served as President from its formation in 1946 until 1964 and then as Chairman of the Board from 1964 until he resigned, in 1971. This association with Ionics kindled Gilliland's interest in electrochemistry, ion exchange, and electrodialysis, and his teaching and research programs at MIT in these areas stimulated a generation of his students. This was typical of Ed Gilliland's total professional involvement in a field. His academic research and theoretical work contributed greatly to the solution of real industrial problems, and the stimulation and challenge of the real problems he encountered in his consulting work were carried back to the classroom and to the research lab at MIT to stimulate and challenge generations of his students.

Ed Gilliland developed a close association with Bradley Dewey

when they worked together on the rubber program during the war, and that relationship lasted throughout their lives. He served as a consultant and a director of the Dewey and Almy Chemical Company, and, when Bradley Dewey later formed the Hampshire Chemical Company, Gilliland served as a director of that company too. Dr. Gilliland served as a consultant to Merck for more than twenty-five years and to Deering Milliken for fifteen years. As evidence of the strength of that latter consulting relationship, Deering Milliken named their production plant at Laurens, South Carolina, the Gilliland Plant. Gilliland developed a number of other consulting relationships, most of them continuing over many years, including Freeport Sulphur, Goodyear, General Electric Co., Halcon International, and Nestle.

In 1938 Ed Gilliland married Ann Frances Miller, and they had a daughter, Gail, who is now Mrs. Grafton J. Corbett III. They made their home for many years in Arlington, Massachusetts, and in later years in Belmont. They also had a summer home on Cape Cod, where Ed enjoyed sailing, motor-boating, and swimming. His other hobbies were electronics-his basement was filled with television sets he was building from war surplus spare parts-and making and repairing antique clocks. He seemed to get his greatest enjoyment in life from the challenges of the intellect. He was an avid reader on a wide variety of subjects, and he took great delight in a debate on any subject from science to politics.

Ed Gilliland will long be remembered and sorely missed by his many friends and colleagues and by four decades of students who came to the Massachusetts Institute of Technology to study chemical engineering, many of whom were attracted there by the promise of studying under Edwin Richard Gilliland.