



*Jacob W Geis*

## Jacob M. Geist

1921-1991

By P. L. Thibaut Brian

JACOB M. GEIST died on March 22, 1991, at the age of sixty-nine. Thus ended the brilliant career of a chemical engineer who made major contributions in the field of cryogenics.

Jack Geist's career included both academic and industrial experience, but his principal contributions were made during his twenty-seven years at Air Products and Chemicals, Inc. Dr. Geist was a prolific contributor to the company's development of processes for the separation of air and the liquefaction of its products, the production of liquid hydrogen and liquid helium, and the liquefaction of natural gas. He played a major role in the design of more than one hundred large-scale process plants embodying these technologies with total installed capital cost exceeding \$1 billion. He was also a major contributor to process safety in the cryogenics industry, especially in the storage of liquefied natural gas.

Jack Geist was born on February 2, 1921, in Bridgeport, Connecticut. After attending Newark College of Engineering the first year, he attended Purdue University, graduating in 1940 with a B.S. degree in chemical engineering. He then entered Pennsylvania State University, where he received the M.S. degree in 1942. After spending the next year as an instructor in chemical engineering at Penn State, he took a position with Publicker Alcohol Company in July of 1944. Three months later he entered the U.S. Army as an enlisted man in the infantry and chemical

warfare service. After attending Officer Candidate School, he reached the rank of second lieutenant in the chemical warfare service, assigned to Edgewood Arsenal. In February 1946, Jack was discharged from the Army and entered the University of Michigan to pursue his doctorate. It was here that he had the privilege of working intimately with Professor G. G. Brown, an experience that greatly influenced Jack's approach to engineering and engineering professionalism throughout his career. Jack finished up the work for his Ph.D. in chemical engineering at the University of Michigan in 1950 (the degree was granted in 1951) and joined the Chemical Engineering Department at Massachusetts Institute Technology, where he was an instructor and then assistant professor from 1950 to 1952. After spending the next three years as senior lecturer in chemical engineering at the Technion, Israel Institute of Technology, Jack returned to the United States and joined Air Products in November of 1955.

At that time Air Products was a fifteen-year-old start-up company in the industrial gas business, just beginning to experience success in developing its founder's concept of the on-site oxygen plant and to establish a position in the production and distribution of liquid oxygen and liquid nitrogen. Air Products had revenues of approximately \$10 million, net income of approximately \$800,000 and about 700 employees. During the next twenty-seven years, Air Products grew to become a major international industrial gas company with 1982 revenues of \$1.5 billion, net income of \$170 million, and almost 19,000 employees. Jack Geist was a major contributor to the technologies that fueled that growth.

Jack participated in all phases of the technology effort at Air Products. He had assignments in research and development, process engineering, plant start-up, and engineering technology development and assessment. Jack's education was in chemical engineering, but he had a flair for mechanical engineering and for equipment manufacturing, and he contributed many key ideas to these areas.

Jack's innovative contributions began almost immediately after his joining Air Products. As head of the technology diversification group in research and development, he used his heat

transfer and mechanical engineering skills to develop the world's smallest cryogenic refrigerator. It was less than two inches in length, had a cool-down time of thirty seconds, and delivered 0.2 watts of refrigeration at liquid nitrogen temperatures. About 30,000 of them were sold to enhance the signal quality of infrared sensors, and this became a key product in the new Advanced Products Division of Air Products. Jack was at ease with both the production technicians and the research engineers.

Jack's most important contribution to Air Products was in the field of liquefied natural gas. When a new, proprietary propane precooled MCR™ process with its large coil-wound heat exchanger was developed by Air Products, Jack's contribution covered the range from the fundamental heat and mass transfer correlations used in the design of these heat exchangers to their mechanical integrity and manufacturing simplicity and to optimum plant operation in the field. The exchangers are the world's largest, some weighing in excess of two hundred tons, containing a thousand miles of tubing, and capable of liquefying up to three hundred million cubic feet of natural gas per day.

When one of the early liquefied natural gas (LNG) plants was installed in Brunei, Jack quickly recognized that although the plant met all guarantees, it did not meet its full potential. Working closely with the operators in the field and Ph.D. engineers in Allentown, Jack probed deeply into the process, the fundamental heat transfer and mass transfer, and the mechanical configurations of these exchangers. The result of his efforts was a 20 percent improvement in productivity for that particular plant, a greater insight into multicomponent, multiphase heat and mass transfer in these exchangers, and innovative design changes in the main cryogenic heat exchanger that led to significant cost reduction and simplification. His was a key contribution to Air Products achieving a 90 percent worldwide market share as a process licensor and heat exchanger supplier in the baseload LNG business. Concurrent with his efforts on the LNG process was his contribution to the safety of LNG storage and transportation. In collaboration with colleagues at Air Products, Jack became the definitive expert in LNG storage safety.

During his career at Air Products, the type of contributions that Jack made in LNG were repeated many times over in plants, such as air separation and liquefaction, hydrocarbon reforming, liquid hydrogen and helium production, and specialty gases manufacturing. He worked on innumerable plants in the United States, Western Europe, Latin America, and the Far East.

Jack Geist was an intellectual leader and a mentor. Through him many young engineers and scientists learned about plant and equipment design philosophy, safety philosophy, the importance of both plant experience and engineering fundamentals, and the importance of addressing new technology details right up front instead of after a problem occurs. He recruited and mentored many of the engineers who went on to form the backbone of the company's technology team. This speaks eloquently of Jack's greatest strength—that of a teacher.

In 1982 Jack took early retirement from Air Products and formed his own consulting firm, GeistTec, Geist Technology and Engineering Company. Air Products was one of his major consulting clients, but he also served a number of other companies with his expertise in process design and development and in engineering safety. He continued his active involvement in professional organizations such as the American Institute of Chemical Engineers, the International Institute of Refrigeration, and the international LNG conferences.

Dr. Geist's contributions to the engineering profession have been widely acclaimed. He was elected honorary fellow of the Indian Cryogenics Council in 1975 and was named Institute Laureate of the International Institute of Refrigeration. He received the Award in Chemical Engineering Practice given by the American Institute of Chemical Engineers (AIChE) in 1976, and AIChE also elected him a fellow in 1975. Dr. Geist was elected a member of the National Academy of Engineering in 1980, and he was elected a fellow of the American Association for the Advancement of Science in 1984. He received an Honorary Doctorate of Science from the Technion, Israel Institute of Technology, in 1987.

Jack Geist made a lasting impact on the cryogenics industry and on the chemical engineering profession. He will long be remembered and missed by his many friends and colleagues.

