



RICHARD H. MACNEAL

1924–2018

Elected in 1996

“For contributions to large-scale, general-purpose finite element analysis and for development of the NASTRAN program.”

BY DAVID HIBBITT

RICHARD HENRI MACNEAL died January 29, 2018, at age 94. He was born February 25, 1923, in Warsaw, Indiana, to Kenneth Forsythe MacNeal (of Illinois) and Marguerite Marie Giroud MacNeal (originally from Grenoble, France), who had met in Montpelier after World War I. Kenneth was an accountant who went on to write *Truth in Accounting* and Margo was a singer who sometimes performed at the Deauville Inn in Strathmere, New Jersey, and on the radio. Dick grew up with his younger brother and sister at Alden Park, in Germantown, Philadelphia, where he attended elementary, middle, and high school at the William Penn Charter School.

The spirit of adventure was evident throughout his life. At the age of 16 he completed a 1500-mile solo bicycle trip from Philadelphia to Montreal. He had intended to travel with a friend from Alden Park but, at the last minute, his friend's parents would not let him go. Undeterred, Dick borrowed a one-speed bicycle with coaster brakes and set out on his own. He took American Express travelers checks to pay his expenses on the road but, under the impression that they could be cashed only at American Express offices, he spent 3 days riding through the wilds of New Hampshire with only 5 cents in his pocket, subsisting on ginger snaps. Not surprisingly, ginger snaps never showed up on the MacNeal menu.

Dick's love of engineering started after he entered Harvard College in 1940 and took a summer class in surveying at a camp on Lake Winnepesaukee. The outdoor life and the trigonometry problems captured his imagination. He graduated with a BA in engineering in 1943 and, because it was wartime, went into the Army immediately. The skills he acquired near Lake Winnepesaukee served him well while plotting the precise location of bomb craters at the Aberdeen Proving Grounds in the California desert. He was discharged in California in April 1946, and a month later married Carolyn Colcord, who was working in the offices of the Mount Wilson Observatory at the time.

He started at Caltech that September thanks, perhaps, to a letter of recommendation written by Edwin Hubble, who was director of the analysis laboratory at the Aberdeen Proving Grounds, although Dick claimed never to have known Hubble (who was "about eighteen levels above me in the organization"). He described his first year as a graduate student at Caltech as "rather rough," but subsequently went to work in the Analysis Laboratory that had been established by Gilbert D. McCann, who had joined the Caltech faculty at the same time Dick arrived as a graduate student.

Dick enjoyed the engineering-oriented approach of looking for quantitative answers to real problems, and quickly recognized the need for computers and numerical methods. He studied methods of stress and vibration analysis using the analog computer in the analysis laboratory and received his MS in 1947 and his PhD in 1949, both in electrical engineering.

After his PhD ("The Solution of Partial Differential Equations by Means of Electrical Networks"), rather than taking a job in industry, at the invitation of Professor McCann Dick became an instructor and then an assistant professor at Caltech, in what was then known as the Division of Civil, Electrical, and Mechanical Engineering and Aeronautics.

By 1952 the analysis laboratory was taking in considerable commercial work from aircraft companies. To avoid conflicts with the laboratory's status as an academic activity, Dick joined McCann and others to found Computer Engineering

Associates (CEA) to do commercial work with analog computers and to build such computers for other companies to use. Dick continued on the faculty at Caltech but left in 1955 to work full time at CEA. After 6 months he went to work for Lockheed in Burbank, staying there for a year before returning to CEA.

In February 1963 Dick and Robert Schwendler founded the MacNeal-Schwendler Corporation (MSC), which continued the development of analog methods for such applications as helicopter rotor dynamics. But they saw increasing opportunities for digital methods, as the capabilities of digital computers continued to grow. They focused their work accordingly, developing SADSAM (Structural Analysis by Digital Simulation of Analog Methods) and working closely with the aerospace industry to improve finite element analysis technology.

In early 1966 the company teamed with the Martin Corporation and the Computer Sciences Corporation to submit what turned out to be the winning bid to develop the NASA general-purpose structural analysis software system based on finite element analysis: NASTRAN (NASA Structural Analysis). The software was duly delivered to NASA, but the NASA contract had not provided for any ongoing user support, error correction, or enhancement. This lack severely limited the product's value to engineers with design responsibility, who had no time to study the complexities of the software itself but needed it as a tool. MacNeal-Schwendler stepped forward to provide such services, and enhancements and error corrections were implemented in what then became the company's proprietary version of the software, MSC/NASTRAN. The result was substantial commercial success, which allowed the company to go public in 1983 and soon be recognized as one of the most promising young companies in the public markets. Dick retired as president of the company in 1983 and continued as chair until 1997 when, at age 73, he entered full-time retirement.

In 1996 he shared with Thomas G. Butler (posthumously) the Elmer A. Sperry Award, for "the development and mechanization of NASA Structural Analysis (NASTRAN) for widespread

utilization as a working tool for finite element computation.” He received CalTech’s Distinguished Alumni Award in 1998.

During their 60-year marriage Dick and Carolyn traveled the world together, visiting most of Europe and Russia, Ireland, Scotland, and England, the Northwest Passage across the top of Canada, Australia and New Zealand, Antarctica, Argentina, east Africa, India, Korea, China, Japan, and all of the United States.

Dick was an uncommonly generous man. His favorite cause was the Idyllwild Arts Foundation in California. He was instrumental in converting USC’s old campus for the Idyllwild School of Music and Arts (ISOMATA) into a year-round arts high school and placing it on a sound financial footing.

Dick is survived by sons Robert (1950), Bruce (1952), and Paul (1957), seven grandchildren, and three great-grandchildren. Carolyn died in 2006.

