



Robert C. McMaster

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1913–1986

By Robert I. Jaffee

Robert Charles McMaster, one of the pioneers of non-destructive testing, died of cardiac shock at his home in Delaware, Ohio, on July 6, 1986. Dr. McMaster, who was seventy-three when he died, was Regents Professor Emeritus of Welding Engineering and Electrical Engineering at Ohio State University (OSU).

He was elected to the National Academy of Engineering in 1970. He retired from OSU in 1977 and spent the last nine years of his life in a typically proactive, Bob McMaster style: involved in countless projects, including continued consulting, editing the second edition of his monumental *Nondestructive Testing Handbook*, and attending to his family to whom he was devoted.

McMaster received a B.S. in 1936 in electrical engineering from Carnegie Mellon University in Pittsburgh, Pennsylvania; an M.S. in 1938 in electrical engineering from California Institute of Technology (Caltech) in Pasadena, California; and a Ph.D., magna cum laude, in electrical engineering and physics in 1944, also from Caltech. At Caltech, McMaster supervised welding and X-ray radiography, his first encounter with the field of nondestructive testing (NDT). His Ph.D. research involved the effects of light on power transmission lines. His teachers included Nobel Laureates Carl D. Anderson, Robert A. Millikan, and Enrico Fermi.

Bob McMaster's first job after finishing his Ph.D. was with Battelle Memorial Institute's Columbus Laboratories, where he cut quite a swath as supervisor of electrical engineering from 1945 to 1954. It was during this period that Bob McMaster became one of the nation's first television weathermen. From 1950 to 1964 he broadcast twice a day at WBNS-TV in Columbus, providing for his watchers a virtual education in weather forecasting that included the "why" as well as the "what" in the local weather picture.

His Battelle days included important work on the use of sonic and ultrasonic wave-assisted oil well drilling and power tools, a topic he continued at OSU. This experience culminated in the licensing of industry to produce high-power-level piezoelectric transducers for metal working and hand tools. McMaster continued his work on NDT, applying the xerox copying process developed by Battelle for Haloid Company, which later became Xerox Corporation, to radiography in the xeroradiography units being marketed by Xerox. Xeroradiography is now widely used in medicine for early cancer detection.

McMaster joined Ohio State University in 1955. He began as a professor of welding engineering and later became Regents Professor of Welding and Electrical Engineering. He taught courses in NDT and welding to both graduate and undergraduate students. Bob McMaster turned out to be a superb teacher. His booming lecture voice and carefully printed blackboard will never be forgotten by his students, to whom he was known as "Doc." His courses in welding and NDT principles and analysis were also perhaps the best English and mathematics courses his students ever had. A report with grammatical errors would be returned with a suitably pithy comment scrawled in the margin for correction before it would be accepted.

Of McMaster's more than three hundred publications and nineteen patents, perhaps the most significant to his field and to society as a whole is the *Nondestructive Testing Handbook* that he edited for the American Society for Nondestructive

Testing. The two-volume first edition appeared in 1959; McMaster finished the second edition in 1986, before his untimely death. His achievement in compiling, and often rewriting, the contributions to this work is staggering.

The manuscript of the first edition totaled 2,700 typed pages, contained 1,250 illustrations, and stood twenty-six inches high when stacked. The award-winning publication was so comprehensive, far reaching, and definitive that it is still widely used twenty-seven years after its publication and has been translated into many languages including French, Spanish, Russian, and Chinese.

McMaster received many honors during his lifetime. He was a life member of the American Society for Nondestructive Testing (ASNT), the American Society for Testing Materials (ASTM), the American Welding Society, the American Society for Metals, and the Institute of Electrical and Electronics Engineers; he was also a member of the American Society for Engineering Education and Sigma Xi. He presented the ASNT Mehl Lecture in 1950 and the ASTM Edgar Marburg Lecture on nondestructive testing in 1952. For the American Welding Society, McMaster presented the Educational Lecture in 1962 and the Adams Honor Lecture in 1965.

In 1970 he was appointed national lecturer of the Midwest region of Sigma Xi. He received the National Reliability Award (1966), the Carnegie Mellon Merit Award (1971), the Ohioana Citation for distinguished service in engineering and research (1971), the American Welding Society Charles H. Jennings Memorial Award (1975), and the OSU Meritorious Service Citation (1980).

From his primary society, the American Society of Nondestructive Testing, McMaster received many honors and awards. He was ASNT president from 1952 to 1953 and received the ASNT Fellow Award (1973), the Coolidge Honor Award (1957), the DeForest Award (1959), the Tutorial Citation (1973), and the Gold Medal (1977). He was awarded honorary membership in 1960.

McMaster's work on NDT was of great timeliness because it coincided with the development of fracture mechanics during the early 1950s, a period marked by catastrophic failures of turbine and generator rotors and rocket motor casings. The juxtaposition of the development of NDT and fracture mechanics appears to be more than coincidental.

Prior to an understanding of fracture mechanics and the development of finite element stress analysis, NDT was used primarily for radiographic inspection. Fracture mechanics required accurate knowledge of flaw size and location relative to the static dynamic stresses that are applied to large, critical components. McMaster's work on advanced NDT techniques, including ultrasonic and eddy-current methods, was vital to the new fracture mechanics technology that was created during the 1950s to analyze failures and predict the life of components.

McMaster had a sophisticated view of NDT in the total context of science and engineering and of the importance of NDT to society. His later publications dealt more and more with management responsibilities and ethical philosophy in the application of NDT. He saw NDT as a broad family of technologies that extended human powers of perception beyond the inspection of industrial materials to many fields, including noninvasive medical diagnostics, geophysical sensing, meteorological environmental monitoring, and radiometric probing of space. His humane vision of the NDT profession is one of his many legacies.

McMaster is survived by his wife, Laura Gerould McMaster; his sons, L. Roy McMaster and James A. McMaster; his daughter, Lois McMaster Bujold; his sister, Mrs. Max T. Rogers; and seven grandchildren. Roy is an investment counselor, Jim works in chemical plant research and development, and Lois writes books on science fiction. Laura McMaster recently closed the house on the left bank of the Scioto River, where they lived happily for seventeen years. Bob and Laura McMaster were members of the Liberty Presbyterian

Church in Delaware, Ohio, the churchyard in which he was buried on July 9, 1986.

Bob McMaster leaves behind a living legacy of hundreds of people with whom he came in contact, students and professional colleagues, to continue his work in nondestructive testing.