At a meeting of the FACULTY OF ARTS AND SCIENCES on November 2, 2021, the following tribute to the life and service of the late Thomas Arthur McMahon was spread upon the permanent records of the Faculty.

THOMAS ARTHUR MCMAHON

BORN: April 21, 1943
DIED: February 14, 1999

The death of Thomas A. McMahon, Gordon McKay Professor of Applied Mechanics and Professor of Biology, at the age of 55 terminated the career of a pioneer in biomechanics and a colleague who excelled in communicating science and fiction through magazine articles, books, and novels. Tom, as he was known to all, served on the Harvard faculty in the Division of Applied Sciences (now the School of Engineering and Applied Sciences) in the Faculty of Arts and Sciences (FAS) from 1970 until his death 29 years later. This was a period in which biomechanics and biomedical engineering came into their own at Harvard and globally. As the holder of one of the first appointments in this area in the FAS, Tom played a major role in establishing biomechanics and biomedical engineering in the FAS and in creating links with the Harvard Medical School and MIT.

Tom was born in Dayton, Ohio, but from a young age until he departed for college he lived and was educated in Lexington, Massachusetts. Tom attended Cornell University, receiving his B.S. in engineering physics in 1965. He enrolled in the Ph.D. program in aeronautical engineering at MIT, in part because of his love of flying and having earned a pilot's license at the age of 17. Under the influence of Professor Ascher Shapiro, an expert in fluid mechanics who worked on physiological applications, Tom shifted his focus from aeronautics and wound up completing a Ph.D. thesis on the biomechanics of intra-aortic devices, which, like aeronautics, was underpinned by fluid mechanics. In 1970, shortly before Tom finished his Ph.D., he was recruited by the Division of Applied Sciences at Harvard as a new faculty member in a new joint program of the FAS, MIT, and the Harvard Medical School called the Division of Health Sciences and Technology (HST). Tom's first contribution was to develop a course on physiological control systems, which became a mainstay of the HST program and which he taught throughout his career.

Fluid mechanics is a keystone in the undergraduate engineering program, and upon joining the faculty Tom taught the fluids course almost every year for many years. Tom developed two courses—Fluid Flow in the Human Body and Muscles, Reflexes, and Locomotion—which, together with his leadership and mentoring, were central to the rapidly growing

popularity of the Biomedical Sciences and Engineering area, formed in 1988. Tom was an exceptional communicator who spread his love and knowledge of engineering and science through his teaching, his lecturing, and his publications in magazines such as *Scientific American* and journals with broad reach such as *Science* and *Nature*. In 1984 he published the influential text *Muscles, Reflexes, and Locomotion*, derived from his course of the same name.

Tom McMahon pursued an unusually eclectic array of research activities, which have been summarized in detail in a review of his contributions by two Harvard colleagues ("Thomas McMahon: A Dedication in Memoriam," by Robert D. Howe and Richard E. Kronauer, *Annual Review of Biomedical Engineering*, 2001). His publications were usually a mix of experiments (often simple, always clever) and enlightened modeling designed to capture the essence of the underlying mechanics. As an example of using the most basic mathematical tools, Tom employed scaling (identification of critical combinations of the dominantly important parameters that delineate specific behavior) combined with historical rowing data to establish the connection between the speed and the class of rowing shell. Scaling is also at the heart of his classic work on the growth and shape of trees, a popular version of which appeared in *Scientific American*. After joining Harvard, Tom collaborated with researchers from the Medical School and computational experts to develop some of the first numerical cardiac models. While Tom's published work predominantly falls under the heading of biomechanics and biomedical engineering, there were exceptions including, for example, his fundamental investigation of splashing (specifically, a falling drop of water's impact on the surface of still water). Depending on parameters such as the size and velocity of the drop, the depth of the water basin, and the viscosity of the water, the drop can bounce, be swallowed up, or cause a sizable splash on the water it hits. Tom later parlayed this knowledge into his study of how the Jesus Christ (basilisk) lizard runs on water, conducted in his Harvard laboratory using lizards imported from Central America. Over the years, Tom developed basic mathematical models of animal locomotion, which ultimately led to his book co-authored with John Bonner of Princeton, *On Size and Life* (1983).

In 1976 Tom was approached by the Harvard track coach, Bill McCurdy, to provide advice on the design of a new indoor track. The coach was hoping for a track that would reduce the number of injuries such as shin splints that plague runners. Tom took up the challenge. Not long afterward his colleagues were surprised to find one of his post-doctoral students running around the perimeter of his office floor, which was covered with pillows. More sophisticated experiments, combined with insights derived from his locomotion models, enabled Tom to design a track with "tuned" compliance that did indeed bring about a significant reduction in injuries and, as an added benefit, increased the average running speed by nearly three percent. As Harvard's fast track was replicated around the world, Tom applied his methods to the design of fast running shoes.

For his entire career at Harvard, before he headed to his office from his home in Wellesley, Tom put in several hours writing fiction, a passion that emerged in college and was encouraged in graduate school at MIT. Tom published four highly regarded novels, each of which was superimposed on a background of science and technology: *Principles of American Nuclear Chemistry: A Novel* (1970), *McKay's Bees* (1979), *Loving Little Egypt* (1987) and *Ira Foxglove* (published posthumously in 2004).

Thomas McMahon is remembered by all as a brilliantly creative, wise, and kind colleague. He is survived by his wife, Carol; his daughter, Elizabeth; his son, Jamie; and four grandchildren.

Respectfully submitted,

Frederick H. Abernathy
Michael McElroy
James R. Rice
John W. Hutchinson, Chair