



*James R. Melcher*

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1936-1991

By Thomas H. Lee And Markus Zahn

JAMES R. MELCHER, an engineer and scientist widely respected for his practical applications of the principles of continuum electromechanics and a member of the faculty of the Massachusetts Institute of Technology (MIT) since 1962, died on January 5, 1991, at the age of fifty-four.

Professor Melcher was elected to the National Academy of Engineering in February 1982. At the time of his death, he was the director of the Laboratory for Electromagnetic and Electronic Systems at MIT and was the Julius A. Stratton Professor of Electrical Engineering and Physics. He was a member of the Department of Electrical Engineering and Computer Science (EECS).

Professor Melcher was noted for work that defined the field of continuum electromechanics and for leading in its engineering and scientific applications to human needs. He was inventor or coinventor of twelve patents.

As a broadly interdisciplinary engineering science, continuum electromechanics draws upon electromagnetics, fluid and solid mechanics, heat transfer, and physical chemistry. Professor Melcher was a leader in its application in a variety of ways, including air-pollution control, energy conversion, plasma physics, the measurement of fluid flows, the control of the thickness of sheet glass, the generation of electricity by means of the flow of fluids in electric and magnetic fields, electric power apparatus, and physiology.

A native of Giard, Iowa, where he was born July 5, 1936, Professor Melcher came to MIT from Iowa State University, where he had received his B.S. in electrical engineering in 1957 and M.S. in nuclear engineering in 1958. He received his Ph.D. at MIT in 1962. His 1971-1972 sabbatical at Churchill College, Cambridge, England, was with Sir Geoffrey I. Taylor at the Cavendish.

Considered an outstanding educator—he received the Outstanding Teacher Award from the New England Section of the American Society for Engineering Education in 1969 and the MIT Graduate Student Teaching Award in 1978—Professor Melcher was noted for his dynamic lectures and as a leader in teaching electromagnetic field theory. He was a critical judge of the quality of his students' work, but he did not spare effort and concern in helping his students reach the high standards that he set for himself and them. He deeply affected his students' lives, careers, and values.

His first book, *Field-Coupled Surface Waves*, an outgrowth of his doctoral thesis, was published in 1963. In the 1960s he coauthored a series of three books titled *Electromechanical Dynamics*, accompanied by films. His book titled *Continuum Electromechanics*, a graduate text and encyclopedic research reference, was published in 1981 and remains the definitive text in the field. In 1989 he was coauthor of another text, *Electromagnetic Fields and Energy*, which includes a set of videotapes of lecture demonstrations. His films, tapes, and texts are in wide use at universities throughout the world.

He was a fellow of the Institute of Electrical and Electronics Engineers and a member of the American Physical Society, the American Chemical Society, and the American Society of Mechanical Engineers.

Professor Melcher's work was recognized with many awards throughout his career, starting with the First Mark Mills Award of the American Nuclear Society (1958), given for his master's thesis; a Guggenheim Fellowship (1971); Young Alumnus Award (1971) and Professional Achievement Citation in Engineering (1981), both from Iowa State University; and numerous best-paper awards.

He was the son of a minister and had a high sense of commitment to important social issues in both his professional and personal life. He felt strongly that MIT in general and the EECS department in particular should make a greater effort to obtain research funding from industrial sources rather than the Department of Defense. Jim was an activist trying to make MIT a leader in addressing national problems, and he educated his students for their wider responsibility to the nation. Unlike many academics, Jim tried to understand the real-life problems of the industrial world (and he taught his students to do the same). He had two simultaneous objectives in his industrial research: solving near-term pressing technical problems for the industrial sponsors while at the same time advancing engineering science. He was one of the founders of the MIT *Faculty Newsletter* and often spoke out if he felt that insufficient attention was paid to matters of principle and integrity. There are many examples of his commitment to be a spokesman for his strongly held beliefs: his work with the Southern New England Conference of the United Methodist Church on a resolution condemning militarism and calling for the conversion of industry from weapons manufacture to peaceful uses, his discussion with engineering colleagues at MIT about the implications of Strategic Defense Initiative (SDI) funding, his support for and work on the MIT committees on Lincoln Laboratory, and his concern about the impact of military funding on education and research.

In 1986 Professor Melcher was one of four university researchers who made public at a Washington, D.C., news conference a petition signed by more than thirty-seven hundred senior faculty members across the nation, who pledged to do no research for the SDI program. Even during his last days, it was important to him to complete an article entitled "America's Perestroika" that compared his own personal deteriorating health to the poor health of the country due to the unwillingness of our leaders to honestly define and address the problems of our present way of life. The paper discussed such topics as the need for a national energy policy and examined the role of the U.S. military in our budgetary and competitiveness problems. An edited version of this paper was published in the April 1991 *Technology Review*

alumni pages. Jim followed the NAE studies on "National Interests in an Age of Global Technology" closely. One of us (T. H. Lee), as chairman of that study, had numerous discussions with Jim. He made significant contributions on the subject at the Irvine, California, conference.

One cannot know Jim Melcher without mentioning his commuting nine miles each way by bicycle from Lexington to MIT every working day of the year, rain or snow. He experimented with all kinds of means to make a bike navigable in snow and on ice. He biked in part because it helped him in his fight with diabetes, but it was also a personal way for him to demonstrate the need for a national energy policy of nonpolluting energy self-sufficiency. It had the secondary benefit of attracting to his laboratory kindred-spirited students who had similar values, resulting in a bicycle as the laboratory symbol on their sweatshirts.

Jim Melcher profoundly affected the careers of his colleagues and students. He lived a life of purpose and scope and faced his painful illness with courage. His wisdom on technical and human matters will be missed by all.

