

## Richard Skalak (1923–1997)



Professor Richard Skalak, a world-renowned authority in biomechanical engineering, passed away peacefully at home in San Diego on August 17, 1997, after a two-year illness with cancer.

Professor Skalak was born in New York City on February 5, 1923. He grew up in New York City and was educated in its public schools system. In 1939 he entered Columbia University to study Civil Engineering, where he received his B.S. degree in 1943 and his C.E. in 1946. From 1944 to 1946, he served in the U.S. Naval Reserve as an Instructor in Radar and Sonar in Washington, D.C. In 1948 he was appointed as Instructor in the Department of Civil Engineering at Columbia while pursuing his graduate study. In 1954 he received his Ph.D. degree in Fluid Mechanics and was promoted to Assistant Professor. He became Associate Professor in 1960 and Professor in 1964. From 1976 to 1988, he was James Kip Finch Professor of Engineering Mechanics. At Columbia University, Professor Skalak

also served as Director of the Bioengineering Institute from 1978 to 1988 and Chairman of the Department of Civil Engineering and Engineering Mechanics from 1985 to 1988. He was a member of the faculty at Columbia for over forty years, making sterling contributions to research, education, and administration.

In 1988, Professor Skalak was recruited by the University of California, San Diego, as Professor of Bioengineering. In addition to his outstanding educational and research accomplishments, Professor Skalak played a major role in the formation of the Institute of Biomedical Engineering and the Department of Bioengineering at UCSD, as well as receiving the Whitaker Foundation Development Award. From 1992 to 1996, he was the Founding Director of the Institute for Mechanics and Materials established by the National Science Foundation at UCSD. He did a marvelous job in promoting interactions between the disciplines of mechanics and materials across the nation, through symposia, workshops, lectures, scientist exchange, and academia–industry interactions.

Professor Skalak had an illustrious academic career. His early research interests were in engineering applications of fluid mechanics. He spent a sabbatical year with Professor George Batchelor of Cambridge University in 1960–1961. Having made important contributions to the understanding of water hammer effects and fluid turbulence, Professor Skalak began to combine engineering mechanics and biomedical sciences in the early 1960s. His pioneering work on wave propagation in pulmonary circulation was performed in collaboration with Dr. Alfred Fishman and his colleagues at Columbia University College of Physicians and Surgeons. In 1967–1968 he took a second sabbatical leave to work with Dr. P.-I. Brånemark in the University of Gottenburg. There he performed a classical study on the flow and deformation of human blood cells in the living microcirculation. Upon returning to Columbia, he initiated a series of imaginative and elegant research studies on biomechanics of blood and blood cells, including the material properties of red blood cells and cell membranes, viscoelasticity of white blood cells in the passive and active states, micromechanical and molecular bases of cell aggregation and adhesion, blood cell interactions in capillaries and microvascular network, and flow properties of blood in the circulation. These interdisciplinary studies established the biomechanical principles of fundamental biomedical problems and have important implications in a number of clinical conditions, including inflammation, blood diseases, cardiovascular disorders, and cancer.

Professor Skalak also made prominent contributions in several other areas of biomechanics, including craniofacial growth, skin replacement, material transport in tumors, osseointegration, and titanium implants. He played a major role in fostering tissue engineering as a new frontier of biomedical engineering.

Professor Skalak had an unusual ability to combine engineering analysis with biomedical experimentation. He was able to formulate problems by distilling their essence into clear mathematical form, and to seek out the subject that is fundamental and important. His analytical approach guided many innovative experimental studies, provided novel insights, and generated new understanding of biological function. He had an unceasing, unselfish drive to create and innovate, and to teach these qualities by example to students and associates.

Professor Skalak was a very talented and dedicated teacher; he won the Great Teacher Award of Columbia University in 1973. His lectures were extremely well organized, clearly presented, and inspiring to the students. He trained many graduate students and postdoctoral fellows, who hold key positions in academia and industry. Even during the last few weeks of his life, Professor Skalak held regular research discussions with his students and fellows; in fact he made the sessions more frequent in order to give as much guidance as possible to the young scientists.

In recognition of his outstanding achievements, Professor Skalak received many prestigious awards and honors. His leadership and visionary role were sought after by many governmental, academic, and private organizations. Particularly noteworthy are the multitudes of accolades bestowed upon him by the American Society of Mechanical Engineers and his outstanding service to ASME. Professor Skalak received the ASME Centennial Service Award in 1980, the Lissner Award from the ASME Bioengineering Division in 1985, and the Melville Medal for the best paper among all ASME publications in 1990. Just one week before his passing, Professor Skalak was pleased to inform his colleagues at UCSD that he was selected by ASME as the recipient of the 1997 Applied Mechanics Award from ASME. Professor Skalak served as Chairman of the ASME Applied Mechanics Division in 1979 and was elected an ASME Fellow in 1981.

A very important contribution Professor Skalak made to ASME and particularly the JOURNAL OF BIOMECHANICAL ENGINEERING was his distinguished service as Associate Technical Editor from 1975 to 1982 and the Technical Editor from 1983 to 1987. Under his outstanding leadership, the journal attained new horizons with enhancement in quality and reputation.

The other awards and honors conferred on Professor Skalak included the ALZA Medal from the Biomedical Engineering Society in 1983, the Theodore von Karman Medal from the Engineering Mechanics Division of the American Society of Civil Engineers (ASCE) in 1987, the Poiseuille Medal from the International Society of Biorheology in 1989, an Honorary M.D. Degree from the University of Gottenburg in 1990, and the Medal of Merit from the Czechoslovakian Academy of Sciences in 1990.

Professor Skalak was elected to many other honorific societies and academies, including Fellow, American Academy of Mechanics in 1982; Fellow, American Society of Civil Engi-

neers in 1985; Fellow, New York Academy of Medicine in 1985; Fellow, Society of Engineering Science in 1990; Founding Fellow, American Institute of Medical and Biological Engineering in 1990; and Fellow, American Association for Advancement of Science in 1996. A most distinguished honor is his election to Membership in the National Academy of Engineering in 1988.

He served in many important capacities for other professional societies and scientific journals. He was a member of the Editorial Advisory Board of *Biorheology* (1976–1988), Associate Editor of the *Journal of Applied Mechanics*, ASME (1978–1979), President of the Society of Engineering Science in 1982, Associate Editor of *Circulation Research* (1982–1985), President of the Society of Biomedical Engineering in 1983, Vice President of the Society of Engineering Science (1984–1985), Co-Chairman of the First World Congress of Biomechanics in 1990, and Co-Chair of the Biomedical Engineering Society Annual Fall Meeting in 1997.

He was a member of Board of Directors of the Institute of Applied Biotechnology, Gottenburg, Sweden (1976–1997), the Biomedical Engineering Society (1980–1984), the American Bureau for Medical Advancement in China (1979–1988), and the Society of Engineering Science (1984–1997).

Professor Skalak was kind, considerate, generous, encouraging, creative, self-disciplined, and hardworking. He was tireless in his working habits, including the efficient use of his time on the airplane and in the hotel during his many trips in the United States and abroad. He had outstanding administrative ability and interpersonal affinity. As Director of the Bioengineering Institute at Columbia University, he laid the foundation for the current development in this field at Columbia. In recognition of his life-long contribution, a “Richard Skalak Colloquium in Biomedical Engineering” was established at Columbia University in 1996. At UCSD, a “Richard Skalak Bioengineering Lectureship” has been established in honor of his outstanding accomplishments and leadership.

Professor Skalak is survived by his wife, née Anna Lesta Allison, whom he married in 1953. They have four children: Steven (wife Diane and children Sarah, Leslie, and Matthew), Thomas (wife Susan), Martha, and Barbara (husband Glen). Professor Skalak was a loving and beloved husband, father, and grandfather. A family funeral service was held on August 21, 1997, and a memorial service was held on October 5, 1997. In accordance with Professor Skalak’s wish, the ashes after cremation were spread in the Pacific Ocean to reach all parts of the world.

In Professor Skalak’s passing, the field of biomechanical engineering lost a great leader and pioneer, all those who knew him lost a wonderful friend, and the world lost a superb human being. While we mourn this immense loss, we should be grateful that the world had been graced by the presence of such a marvelous man. Professor Skalak’s spirit, thoughts, and deeds have been spread to all parts of the world, and he will always be a guiding light for generations to come.