DOCUMENTS OF THE GENERAL FACULTY

REPORT OF THE MEMORIAL RESOLUTION COMMITTEE FOR MARSHALL N. ROSENBLUTH

The special committee of the General Faculty to prepare a memorial resolution for Marshall N. Rosenbluth, professor, physics, has filed with the secretary of the General Faculty the following report.

Sue Alexander Greninger, Secretary
The General Faculty

IN MEMORIAM
MARSHALL N. ROSENBLUTH

Professor Marshall N. Rosenbluth passed away on September 28, 2003, after a valiant two-year struggle with pancreatic cancer. During much of his last two years, he maintained a high level of productivity in his research activities as well in his scientific advisory roles, a testament to his strength of character that typified his entire life.

Marshall Rosenbluth was born in Albany, New York, on February 5, 1927. His intellectual gifts were already admired in Stuyvesant High School in New York City when he graduated in 1942. One of us (H. M.) met Marshall for the first time at this high school just as he was leaving to go to Harvard. Even then he was one of the "heroes" of Stuyvesant, who was sought after by incoming students for advice and guidance. Subsequently he received, in 1968, the Stuyvesant Alumni Achievement Award. His undergraduate college education was interrupted by his voluntary service in the U.S. Navy (1944-46). He then returned to Harvard to graduate in 1946 with a B.S. (Phi Beta Kappa) diploma at the age of 19. Rosenbluth then attended graduate school at the University of Chicago, obtaining his Ph.D. under the supervision of Edward Teller in the emerging area of high energy particle physics. His first post-doctoral position was as instructor at Stanford University (1949-1950), where he derived the elastic scattering cross section of electron off protons. This famous 'Rosenbluth formula' was the basis of the analysis used by Robert Hofstadter in his Nobel prize-winning experimental investigation.

He next joined the Los Alamos Laboratory as a staff member from 1950-56 to participate in the nation's weapons program where he became a leading member of the team that developed the hydrogen bomb. During his career in Los Alamos, he began his life-long quest to develop controlled fusion into a viable energy source. In addition, he made fundamental advances in the use of computational algorithms as a tool for theoretical research. His pioneering work on the Monte-Carlo algorithm is the basis of many present-day calculations in physics, chemistry, and engineering.

In 1956, Rosenbluth joined a new nuclear energy research company, General Atomics (GA) in San Diego, in the position of senior research advisor. Together with his group at GA and collaborators from other laboratories, he addressed and solved many of the basic stability and transport issues that were needed to understand how to obtain good confinement of an ionized gas (a plasma) in a magnetic field to achieve net energy from controlled nuclear fusion. Rosenbluth was appointed professor of physics in 1960 at the new University of California of San Diego (UCSD) campus, which he then held jointly with the GA position. In 1964, he was the recipient of the E.O. Lawrence Prize awarded by the U.S. Atomic Energy Commission. Rosenbluth, together with Roald Sagdeev, then of the Soviet Union, co-directed an international plasma theory workshop in 1965-66 at the International Centre of Theoretical Physics (ICTP) in Trieste. This workshop led to many new scientific contributions as well as an international camaraderie that remain significant to this day.

Rosenbluth accepted a professorship at the Princeton Institute of Advanced Study in 1967. In addition, he served as a senior staff member of the Princeton Plasma Physics Laboratory and lecturer with rank of professor at Princeton University. In this period, he and his collaborators continually remained in the forefront of magnetic fusion confinement theory. The international program in controlled inertial fusion started during his stay at Princeton, and Rosenbluth contributed to many of the new theoretical insights that were needed in this

newly-emerging field. He also developed a special post-doctoral program at the Institute, which became a 'finishing school' for many of the leading plasma theorists in the field today. In recognition of his contributions, Rosenbluth was elected to the National Academy of Science in 1969, and he was the second recipient of the James Clerk Maxwell Prize in Plasma Physics awarded by the American Physical Society in 1976.

In 1980, Marshall Rosenbluth moved to The University of Texas at Austin, as professor and director of the newly-formed Institute of Fusion Studies (IFS) that was supported by the Department of Energy (DOE) with matching funds from The University of Texas. During the seven years of his tenure at Texas, Rosenbluth led a beehive of scientific activity in many areas of plasma physics that included the understanding of how kinetic theory influences the behavior of magneto-hydrodynamic stability, the development of new concepts in nonlinear dynamics, and the development of new approaches in the description of plasma turbulence and transport. Marshall was appointed to the Fondren Chair in 1983, and he was a recipient of the Enrico Fermi Prize awarded by the Department of Energy in 1985. In 1987, the IFS organized a symposium to celebrate Marshall's sixtieth birthday. Approximately 150 physicists from many countries (most being past collaborators) attended, and a book of this symposium, "From Particles to Plasmas: Lectures Honoring Marshall N. Rosenbluth," edited by James Van Dam, was published.

Rosenbluth returned to San Diego in 1987 to be reappointed to his joint positions at GA and UCSD. He continued to be a leading contributor to new developments in plasma theory, and his counsel on scientific directions was frequently sought. During this period and until his last illness, he was an active member of the Fusion Energy Special Advisory Committee that advised DOE. In 1993, Rosenbluth retired from UCSD to become professor emeritus. Upon this retirement, he took on the responsibility of chief scientist of the Central Team for the International Tokamak Experimental Reactor (ITER) until 1999. His group analyzed in great detail the physics issues that needed to be addressed in the proposed magnetic confinement experiment that is expected to produce net energy from nuclear fusion. Naturally, Rosenbluth developed new insights and solutions of several unexpected issues that emerged during this design stage. In honor of his lifetime of contributions to science, President Clinton awarded Rosenbluth the National Medal of Science in 1997. One of Rosenbluth's last activities to which he was deeply committed at GA was advancing new computational methods through the development of numerical simulation codes in order to describe plasma turbulence and transport on both large and small scales.

Marshall Rosenbluth's choice for his principal discipline of study, the development of the principles in plasma physics to achieve practical commercial power from controlled nuclear fusion, was motivated by his desire that science be used to improve the well-being of society. Since Marshall had both breath and depth in many physics disciplines (these included space and astrophysics, statistical mechanics, laser and physical optics, high energy particle physics, accelerator physics, etc.), he frequently took 'vacations' and made important contributions to other fields. Examples include the following: producing a detailed analysis of the free electron laser and how its spectral intensity can be optimized, hiding from the CIA and KGB in Paris in the 1970s together with Roald Sagdeev so that they could develop the criteria for instabilities arising from laser-plasma interactions, and, more recently, producing an understanding of the focusing properties of light in negative refractive optical material. He had the ability to process information quickly and then make rapid and accurate calculations that usually solved a problem in a straightforward manner that was elegant in its simplicity. He actively sought to maintain the strength of the United States by annually attending the JASON meeting where scientific military problems were discussed. At the same time, he worked for world cooperation through activities that included attending meetings and participating in close collaborations with many Soviet scientists during the cold war; being among the first U.S. scientific visitors to China in the 1970s; and being a co-founder of the U.S.–Japan Institute for Fusion Theory, which was organized in 1980 when he came to The University of Texas.

He was often referred to as the 'pope of plasma physics' in recognition of his deep understanding of the field. Many scientists would go out their way to visit him in order to vent their ideas and receive his insights, which were always valuable to the progress of new scientific directions. He was modest in his demeanor, which enabled him to be an excellent mentor to young scientists who would quickly feel at ease with him so that they could readily discuss both scientific and personal matters. In 2000, he received the Nicholson Medal from the American Physical Society in recognition of his success in developing young scientists and his leadership in developing international scientific cooperation.

Rosenbluth's interests and talents extended beyond scientific matters. He was facile with languages as well as interested in politics, sports, art, and music. He had a remarkable wit that often spiced up lectures, meetings, and parties. Indeed, his witticisms often displayed deep insight into particular situations.

Rosenbluth clearly enjoyed working with a host of collaborators, and he encouraged team effort in scientific activity. Moreover, his fellow scientists and collaborators enjoyed and felt extremely privileged interacting with him. His works, personality, and character will be long remembered.

Marshall Rosenbluth is survived by his wife, Sara, and four children from his previous marriage, Alan, Mary, Robin, and Jean.

This memorial resolution was prepared by a special committee consisting of Professors Herbert L. Berk (chair), Hans Mark and Steven Weinberg.

Distributed to the dean of the College of Natural Sciences, the executive vice president and provost, and the president on October 5, 2004. Copies are available on request from the Office of the General Faculty, FAC 22, F9500. This resolution is posted under "Memorials" at: http://www.utexas.edu/faculty/council/.