Marshall Nicholas Rosenbluth

of nationally renowned scientific institutions. In 1949, Rosenbluth earned his PhD in physics under the supervision of Edward Teller. His thesis was in elementary particle physics and dealt with meson interaction theory.

After playing a key role in national defense projects at Los Alamos (1950–56), Rosenbluth began his lifelong concentration on plasma physics and controlled fusion the following year, when he joined the research staff of General Atomics in La Jolla, California. He would continue his connection to GA for the rest of his life. Rosenbluth held professorships at the University of California, San Diego (1960–67); the Institute for Advanced Study (1967–79); and the University of Texas at Austin (1980–87), where he was the founding director of the Institute for Fusion Studies. He returned to UCSD and GA in 1987, and remained active in both institutions until his death. He also was chief scientist (1993–98) of the joint central team for ITER, an international prototype fusion energy reactor.

Rosenbluth was unique in his tremendous strength, breadth, and depth in many areas of theoretical physics. His numerous major achievements included the development of the Monte Carlo Simulation technique, the defining calculation for the scattering of electrons off nucleons (the "Rosenbluth formula"), and the basic theory of the free electron laser. Rosenbluth left his mark on basic plasma physics, all aspects of magnetic confinement theory, inertial confinement, and laser–plasma interaction theory. He was particularly interested in the kinetic foundations and descriptions of macroscopic plasma dynamics.

He was both superbly insightful and a theoretical and calculational virtuoso, known for overnight delivery of key results, usually scribbled on the back of a piece of paper stained with tobacco from his ever-present pipe. He had an unusual knack for simple, elegant minimalistic solutions that cut directly to the heart of an issue. Though he generally avoided ponderous formalism, he readily developed new formalistic methods when the physics problem at hand required them. Rosenbluth was a pragmatic theorist, with a strong interest in and deep knowledge of experiments and was amazingly facile with numbers and magnitudes. He was among the first to grasp the potential of scientific computation as a tool for discovery and progress in physics and was a leading contributor to and promoter of this field from his early work at Los Alamos right up until his death.

In addition to scientific research, Rosenbluth was devoted to serving physics in general and the fusion program in particular. In the fusion arena, he played a key role in US and international programmatic leadership and oversight. He also remained active in defense and disarmament policy and was a member of JASON for more than 30 years. Rosenbluth actively promoted international collaborations in science, beginning with his work at the International Centre for Theoretical Physics in Trieste, Italy. From 1966 to 1967, he led a famous and influential international program there that included leading Soviet scientists; the impact of his leadership is still felt today. Further international collaborative efforts continued later with his participation in the ITER project, to which he remained passionately committed until his death. He also cofounded (in 1980) the US–Japan Joint Institute for Fusion Theory.

Always the teacher, Rosenbluth mentored a large school of students, postdocs, and young scientists. No matter how busy, he made time to advise, nurture, and promote young people. Rosenbluth was also a superb lecturer and speaker, whose seminars were models of insight and clarity.

He was an exemplary member of a group that journalist Tom Brokaw has dubbed "The Greatest Generation." His life experiences in the Depression, World War II, and the postwar era made him an optimist and a believer in the triumph of ability, reason, and effort in the face of adversity. He believed that one person could make a difference.

The most notable of numerous honors Rosenbluth received were the US government's Enrico Fermi Award (1985) and National Medal of Science (1997), the European Geophysical Society's Hannes Alfvén Prize (2002), and the Nicholson Prize for Humanitarian Service (2002), given by the American Physical Society's division of plasma physics.

Rosenbluth genuinely enjoyed human interactions in the course of science and greatly valued the collaboration and camaraderie of scientists worldwide. He enthusiastically participated and led team efforts aimed toward a larger common goal, whether it was in defense, various projects in the fusion program, or in building international scientific bridges during his many visits to Trieste. In addition to his pursuit of science, he was an avid reader and was interested in history, politics, art, music, and opera. He had a keen and penetrating wit, was adept with language, and conceived many humorous anecdotes, jokes, puns, and limericks, for which he is fondly remembered. Rosenbluth's other attractive qualities included compassion, modesty, consideration, and grace under pressure. He is, and will continue to be, sorely missed.

Patrick H. Diamond
Marvin L. Goldberger
University of California, San Diego
La Jolla
Roald Z. Sagdeev
University of Maryland, College Park
Herbert L. Berk
University of Texas at Austin

Richard Bersohn

Richard Bersohn, a chemical physicist best known for his elegant, powerfully simple studies of molecular photodissociation and chemical kinetics, died of cancer on 18 November 2003 in New York City. He was the Higgins Professor of Natural Science at Columbia University.

Born 13 May 1925 on the Upper West Side of Manhattan in New York City, Richard earned his BS in chemistry from MIT at age 19. After receiving his degree, he entered the US Army, passed through basic training, and then worked on chemical separations at Clinton National Laboratory (now Oak Ridge National Laboratory) as part of the Manhattan Project.

Deeply interested in physics, Richard began his theoretical studies in 1946 as a student of John Van Vleck at Harvard University. He did his PhD thesis on dipole interactions in nuclear magnetic resonance (NMR), which had just been discovered in Edward Purcell's laboratory at Harvard. In 1949, he

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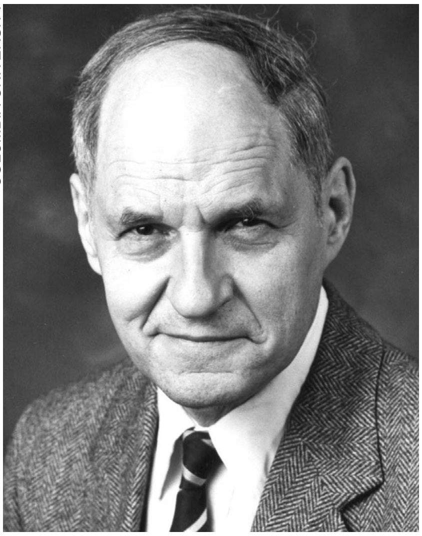

Richard Bersohn

took a postdoctoral fellowship in theoretical quantum electrodynamics with Willis Lamb at Columbia and in 1951, began his academic career at Cornell University. He moved back to Columbia in 1959 to become a professor of chemistry, and remained at Columbia for 44 years. He held an adjunct appointment at the Weizmann Institute of Science, in Rehovot, Israel, where he spent his summers for many years, and had strong, long-lasting collaborations in both that country and in Japan.

At Cornell, Richard started research work in theory, but as computers came of age, he realized that he did not enjoy numerical work. He would sometimes quote Peter Debye, with whom he interacted at Cornell, who said, "You should understand the physics, write down the correct equations, and then let Nature do the calculations." With his first Cornell students, he began experiments in molecular physics and spent a sabbatical, beginning in 1958, working on the optical pumping field with Alfred Kastler at the École Normale Supérieure.

At Columbia, Richard established experimental groups in optical probes of molecular kinetics and in biophysics. A pioneer in biophysics, he used both Förster energy transfer and NMR methods to study the tertiary structure of proteins. Having recognized quite early the value of short-pulse lasers in biology, he collaborated in that area with Peter Rentzepis and with Erich Ippen and Charles Shank at Bell Labs in Murray Hill, New Jersey, where Richard was a long-standing consultant.

In molecular kinetics, Richard invented "photolysis mapping," which reveals the symmetry of the excited state in a photodissociation process through the relative spatial pattern of the resultant fragments. That experiment, which came simultaneously with the molecular beam revolution in chemical kinetics, had a deep effect on the entire community of photochemists and photophysicists. It was a forerunner of modern multidimensional product velocity mapping.

Richard was a quiet and gentle soul who was widely respected in both the molecular physics and chemistry communities. He was a minimalist in his personal and professional life, shunning fluff and venality. As a boy, his great enthusiasm was for experiments, and he never lost that youthful fascination. Almost two years before his passing, he wrote his scientific memoirs in volume 54 of the *Annual Review of Physical Chemistry*, and that fascination animates his recollections. Richard's understanding of chemistry and physics was deep and broad, and his colleagues invariably turned to him for advice on any new project.

An insightful judge of people and ideas, Richard was instrumental in building the chemical physics community at Columbia during his long academic career. He showed leadership and scientific courage by personal example and gave his students the freedom to explore—and to learn from their failures—in their scientific endeavors. He championed the cause of the junior faculty and gave freely of his time not only to the Columbia chemistry department, but also to the wider scientific community. Anyone felt fortunate to be among Richard's friends.

In 1985, Richard won the American Physical Society's Herbert P. Broida Prize. He was head of APS's division of chemical physics in 1971 and chair of the advisory committee to Brookhaven National Laboratory's chemistry department (1981–84). He was chairman of the chemistry department at Columbia (1990–93) and associate editor for chemical physics for *Physical Review Letters* (1995–98). He had been planning to retire in 2004.

A scientist, colleague, and mentor of exceptional intellectual creativity and talent, Richard is sorely missed by his family, friends, and the scientific community.

Bruce J. Berne
Louis Brus
George W. Flynn
James J. Valentini
Columbia University
New York City