categories must be nested among one another. This requirement, which forbids partial overlap between categories, permitted Kuhn to recast his original concept of incommensurability in a more rigorous form because, with this new understanding, scientific systems could be commensurate with one another—or, in the term he preferred, mutually translatable—only if they shared the same taxonomic structure. Unfortunately, death interceded before Kuhn was able to finish a manuscript fully laying out his developed understanding, although his last publications go quite far in doing so, and an edited version of his final writings will eventually appear in print.

Kuhn was deeply committed to his work, and anyone who wanted to benefit from his tutelage had to be as serious about it as Kuhn himself was. Many of his students gained a great deal indeed from his close scrutiny of their work and his powerful, dedicated drive to uncover the essential meaning of past scientific conceptions. He brought the same intensity to his personal life that he brought to the history and philosophy of science. His friends and his students, including myself, will long remember Tom's dedication to the truth of the matter, as he saw it, in both life and work.

JED Z. BUCHWALD
Massachusetts Institute of Technology

Katharine Way

Katharine Way, a pioneer in developing techniques for the retrieval, evaluation and dissemination of information on nuclear structure, passed away in Chapel Hill, North Carolina, on 8 December 1995.

KATHARINE WAY

Born in Sewickley, Pennsylvania, on 20 February 1903, Kay Way earned a BS in physics from Columbia University in 1932 and a PhD in nuclear theory from the University of North Carolina in 1938 under John Wheeler. After a year teaching at Bryn Mawr College, she became an instructor and assistant professor at the University of Tennessee. In 1942, she started doing wartime work, briefly in Washington, DC, and then at the Metallurgical Laboratory in Chicago, where she worked on reactor design, evaluation of reactor constants and the organization of radioactivity data on fission products. Theoretical work there with Eugene Wigner led to what became known as the Way–Wigner formula for fission-product decay. She also began to systematize the vast quantities of new results produced by wartime research, at first as a much-enjoyed hobby and eventually as the work that absorbed a major fraction of her time and effort for the remainder of her professional career.

In 1945, Kay joined the Clinton Laboratories in Oak Ridge, Tennessee, the forerunner of Oak Ridge National Laboratory (ORNL). She continued her analysis of fission products and began collecting and organizing the growing amount of data on nuclear decay. There also, Kay provided the seminal idea for what has become Oak Ridge Associated Universities.

In 1947, Kay moved to the National Bureau of Standards in Washington, DC, where she devoted herself full-time to the data evaluation needs of the basic and applied research communities. She coauthored a series of publications that evolved into the Nuclear Data Sheets, and created the Nuclear Data Project in 1953. The project moved to ORNL in 1964, and Kay continued as its head until her retirement in 1968.

In 1964, Kay arranged with Academic Press to establish a new journal, *Nuclear Data Sheets*, to publish the extensive data that she and her colleagues had prepared, and in 1965 she was instrumental in establishing a second journal, now titled *Atomic Data and Nuclear Data Tables*. During this same period, Kay persuaded the editors of *Nuclear Physics* to add keywords to the title page of each article, a practice that has evolved into the Nuclear Science Reference File. After retiring from ORNL in 1968, Kay relocated to the Triangle Universities Nuclear Laboratory in Durham, North Carolina, and became an adjunct professor at Duke University.

By her insistence on the critical evaluation of all published basic data and her ability to combine these data into as logical and self-consistent a set of nuclear structure properties as possible, Kay influenced an entire generation of evaluation experts and the presentation of data in physics literature.

Kay Way felt and expressed herself passionately not only about the analysis of nuclear data, but also about many issues of human fairness and social justice. In such matters, she was an outspoken advocate rather than merely a sympathetic bystander. In Washington, Oak Ridge and Durham, she surrounded herself with many colleagues. They all remember with affection and gratitude her keen intelligence, sharp wit and loyal decency.

MURRAY MARTIN
NORWOOD GOVE
RUTH GOVE
SUBRAMANIAN RAMAN
Oak Ridge, Tennessee
EUGEN MERZBACHER
Chapel Hill, North Carolina

Brian Edward Bent

Brian Edward Bent, a professor of chemistry at Columbia University and an experimental surface scientist of exceptional distinction and promise, collapsed and died on 23 July 1996 while on vacation with his family in northern Minnesota. He was 35 years old.

Brian was born in Minneapolis. He earned a BA in chemistry from Carleton College in 1982 and a PhD in physical chemistry from the University of California, Berkeley, under Gabor Somorjai, in 1986. He joined the Columbia faculty in 1988 after two years of postdoctoral research with Ralph Nuzzo at AT&T Bell Laboratories.

Brian's elegant studies of the molecular details of chemical reactions on solid surfaces answered long-standing questions in materials deposition and etching, metal-catalyzed organic synthesis, and heterogeneous catalysis. He showed that ultrahigh-vacuum spectroscopic studies of stable monolayers adsorbed on cold single-crystal surfaces can in fact give kinetic and mechanistic information about technologically important high-pressure, high-temperature surface reactions. One such reaction is the Fischer–Tropsch process for making hydrocarbons by metal-catalyzed hydrogenation of carbon monoxide. This reaction affected history: Without fully understanding the chemistry of the process, the Germans used it to make 15 million barrels of fuel a year during World War II. Brian determined the mechanism of the Fischer–Tropsch process—a mechanism that had been debated for over 60 years—by demonstrating and studying the methylene–methyl migratory insertion reaction on copper surfaces.

Copper catalyzes another important and poorly understood synthesis, of dimethyldichlorosilane from silicon and methyl chloride; this reaction supports the billion-dollar-per-year silicone polymer industry. Before Brian, nobody had been able to get the reaction to go under vacuum conditions and thereby study its mechanism.

Other accomplishments of Brian and his coworkers, reported in papers that are widely admired for their insight and clarity, include resolution of the controversy over the role of radicals in classic syntheses bearing the names Ullmann, Grignard, Wurtz and Rochow; demonstration of the elusive Eley–Rideal mechanism, involving direct reaction between an adsorbate and a gas-phase species, in the plasma etching of organic polymers; and fabrication, from semiconductors, of new microelectronics materials by metal-organic chemical vapor deposition and chemical dry etching.

To his students at Columbia, Brian was a superb teacher and mentor, unfailingly patient, attentive and good-humored. The same wonderful human qualities marked his relations with his colleagues and with his scientific peers. He was an accomplished cellist, an athlete who had once held the world record—for 12-year-olds!—in the marathon, a devoted husband and father. He managed his intensely active and varied life with grace and modesty and the illusion of effortlessness. We miss him deeply.

Kenneth B. Eisenthal
George W. Flynn
Philip Pechukas
Columbia University
New York, New York

Martin E. Rickey

Martin E. Rickey, a leading pioneer in the development of the second generation of isochronous cyclotrons and a professor emeritus of physics at Indiana University at Bloomington, died on 8 September 1996 in Berlin, Germany, at the age of 69.

Rickey was born in Memphis, Tennessee. After a year at the University of Tennessee, he enlisted in the US Navy in the spring of 1945. Upon discharge in 1946, he returned to school at Southwestern College (now Rhodes College) in Memphis, where he received a BS degree in 1949. Following a year of graduate work at Columbia University, he worked during 1951–54 at Brookhaven National Laboratory. He then entered the University of Washington in Seattle for graduate studies in nuclear physics, working at the school's cyclotron, where he participated in one of the early investigations of time reversal. This work became a part of his thesis for the PhD degree, which he received in 1958.

After graduation, Rickey accepted an assistant professorship in physics at the University of Colorado in Boulder, which at that time was undertaking the construction of an early isochronous cyclotron. There, he played a central role in the first successful acceleration and extraction of negative ions in a cyclotron. This work was exploited some years later in the 500 MeV particle accelerator constructed at TRIUMF in Vancouver, Canada. In 1965, Rickey was attracted to Indiana University, which was planning a new accelerator facility to replace its aging cyclotron, constructed just prior to World War II.

From 1930 to 1960, cyclotrons had been of classical design with energies limited to well below 25 MeV per nucleon. The first-generation isochronous cyclotrons came into operation in the early 1960s at energies well above those achievable in classical cyclotrons. Despite the successes of these machines, a number of fundamental problems and limitations inherent in the classical cyclotrons remained unsolved.

Then Rickey, who was quite perceptive about the historic limitations and the future needs of nuclear physics research, conceived an ingenious second-generation isochronous cyclotron system incorporating a number of important ideas. Principal among these were the separated sector magnets, high-quality external beam injection and novel RF cavity structures. The genius of his accomplishment lay in putting together these various ideas in a cohesive design. The result was a multistage cyclotron accelerator system that would provide intense particle beams with energies that could vary continuously up to 200 MeV, having far higher precision than achievable with existing isochronous cyclotrons.

Rickey developed the practical implementation of this concept while serving as chief designer of the proposed Indiana University Cyclotron Facility (IUCF) from 1965 to 1972. He served as the first director of IUCF during 1971–72, at this crucial stage of its construction.

Since going into operation in the fall of 1975, the IUCF has become one of the major medium-energy nuclear physics user facilities in the world. Cyclotrons using the basic concepts of the "Rickey design" have also appeared in countries around the world. Never fully recovered from an automobile accident in 1967, Rickey resigned as director in 1972 to take a sabbatical and to prepare to do experiments with the new accelerator.

Throughout his career at Indiana University, Rickey also pursued his interest in music through the teaching of a course on the physics of sound and research on the physics of kettle drums. As an amateur pianist, he had a long-standing interest in the mechanics of the piano keyboard and invented a new keyboard action.

Rickey will be remembered by his colleagues for his fertile imagination and diverse interests. His legacy lives on in the physics still being carried on at the Indiana University Cyclotron Facility.

Robert Bent
Don Lichtenberg
Dan Miller
Peter Schwandt
Indiana University at Bloomington

Ganesar Chanmugam

Ganesar Chanmugam, a professor in the department of physics and astronomy at Louisiana State University for 25 years and an internationally recognized expert on the physics of degenerate stars, died on 25 March 1996 in Houston, Texas.

Ganesh was born in Colombo, Ceylon (now Sri Lanka), on 24 October 1939. He received two undergraduate degrees in mathematics, both with honors: one from what is now the University of Colombo in 1961 and the other from the University of Cambridge in 1963. After a year spent teaching at the University of Massachusetts in Amherst, he went to Brandeis University for graduate studies. From the beginning of his career, Ganesh focused his mathematical skills and physical insight on many of the astrophysical problems associated with white dwarfs and neutron stars. His PhD thesis concerned the effects of three-body forces on the nuclear equation of state. He also published work with his thesis supervisor, Sylvan Schweber, on the role of electromagnetic many-body forces in dense matter.

Upon completing his PhD degree in 1970, he joined the physics department at Louisiana State University, where he remained for the rest of his career. For the next two and a half decades, a steady stream of insightful papers about degenerate stars were published by Ganesh and various colleagues with whom he often collaborated during summers and leaves of absence at universities and research institutions around the world. Though he would often return to questions concerning