ponents at Federal Telecommunication Laboratories Inc, NY (later in Nutley, NJ), and within two months he was heading the microwave department. Later that year he consulted for Columbia University in the planning phases of Brookhaven National Laboratory.

Brookhaven's official start was in January 1947, and its first employee was Kuper's wife, the former Mariette Kovessi von Neumann. By February Kuper had joined the lab as head of the electronics and instrumentation division, where he designed the monitoring system for a nuclear research reactor.

In 1948 he was named chairman of the new instrumentation and health physics department, a position he retained until 1970. Under his leadership the department became vital to Brookhaven, developing state-of-the-art instrumentation. One of Kuper's principal contributions to the department was to create a stimulating climate, which attracted many outstanding individuals.

In 1970 Kuper became assistant to the director of Brookhaven; he kept that position until his official retirement in 1974. He continued as a consultant to Brookhaven until 1991.

Outside his work for Brookhaven, Kuper, who held several patents on early electronic technologies, was an enthusiastic ham radio operator. He was chairman of the radiation detector standards committee of the Institute of Radio Engineers during the 1950s. He served on the board of editors of the *Proceedings of the Institute of Radio Engineers* and headed the New York governor's advisory committee on atomic energy.

In 1954 Kuper succeeded G. P. Harnwell as editor of the *Review of Scientific Instruments*. Under Kuper's direction the journal enhanced and solidified its preeminent position. When Kuper turned over the editorial reins in 1979 to his successor, Thomas Braid, he remained with the journal as editor emeritus. Thanks to Kuper, a rather quiet and shy man, during his 25-year tenure the journal maintained its traditional role as *the* journal to consult for new developments or new ideas on how better to solve problems in almost any field of instrumentation.

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Brookhaven National Laboratory
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Zdeněk Kopal

Zdeněk Kopal, who died on 23 June 1993, was a classical astronomer whose career lasted nearly 60 years. He was born in 1914 in Litomyšl, Bohemia (now the Czech Republic), and studied astronomy at Prague University. In 1938 he moved to Cambridge University, England, where he worked with Arthur Eddington. He then held appointments at Harvard and later MIT. In 1951, the University of Manchester appointed him to their first Chair of Astronomy, which he held until he retired in 1981.

During the war years, he did work on shock-wave propagation that demanded the development of the tools of numerical analysis. His work culminated in a classic textbook, *Numerical Analysis*, (1955, Chapman and Hall: London). He spent the latter part of his career working in two areas. The most important was close binary systems: his work led to one of the most important discoveries in 20th-century astrophysics, that of mass transfer in binary systems. This discovery underpins such important topics as cataclysmic novae and x-ray binaries. The other area was the mapping of the Moon, funded largely by the US Air Force.

Kopal was active in training astronomers from all over the world. He was the founder of the journal *Icarus* and, in 1969, of *Astrophysics and Space Science*, which he edited right up to his death. He also founded a specialized journal, *The Moon*, which now exists as *Earth, Moon and Planets*. He wrote many semipopular books on aspects of the solar system, but he always remained at heart an elegant and perhaps by modern standards an old-fashioned astronomer. Kopal was an inspiring teacher and will be missed throughout the astronomical world.

Zdeněk Kopal

JOHN DYSON
University of Manchester
Manchester, UK

Howard H. Sample

Howard H. Sample, an experimental condensed matter physicist and a professor of physics at Tufts University, died unexpectedly on 13 February 1993.

Howard was born in Dallas, Texas, on 20 September 1938. He received both his bachelor's degree and his doctorate in physics from Iowa State University. After graduating he was a NATO postdoctoral fellow at the Clarendon Laboratory at Oxford. He began his academic career at Tufts in 1967, and in 1981 he became a professor of physics. Since 1968 he had been a visiting scientist at the Francis Bitter National Magnet Laboratory at MIT, and since 1977 he had been the director of the Undergraduate Research Projects program at the General Telephone and Electronics Laboratories.

At Tufts University Howard was a widely admired and popular lecturer in introductory physics. He was very active on university committees, particularly those concerned with curriculum development and with awarding scholarships and prizes. He served on the advisory committee of the PHYSICS TODAY *Buyer's Guide* and on the executive committee of the American Physical Society's instrument and measurement group.

Much of Howard's research was on solid systems at cryogenic temperatures and in high magnetic fields. His studies of instrumentation and methods for low-temperature measurements in the presence of high magnetic fields are classic, forming the standards for most contemporary measurements. He had recently been a prime investigator in the characterization of optoelectronic and optoacoustic materials and in their use for the optical detection of polluting gases.

Howard's colleagues appreciated his deft touch with instruments and the nitty-gritty of hardware as well as his keen insight in identifying and correcting the problems that always accompany complex experiments. Any group with whom he worked came to depend on his constant good humor, especially during difficult moments. He brought clarity and in-

tegrity to every paper he wrote. He was known for his generosity in assisting colleagues and both graduate and undergraduate students, and for his kindness to all.

KATHRYN A. MCCARTHY
YAAKOV SHAPIRA
DAVID WEAVER
ROBERT P. GUERTIN
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Medford, Massachusetts
LAWRENCE RUBIN
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Cambridge, Massachusetts

Masao Kotani

Masao Kotani died on 6 June 1993, bringing to an end a long career in theoretical physics and university administration. He was born in Kyoto on 14 January 1906 and received his BS (1929) and DSc (1943) in physics from the University of Tokyo. In 1929 he began his teaching career as a lecturer at the university, and in 1943 he became a professor of physics there. In 1965 he moved to Osaka University as a professor in the faculty of engineering science. He served as president of the Science University of Tokyo from 1970 to 1982, after which he retired.

Kotani was a pioneer in introducing the developing science of quantum mechanics to Japan, starting in the middle 1930s. From 1938 to 1955, in the precomputer era, he and his students carried out the systematic calculation of tables of integrals for quantum mechanical calculations, which they then applied to numerous atomic and molecular electronic problems, especially state energies. This work included research on electron–atom collisions and the photoionization and recombination of atoms. In the molecular field, their research included the calculation of intermolecular forces from transport phenomena in gases, ligand field theory and the magnetic moments of complex ions. In the 1950s Kotani's early calculations on molecular oxygen set a new standard of precision for energy calculations for the precomputer age and led to work on hemoglobin, which earned him special recognition. He delighted in using purely mathematical and theoretical methods to calculate important properties of complex molecules in the real world.

Kotani had a very private personality and loved hiking alone on remote offshore islands of Japan. He did not easily express personal feelings. Nevertheless, his friends developed deep affection for him, and he reciprocated in a subtle but definite manner. When my wife and I visited Tokyo a few years ago, he showed great enthusiasm, and we found his company delightful.

Masao Kotani created a whole school of quantum physicists and quantum chemists in Japan, many of whom are prominent in the world of science today. He exerted a powerfully stimulating influence on his scientific colleagues and in his academic endeavors, and he developed deep friendships with those close to him.

MICHAEL KASHA
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Kristin Ralls

On 30 June 1993 cancer claimed Kristin Sarah Ralls. She was a vital, young experimental scientist of singular promise, skill and insight.

Ralls was born on 21 December 1961. She earned a BS in physics from Stanford University in 1983 and a PhD from Cornell University in 1990. She spent two years as a member of the technical staff at AT&T Bell Laboratories in Murray Hill, New Jersey, before taking a position in the chemical and materials science division at Lawrence Livermore National Laboratory, where she remained until her death.

At Cornell, Ralls's thesis was concerned with examining aspects of electron transport phenomena in ultrasmall metallic structures. She developed a novel technique for fabricating metallic nanoconstrictions whose diameters were as small as 3 nanometers. In collaboration with Robert Buhrman and Daniel Ralph, Ralls then used these nanostructures in a variety of experimental investigations.

Upon moving to Lawrence Livermore, Ralls began collaborating with James Eckstein, Ivan Bozovic and colleagues at the Varian Associates to characterize the Josephson properties of epitaxial cuprate thin film tunnel junctions.

Ralls's life was full of wide-ranging interests. She was always a caring friend and a supportive colleague. During much of her short career she had to deal with a series of personal challenges, including the birth of her second child during her fatal illness. Ralls had a major talent for experimental work and deep physical insight. It is clear to all who knew her that her career, so very well begun, would have blossomed.

ROBERT BUHRMAN
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