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mittee), not to mention Sigma Xi and the New York Academy of Sciences. Judy travelled widely, and in addition to her other gifts had a great talent for friendship. Her enthusiasm and zest for life were contagious. Colleagues and friends in many parts of the world will be deeply grieved by her untimely death.

MELBA PHILLIPS
New York, N.Y.

Bruce V. Waddell

Bruce V. Waddell died after a long illness in Oak Ridge, Tennessee, 14 September at the age of 31. His death came just when his accomplishments had gained him an international reputation in the field of plasma theory.

Waddell was born and raised in the small community of St. Charles, Virginia. As an undergraduate physics major at the University of Kentucky, he was already doing original work in atomic physics with George S. Hurst, earning him the school's Oswald Award. His graduate work in plasma physics at MIT under Bruno Coppi was on the topic "Effects of Toroidal Plasma Modes on Transport Coefficients." In recognition of his academic achievements he was awarded many academic honors, including the prestigious National Science Foundation and Woodrow Wilson fellowships. At this point it was already apparent that he was a brilliant scholar who would be one of the future leaders in the field.

After receiving his PhD in physics, he realized an early childhood ambition by undertaking post-doctoral work at the Institute for Advanced Study. There he became interested in the topic that was to occupy him for the rest of his life—the nonlinear behavior of magnetohydrodynamic and resistive instabilities. As in many branches of physics, the linear theory of waves or instabilities is easy to

WADDELL



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develop, but their nonlinear consequences are difficult to predict. Using a combination of analytic and computational tools, Waddell contributed enormously to an effort that has now led to a quite good understanding of the macroscopic behavior of such fusion devices as tokamaks.

In 1976 Waddell joined the staff of Oak Ridge National Laboratory with a Wigner Fellowship. There he proceeded to build up a group to carry on with this work and to apply it in ever-increasing and convincing detail to understanding current tokamak experiments. During the past year these efforts culminated in the remarkable accomplishment of developing a three-dimensional computation that could definitively settle the remaining questions in the nonlinear macroscopic evolution of tokamaks.

Waddell was characterized by a brilliant mind, an enormous dedication to physics and an unerring instinct for determining what were the central issues both in his scientific and personal life. In spite of his accomplishments, he remained a congenial and unassuming person whose colleagues were also his friends.

JAMES D. CALLEN
Oak Ridge National Laboratory
MARSHALL N. ROSENBLUTH
Institute for Advanced Study

Allen Lurio

Allen Lurio, research physicist at the IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y., died suddenly at the age of 49 on 22 August. His work in spectroscopy, particularly on atoms, is well known to scientists in this field.

He studied physics first at MIT and then as a graduate student at Columbia University, receiving his PhD in 1956. Following two years as an instructor at Yale University, he joined IBM in 1957. From 1965 through 1971, in addition to his work at IBM, he was an adjunct associate professor at Columbia. During this time he guided the PhD work of nine students in atomic spectroscopy.

He published over fifty papers in the field of spectroscopy, working, as he used to say, in almost every region of the electromagnetic spectrum from radio frequencies to x rays. His first love was certainly atomic spectroscopy, but he also made important contributions to the study of ferroelectrics, semiconductors and other solid-state materials.

In his final experiments he returned to the study of atoms. By the use of Doppler-shift spectroscopy, the hyperfine structure in the absorption spectrum of metastable $^3\text{S}_1\text{Li}^+$ was resolved, with much narrower lines than were previously obtained and with the potential for an even more dramatic improvement. He was very enthusiastic and pleased by these results.

Along with a deep interest in his subject, Lurio possessed great perseverance and competence as well as an enthusiasm for new skills, new techniques and new approaches. His colleagues will miss him both as a friend and as a scientist.

ARTHUR H. NETHERCOT
IBM Thomas J. Watson Research Center
Yorktown Heights, N.Y.

Rudolf Kollath

Rudolf Kollath, Professor Emeritus at the Johannes Gutenberg University in Mainz and a recognized authority in the fields of secondary-electron emission and atomic collision processes, died 12 August at the age of 77.

Born at Hohensalza (West Prussia) in 1900, he studied architecture at first, then physics under Carl Ramsauer at the Technical University in Danzig. Shortly after obtaining his doctorate in 1928 he joined the AEG Research Institute at Berlin-Reinickendorf together with Ramsauer and remained there until 1941. His pioneering investigations on the scattering cross section of slow electrons and ions in gas molecules and on the passage of corpuscular beams through matter originated from this period. In 1934 Kollath started fundamental research on the secondary-electron emission of solids. This scientifically productive period was interrupted in 1941 by World War II, bringing Kollath to Norway. He resumed his scientific work in Hamburg in 1944 on the development of particle accelerators (betatrons).

Kollath received the *venia legendi* for physics in 1948 at the University of Hamburg, where he helped to rebuild the physics department. In 1953 he was appointed associate professor for experimental physics at the University of Mainz, and his appointment to the head of the department and full professor followed soon after.

Many of his activities were devoted to international cooperation—for example, his work on behalf of UNESCO for the Research Centre at Cairo. Due to his initiative a partnership was arranged between the Universidad Nacional Bogotá and the Universität Mainz.

Hermon W. Farwell

Hermon Waldo Farwell, a member of the Columbia University physics department for 43 years and the University's senior emeritus professor, died at age 98 on 2 June in Stamford, Connecticut.

Born 29 December 1879 in Keene, New Hampshire, Farwell was graduated from Dartmouth College in 1902 and, after teaching for two years in the Woburn, Massachusetts secondary schools, returned to Dartmouth for an MA degree

awarded in 1906. In that year he began his long service at Columbia, first as assistant in physics, then as instructor in 1909, assistant professor in 1917, associate professor in 1923 and full professor in 1929. He held that post for twenty years, retiring as professor emeritus in 1949.

At Columbia, in the first decade of this century, Farwell created the first courses in which college students could have "hands-on" experience in physics experiments, and throughout his long career he was associated with or in charge of the large introductory physics course and the numerous group of assistants who supervised the laboratory. From this group came many prominent physicists of later years. Generations of pre-medical students also passed under his tutelage, and his Socratic method of teaching and striking lecture demonstrations left indelible marks on the minds of his pupils, who remembered him long after much of their undergraduate experiences were forgotten.

A specialist in the field of optics, Farwell taught military photographers during World War I. Subsequently, he was the author of *General Physics for Colleges* (with David L. Webster and E. R. Drew) in 1923 and 1927, *Laboratory Experiments in Physics* in 1926 (with Drew) and *Objective Tests for High School Physics*.

Farwell was associate editor of the *American Journal of Physics* from 1936 to 1938 and from 1944 to 1946. He was a member of the American Association of Physics Teachers, the Optical Society of America, Sigma Xi, Phi Gamma Delta and Phi Beta Kappa. In his personal life he typified the "New England conscience" and his colleagues will long honor his devotion to the highest standards of personal and professional conduct.

HENRY A. BOORSE
Professor Emeritus
Columbia University

Corwin H. Brumley

Corwin H. Brumley, senior vice president of Bausch & Lomb, died 9 July at the age of 54. A graduate of MIT, he was the author of numerous technical papers and articles and held a number of patents on optical devices and electronic circuits. During 1947–48 he was a staff member of the division of industrial cooperation in the Laboratory for Nuclear Science at MIT. Brumley joined Bausch & Lomb in 1949 and progressed through management positions in research and development. He was elected vice president of the company in 1963 and named general manager of the analytic systems division in 1967. In 1976 Brumley became corporate group vice president and president of the Soflens division and served in that position until being elected senior vice president in April 1978. □