

met, but the satellite, launched in mid-1970, worked well.

At IKI, Galperin headed the Auroral Laboratory, and, after 1976, chaired the department for space plasma physics, for several years. More recently, he was active in Interball, a four-satellite mission that simultaneously observed both the distant regions of Earth's magnetosphere, where auroras are initiated, and the polar cap, where auroras come down. He was also active in planning a proposed multiple spacecraft mission called "Roy" (in English, swarm) and had just returned from a scientific visit to Japan when he died.

DAVID P. STERN
Greenbelt, Maryland

Warren Elliot Henry

Warren Elliot Henry, a pioneering researcher on the paramagnetic properties of materials and the superconductivity of rare earth metals at low temperature, died of congestive heart failure on 31 October 2001 in Washington, DC.

Henry had a remarkable career, given the social barriers he faced. As an African American born in the Deep South during the early part of the 20th century, Henry had seemingly limited prospects for success, but he had the rare opportunity to be mentored by noted scientists who defied social norms. Henry studied at the University of Chicago under Nobel Prize winners Arthur Holly Compton, Wolfgang Pauli, and Robert Mulliken, and was also intellectually stimulated by family friend George Washington Carver, Kimuel Huggins, and Halson Eagleson.

Born on 18 February 1909 in China, Alabama, Henry was a mathematics graduate (BS degree) and valedictorian of the Tuskegee Institute's class of 1931. He then joined Escambia County Training School as principal, a position he held for three years until he was appointed physics professor at Morehouse College in Atlanta, Georgia, and concurrently taught physics at Spelman College, also in Atlanta. In 1937, he earned a master's degree in organic chemistry from Atlanta University.

In 1938, with only a promise of moral support from professor Anton Berg, and no financial assistance, Henry enrolled at the University of Chicago. He survived doing odd jobs before he received a graduate fellowship from the university. In 1941, he was awarded a doctorate in physical chemistry; his dissertation, guided by



WARREN ELLIOT HENRY

adviser Thomas Frazier Young, was entitled "I. Resistance Thermometry and II. An Experimental Investigation of the Possibility of Using Alternating Current Techniques in the Measurement of Small Temperature Differences." He subsequently returned to the Tuskegee Institute, where he taught chemistry, physics, and radio, as well as special physics courses for flight preparation to the Tuskegee airmen.

In the fall of 1943, Henry's Chicago classmate and fellow Alabama native, P. R. Bell (see *PHYSICS TODAY*, November 2001, page 77), who held a leadership position at the MIT Radiation Laboratory, hired him to work on a radar project. This research led to Henry's invention of two video amplifiers for K-band radar and an infrared amplifier for radar in 1944.

Following World War II, Henry's lone job prospect was a one-year postdoctoral position, offered by Clarence Zener, at the University of Chicago's Institute for the Study of Metals. Disappointed by the absence of permanent offers following this appointment, Henry returned to Morehouse College as the acting head of the physics department.

Denied research opportunities at other institutions, Henry obtained a position in 1948 at the Naval Research Laboratory, where he conducted pioneering research on magnetic susceptibilities. During this period, he invented a metal dewar for liquid helium and a magnetic moment lift for moving samples in and out of a magnetic field. He also installed a Bitter magnet that produced a field of 12 tesla—a high field by even today's standards.

Henry's work on paramagnetic

ions used the Bitter magnet to carry out experiments to understand the magnetic properties of rare earth and actinide metals. In addition, he and coworker Robert Hein established in 1957 that uranium is a superconductor—a controversial issue at the time.

In 1960, Henry joined Lockheed Missiles and Space Co in Palo Alto, California, where he held appointments as senior staff scientist and senior staff engineer. While at Lockheed, he developed fiber-optic devices for missile and submarine detection and helped design a quiet night surveillance airplane (the YO 3A—a converted Schwitzer two-seat sailplane) that was used for night fighting.

For eight years during this period, Henry continued to conduct magnetic susceptibility experiments by commuting daily 80 miles roundtrip after work to use the Giaque magnet at the University of California, Berkeley—an arrangement made possible by then chancellor Glenn Seaborg.

In 1968, Henry began teaching at Howard University in Washington, DC, as a visiting professor, becoming full-time in 1969. At the time of his semiretirement in 1977, he was a full professor in the physics department, and was teaching nuclear systems courses in the school of engineering. He continued to work part-time with the Minority Access to Research Careers programs. He supervised four PhD students in physics; his main pleasure was guiding doctoral students through their research. He was watchful to sense the great abilities in students and tried to draw those abilities out. He was very popular and greatly admired by both undergraduate and graduate students.

Henry gave his students a sense of personal worth and pride in who they were and in what they were doing. Zolili Ndele, associate professor of physics at California State University at Sacramento, delights in telling the story of when he was working on his master's in physics at Howard University. He had applied to Stanford University to pursue his doctorate. William Fairbanks, a noted physicist at Stanford whom Henry knew, was scheduled to give a talk at Johns Hopkins University. Henry found Ndele, bundled him into his car, and drove him to hear the lecture and personally meet Fairbanks. Henry, in his quiet, unassuming yet persistent, manner pushed his way through the crowd of other notables in the auditorium to introduce Ndele to Fairbanks and explain that Ndele had applied to Stanford. Ndele was astonished by

LAWRENCE BERKELEY NATIONAL LABORATORY

the effort that Henry was willing to expend on his behalf.

In 1954, Henry was elected a fellow of the American Association for the Advancement of Science. He received the Outstanding Educator in America for 1974–75 and, in 1994, received the Lifetime Achievement Award, which was presented at the first diversity conference, sponsored by NSF's directorate for education and human resources. In 1999, the University of Chicago awarded Henry with a professional achievement citation, honoring his contributions to research on cryogenics and magnetism.

Henry was an ardent spokesman for equality, justice, and opportunity. He successfully confronted major challenges in his career and was determined to ensure that other African Americans would have the opportunity to perform world-class research. He founded the Committee on Minorities in Physics of the American Physical Society and was one of the early leaders in the National Society of Black Physicists. Henry was widely recognized for his dedication as an educator and supporter of generations of physics students. He will be missed by many.

HATTIE CARWELL

*Museum of African American
Technology Science Village
Oakland, California*

WILLIAM A. LESTER JR

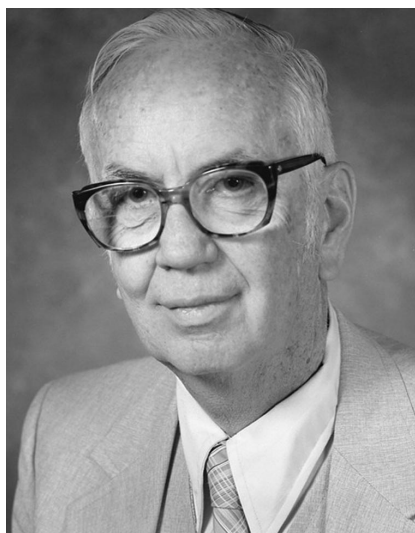
University of California, Berkeley

Robert Simpson Livingston

Robert Simpson Livingston, a leader in isotope separation and ion-source development at Oak Ridge, died on 6 March 2002 in Knoxville, Tennessee. He had been in declining health for several years.

Bob was born in Summerland, California, on 20 September 1914. He received his bachelor's degree in physics from Pomona College in Claremont, California, in 1935 and both his MA and his PhD in nuclear physics from the University of California, Berkeley, in 1941. His doctoral thesis was entitled "Heavy Particle and X-rays Produced by Deuteron Bombardment in the Cyclotron."

A protégé of Ernest Lawrence, Bob moved with a group of physicists and research engineers from the University of California Radiation Laboratory to Oak Ridge in 1943 to help supervise work on the electromagnetic isotope separation portion of the Manhattan Project. He and his asso-



ROBERT SIMPSON LIVINGSTON

ciates were responsible for the design and operation of the calutron facility for the separation of uranium-235.

After World War II, the group, under Bob's direction, continued to improve the separation process and successfully separated the first significant (gram) quantities of numerous highly enriched isotopes of thorium, uranium, and plutonium, including ^{236}U , which occurs only as a byproduct of reactor operation. Those samples were critical to the accurate determination of the physical properties needed for reactor and weapons design. Bob directed calutron process improvement until 1950, when he was appointed the director of the newly formed electronuclear research division at Oak Ridge National Laboratory (ORNL), a position he held for the next 20 years.

Bob's group also resumed cyclotron studies after the war, beginning with a small 22-inch machine constructed by inserting the accelerating structure into the modified magnet gap of a calutron separator. This machine and its successors led in 1952 to the 63-inch nitrogen cyclotron, the world's first heavy-ion cyclotron. Other free-standing machines built by the group included the 86-inch proton cyclotron, which began operation in 1950 and provided internal beam currents in excess of 2 mA at an energy of 20 MeV. Another was the Oak Ridge Isochronous Cyclotron, a variable-energy, variable-particle machine that produced its first beam in 1962 and remains fully operational today as part of ORNL's Holifield Radioactive Ion Beam Facility.

Under Bob's leadership, the electronuclear division also developed, in the late 1950s, two electron analog

cyclotrons, the second of which, in 1961, successfully accelerated electrons to their rest mass energy of 0.511 MeV. Bob organized the ORNL team that developed the Army Package Power Reactor and contributed to several other reactor projects, including the nuclear ship *Savannah*. In 1971, he joined the ORNL director's division to head the office of planning and analysis. He directed this office until his retirement in 1981.

Bob was a fellow of the Institute of Electrical and Electronics Engineers and the American Association for the Advancement of Science. In these and other learned societies, he was active in many areas. He led the organization of the biennial particle accelerator conferences and chaired the first two meetings in 1965 and 1967. Perhaps he will be best remembered by the nuclear physics community for chairing the 1972–74 NSF/Department of Energy study group on the long-range role of electron accelerators in nuclear science. Out of this study came support for what would eventually become the Thomas Jefferson National Accelerator Facility.

Bob's main hobbies were music and photography. He was an audio and recording enthusiast and loved to tinker with the newest innovations in high-fidelity sound equipment.

Bob will be remembered by those who worked with him as a man respected for his science, for his vision in directing his organization into new and challenging fields, for his ability to deal fairly and sensitively with his colleagues, and for his high level of integrity.

JAMES B. BALL

*Oak Ridge National Laboratory
Oak Ridge, Tennessee*

Harry Lee Morrison

Harry Lee Morrison, a professor of physics at the University of California, Berkeley (UCB), for 22 years and an assistant dean of the College of Letters & Science, died following a heart attack on 14 January 2002 at his home in Berkeley.

Born on 7 October 1932 in Arlington, Virginia, Morrison attended the Catholic University of America in Washington, DC, from which he received a BA in chemistry in 1955 and a PhD in chemistry 1960. His thesis, "Theoretical Investigation of Linear H_3 ," was prepared under the guidance of his adviser, Virginia Griffing, one of the few women in the US at that time to hold a senior faculty position in the sciences.