IN MEMORIAM

Kenneth Ross MacKenzie
Professor of Physics and Astronomy, Emeritus
Los Angeles
1912– 2002

Kenneth Ross MacKenzie, who made contributions to nuclear physics, particle accelerators and plasma physics, died July 3, 2002 at age 90, following complications resulting from a series of small strokes, at his home in Los Angeles, California.

Ken was born in Portland, Oregon. The family moved to Victoria, British Columbia when he was 10 years old. He received bachelor's and master's degrees from the University of British Columbia, and began further graduate study at the University of California, Berkeley, in 1937.

The longstanding vacancy in the periodic table at element 85 ended in 1940. Carson, MacKenzie and Segre, in the Physical Review, reported "Artificially Radioactive Element 85". They bombarded Bismuth-209 with alpha particles to produce what was suspected to be element 85-211. Physical, chemical and even physiological evidence confirmed the assignment. After a reminder to do so, in a 1947 Nature article, they named the element "Astatine", which means unstable in Greek. All 31 of the isotopes of Astatine are unstable.

When Ken began working in the Radiation Laboratory, the 60- inch cyclotron was nearing completion. He became involved with the radiofrequency (RF) system which produces the D- voltage. With this beginning he became an authority on RF systems. He made a major contribution to the design of the system for the 184-inch cyclotron which was completed in 1947. It was the first machine capable of producing mesons. He also made significant contributions to the system for TRIUMF, the meson factory which was completed in 1974. RF systems can be temperamental. Ken had an uncanny knack in getting them to perform properly.

Ken contributed to the development of cyclotrons from day one. He was in Berkeley when the first tests of large- current Uranium mass spectrometry were made in late 1941. He participated in the full scale tests which were made in the recently completed 184- inch magnet, beginning in mid-1942. An accelerating voltage had to be held constant with great precision. The system developed, involving RF signals, is described in a chapter which he contributed to a book in the National Nuclear Energy Series, Manhattan Project. Ken also went to Oak Ridge where he participated in the process of getting the production plant into operation.

In 1964 Ken wrote a paper titled "Space Charge Effects and Cyclotron Beam Enhancement." Cyclotrons had been in operation some thirty years and this effect had been overlooked. Near the center of a cyclotron there can be appreciable loss of particles which are near the surface of the circulating current due to repulsion by those particles within the body of the beam. Once the effect was recognized, steps could be taken to reduce it. As a result, several large synchrocyclotron laboratories were able to increase their research output.

McMillan and Veksler, during World War II, predicted means of increasing the upper energy limit of cyclotrons. The first test of the proposal was made in Berkeley in 1946. The 37- inch magnet was modified for the test. Ken participated, not surprisingly, in the design of the RF system, which now involved frequency modulation. The prediction was confirmed.

After World War II, UCLA was interested in establishing a program in nuclear physics. It was decided to move the 37- inch frequency- modulated cyclotron to UCLA to begin the new program. After a year at the

University of British Columbia, Ken joined the UCLA faculty in 1947. Over the next 10 years he and his students performed positron- electron scattering experiments, stopping power measurements, precision range-energy relationships and a final increase of the "37- inch" energy to 20 Mev protons.

In about 1960, Ken initiated the UCLA Department of Physics program in experimental plasma physics. Over the next 15 years, with various colleagues, he published some 20 papers in this field, many involving various aspects of large quiescent plasmas. Early on, Ken and his students lined the walls of a vacuum chamber with permanent magnets of alternating polarity to suppress plasma electron losses. "MacKenzie buckets" are now universally used as plasma sources. He initiated an introductory undergraduate course in plasma physics and an accompanying laboratory (which used a restaurant size cooking pot as an ion bucket). He invented simple physical pictures for a number of plasma wave phenomena usually described in complex mathematical terms.

Ken can be given much credit for the impressive status of experimental plasma physics at UCLA today. Studies of plasmas in the ionosphere (Alfred Wong); the physically largest Electric Tokomak (directed by one of Ken's students, Robert Taylor); and physically large plasmas for wave studies (Reiner Stenzel and Walter Gekelman) are examples of important work in progress.

For a period of about two years Ken was the president of a small company, Meva Corp, which was formed to build cyclotrons. After producing one for an undergraduate laboratory at Pomona College, the company was sold to Hughes Aircraft.

After retirement, Ken continued a long standing interest in Special and General Relativity. Some results are described in an unpublished monograph titled Einstein's General Relativity in Three Dimensions. He also wrestled with the dark matter enigma.

Ken made very significant contributions to the Department. In a broad sense, being one of eight new faculty appointments following World War II, he participated actively and fully in every aspect of the Department's development. Over the years he saw to it that the electricity and magnetism laboratories were kept up to date. He introduced the plasma physics curriculum. He took the course in “Physics for Non- Science Majors” seriously, devoting a great effort to make special relativity understandable. In the mid-70s he served as chairman.

What kind of a physicist was he? He could of course use mathematics to formulate and solve problems. Beyond that, he could see through the most complex situations to their conceptualization and solution. As a person, he was gentle, kind, understanding, pleasant and modest to a fault. He rarely, if ever, raised his voice. He had a considerable range of interests outside of physics, both physical and intellectual. Verna, his second wife whom he married in 1981, gave him great care during his decline. Other survivors are his children, Robert, Maryann and Wallace. They miss him dearly as do all who knew him well.

David S. Saxon
Alfred Y. Wong
Byron T. Wright
Ralph F. Wuerker