

and a professor at Ottawa University, Kansas, will receive the award at the XIIth International Congress of Radiology. The meeting will be held in Tokyo during 6-11 Oct.

Spencer is honored for his long-term study of the theory of charged-particle penetration. His calculation on the electron slowing-down spectrum led to

an extension of Gray's theory of cavity ionization chambers, which resulted in a cavity ionization function. He also developed a mathematical treatment of the Boltzmann equation, leading to an accurate calculation of the penetration of gamma rays in matter.

The medal was established in 1967 and honors the late Louis Harold Gray, former member and vice-chairman of the commission.

Astronomer at Kitt Peak, R. W. Michie, 38, Dies

Richard W. Michie, associate astronomer at Kitt Peak National Observatory, died 27 March after a prolonged illness. Born 1931 at Long Beach, California, he received a BS in physics at Cal Tech and a PhD in astronomy at Princeton University in 1960.

He served three years on the faculty of the University of California, Berkeley before joining the staff of the space division at Kitt Peak in 1963. He was known for his contributions to the dynamical theory of star clusters and the formation of galaxies.

W. H. Barkas Developed Nuclear-Emulsion Method

Walter H. Barkas, professor at the University of California, Riverside, died on 26 March of a heart attack at the age of 56. He was born in Portland, Oregon in 1912 and received a BS degree in 1932 and a PhD in 1936 from the University of Washington.

He was best known for his pioneering work on the development of the nuclear-emulsion technique in high-energy physics, which he applied in a series of classic measurements on pion and muon properties.

His career embraced a large range of activities, including astrophysics at the University of Washington (1933-36), beta-ray spectroscopy at Columbia University (1936-38) and fission studies at Princeton University (1938-40). During World War II, he worked for the Navy on mines and explosives, first in Washington D.C. and later as assistant director of the Applied Physics Laboratory at the University of Washington. In 1947 he was appointed head scientist at the Office of Naval Research in San Francisco.

In 1950 Barkas joined Lawrence Radiation Laboratory, where he head-

ed the group using the nuclear-emulsion technique. Contributions include the measurements of the masses, lifetimes, and decay modes of K mesons and Σ and Λ hyperons. His book, *Nuclear Research Emulsions*, was published in 1963 by Academic Press and is one of the most authoritative in its field.

He joined the University of California, Riverside in 1965, where he continued his emulsion work and built up a bubble-chamber group.

Barkas was a fellow of the American Physical Society and a member of the American Association for the Advancement of Science. He was also a member of the National Academy of Sciences Committee on Nuclear Science.

Ray Lee Edwards Was Professor for 58 Years

Ray Lee Edwards, a physics professor for 58 years, died 4 April in Claremont, Calif., after a long illness. He was 83 years old.

He received numerous degrees including a BA from Oberlin College in 1908, a BS from Ohio Wesleyan University in 1909 and an MA from Ohio State University in 1916. Edwards was also awarded a PhD by the State University of Iowa in 1925 and a DSc by Denison University in 1963.

For his contributions to teaching he received the 1945 Oersted Medal, given by the American Association of Physics Teachers. He was professor and department chairman at Park College, Missouri, and later at Miami University in Ohio, where he was also professor emeritus from 1956. The physics research library at Miami was named in his honor.

Edwards's research was in mechanics, liquid viscosities and magnetism, and he also served as associate editor of the *American Journal of Physics* during 1945-47. □

Inside this new quadrupole magnet is some very interesting engineering which results in a beam of beauty. (Sample: magnetic/geometric coincidence is within ± 0.003 inch.) Mechanical symmetry is achieved by utter simplicity of fabrication and assembly - simple, but ingenious nevertheless. Magnetic symmetry follows as surely as Planck's constant is constant.

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