the University of Berlin from 1931 to 1932, and as a foundation fellow at the University of Copenhagen and at Cambridge University from 1932 to 1933. He was a research associate at the Swiss Federal Institute of Technology from 1933 to 1936 and at the University of Copenhagen from 1936 to 1937. In 1937 he joined the faculty of the University of Rochester. He became a group leader at Los Alamos in 1943; after the War, he became a professor at M.I.T. in 1945. From 1961 to 1965 he served as director general of CERN.

His contributions to quantum field theory are legion, beginning with his explanation (with Eugene Wigner) of the natural radiative lifetime of atoms. He was among the first to recognize the importance of the self-energy in relativistic field theories and to suggest that renormalization of mass and charge may lead to the removal of the problematic infinities of quantum electrodynamics. In collaboration with Wolfgang Pauli he formulated the correct quantization rules for boson fields. He has made important contributions to the theories of nuclear structure and nuclear-nucleon scattering. The textbook on theoretical nuclear physics that he wrote with John Blatt has become a classic.

Wyld Propulsion Award To John Kincaid

The American Institute of Aeronautics and Astronautics has presented the Wyld Propulsion Award for 1981 to John F. Kincaid of the Applied Physics Laboratory at Johns Hopkins University.

Kincaid, while speaking at the awards ceremony, expressed "alarm" at current thinking about laser weapons, asserting that "laser weapon systems emplaced in space by the great powers would seriously degrade their mutual security." He advocated instead that we strengthen our arms control agreement with hardware. "A far better course than deploying satellite battle stations, is to design missiles which can tolerate attack by space-borne weapons. We should strive to do this so well that no power is tempted to put weapons in space," Kincaid said.

The Wyld Award is named for James Wyld, inventor of the regenerative rocket motor, which is now the standard motor for rocket propulsion. Given annually by the AIAA, it consists of a medal, a certificate and a citation. Past winners include such distinguished scientists as James Van Allen and William Pickering. Kincaid is honored for "innovative and timely contributions to the solid-propulsion community as an inventor, scientist, and manager, and for continued outstanding technical leadership in the development of propulsion systems for tactical and strategic missiles."

KINCAID

After receiving his master's degree at George Washington University, Kincaid went on to obtain his PhD from Princeton in 1938. His career has gone from conducting research at industrial labs, such as General Electric Co., and Rohm & Haas Co., to working for the government, including the Institute for Defense Analysis and the Department of Commerce, where he served as assistant secretary for science and technology. Since 1971, when he came to Johns Hopkins, he has been the senior scientist at the Applied Physics Lab.

obituaries

Hideki Yukawa

Hideki Yukawa, one of the most original theoretical physicists of the twentieth century and inventor of the meson theory of nuclear forces, died on 8 September 1981 at the age of 74 in Kyoto, where he had lived most of his life. Although in poor health for the past six years, he continued to be editor of *Progress of Theoretical Physics*, the English-language journal that he founded in 1946.

Yukawa's greatest work, for which he was awarded the Nobel Prize in 1949 and which was also his first published scientific paper, was a fundamental field theory proposed to underly both Werner Heisenberg's strong nuclear exchange force and Enrico Fermi's theory of beta decay. One of its predictions was the existence of the meson, to serve as an "intermediate boson" (in modern language) for both strong and weak nuclear forces, which he was the first to clearly distinguish. In the same article, in the *Journal of the Physico-Mathematical Society of Japan* (February 1935), he suggested that the meson should be present in the cosmic rays as a charged particle of mass about 200 times that of the electron. No attention whatever was paid to the work of the unknown Yukawa until 1937, when the "cosmic ray meson" (now called the muon) was found to be the main part of the penetrating component of cosmic rays. This identification, though it was false, brought instant fame to Yukawa and created a surge of interest in meson theory, which was then actively pursued both in Japan, by Yukawa and his collaborators, and in the West.

YUKAWA

Yukawa's meson, the pion, the nuclear force carrier that is the parent of the muon, was found in 1947. Both "mesons" may be regarded as prototypes of new families, lepton and hadron, that became the objects of study of the new field called elementary-particle physics. In that sense, Yukawa became the prophet of a new era in physics.

Appointed professor at Kyoto University in 1939, Yukawa was awarded the Imperial Prize of the Japan Academy (1940) and the Cultural Medal (1943), Japan's highest award. Nevertheless, the international honor of becoming Japan's first Nobel Laureate, at a time when Japanese prestige was low, was a tremendous encouragement to Japan's young scientists and, indeed, to the entire nation. In 1948, Yukawa was a member of the Institute for Advanced Study at Princeton, and from 1949 to 1953 he was professor at Columbia University. To thank Yukawa and to help persuade him to return to Japan, a new institute was established in 1953 at Kyoto, the Research Institute for Fundamental Physics, with Yukawa as its director, a position he held until 1970.

He was born in Tokyo in 1907, the son of Takuji and Koyuki Ogawa. His