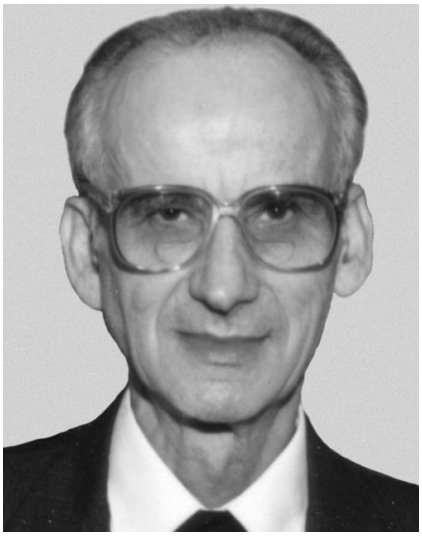


SAMUEL NEWTON FONER

ing geometry to complete the first successful study of neutral atom–molecule reactions. Foner, who had learned the molecular beam techniques from their developer, Stern, had by then been working on refining mass spectrometers for at least two decades. He was the first to identify the elusive molecule hydroperoxyl (HO_2) by mass spectrometry in 1953, nearly two decades after its existence was theoretically deemed essential for fully understanding the hydrogen–oxygen system.

By 1962, Foner had found a way to increase the concentration of HO_2 by more than two orders of magnitude so that one could actually study, using a plethora of techniques, the molecule in the gas phase and as trapped in low-temperature solid matrices. Foner and his colleagues Chih Kung Jen, Edward Cochran, and Vernon Bowers had already pioneered techniques for trapping free radicals. The results of one such experiment, the trapping of hydrogen atoms in a solid hydrogen matrix at liquid helium temperatures and their study by electron spin resonance techniques, allowed Norman Ramsey to infer the lifetime of hydrogen atoms bouncing around in the maser chamber and to conclude that the system will not be too lossy. Ramsey could therefore confidently proceed with the building of the hydrogen maser.

Foner had great enthusiasm for science and was cognizant of its role in addressing national security problems. He also often judged science projects at local schools, served as science coordinator of the US science exhibit at the Seattle World's Fair in 1962, and was adviser to NATO's scientific affairs division (1973–82). He was the founding member of the *APL Technical Digest*; he served on the editorial board (1961–63) and was later the chairman (1963–79). He also served as vice chairman of APL's Milton S. Eisenhower Research Center (1975–83). He retired from APL in December 1990.

Foner was a reserved and unassuming man who was truly embarrassed by praise. My attempts to recount Estermann's high opinion of Foner, as expressed by Estermann to me, met with a quick change of subject. Used to doing first-rate research at an institute where such research was internally funded, he never took to proposal writing and seeking outside funds, even when it became de rigueur. He often said that such actions would soon lead the funding agencies to dictate the problems on which one could work. He was not entirely wrong. Foner was an exemplary scientist who leaves a strong scientific legacy.

KISHIN MOORJANI
Applied Physics Laboratory
Johns Hopkins University
Laurel, Maryland

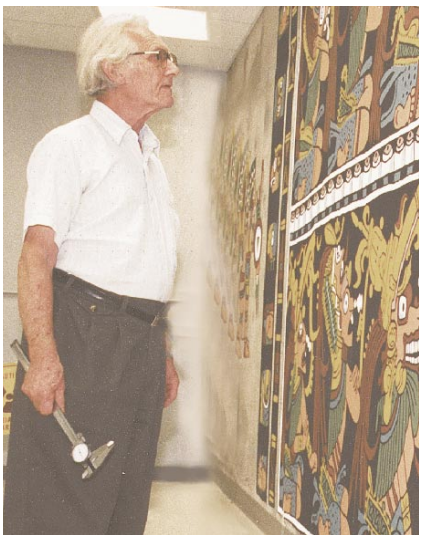
Stanley Kronenberg

Stanley Kronenberg, a nuclear physicist and authority on nuclear-radiation technology and detectors, died from a heart attack at his home in Skillman, New Jersey, on 9 December 2000.

Born on 3 May 1927 in Krosno, Poland, Kronenberg received his PhD in physics from the University of Vienna in 1952. His thesis was on atomic weapon design; at that time, such information and work in the US was classified by the US government.

In 1953, the US State Department offered Kronenberg a position as a nuclear research scientist at the US Army's Nuclear Radiation Laboratory in Fort Monmouth, New Jersey. Subsequently, he commenced a productive 47-year career at Fort Monmouth, during which he published nearly 100 papers on nuclear radiation detection and measurement. He also was awarded 22 patents for work in that field.

Kronenberg was one of the few people in the US who could design, arm, and disarm a nuclear weapon. From the 1960s through 1970, he devised and carried out radiation experiments for every atomic bomb test in the Pacific, then at most of the aboveground nuclear tests in Nevada, and at some of the underground tests. In one aboveground bomb test in Nevada, he actually climbed the tower on which a nuclear weapon had misfired and disarmed it.



STANLEY KRONENBERG

His most significant contribution to US atomic bomb research was the experiment he designed in 1968 to measure the radiation in the environment following a nuclear explosion. The design covered a timescale from a fraction of a nanosecond to hours after the event. The experimental setup involved 100 Tektronix oscilloscopes with 0.3-ns rise times that were arranged to trigger at various times after the event to cover the total timescale. He used a SEMIRAD detector, which he invented specifically for this experiment, to measure the nuclear environment. The data, still highly classified, significantly contributed to the US effort in nuclear weapons design. It was not widely known that Kronenberg was responsible for designing this experiment and successfully acquiring such important data.

From 1962 to 1983, Kronenberg served as the director of the Evans Laboratory nuclear radiation division at Fort Monmouth. He then abdicated the management position and turned his attention solely to radiation research, which was his first love.

Kronenberg received numerous honors and awards, among them the Meritorious Civil Service Medal (1966); four Department of the Army Research and Development Achievement Awards (1968, 1971, 1972, and 1976); and the Federal Emergency Management Agency Outstanding Public Service Award (1986).

Among his many talents, Kronenberg was an expert watchmaker, machinist, and mechanical designer who could operate any machine shop equipment with high precision. He

designed and fabricated his experimental setups in a matter of a few days. His second love was collecting Polish postage stamps. Kronenberg was an international expert who determined, for collectors and auctioneers, whether stamps were genuine or forgeries. About 100 publications about stamps and related subjects bear his name.

Kronenberg was also quite an artist. The photograph accompanying this obituary shows him standing in front of a 30-foot-wide by 9-foot-high mural that he painted on his concrete laboratory wall; he completed the work in February 2000. The mural depicts seven Mayan gods creating the universe. His inspiration was a vase found in the Mayan ruins, and the original painting was in black and white.

Kronenberg was a gentle man who had affection and concern for others. He was available with help or advice on any problem or project, whether private or official. We will sorely miss him.

GEORGE BRUCKER
Fort Monmouth, New Jersey
CARL ACCARDO
Massachusetts Institute of Technology
Cambridge, Massachusetts

Louis Leprince-Ringuet

Louis Leprince-Ringuet, an expert in cosmic rays and a great French scientific figure, died on 23 December 2000, a few months before his 100th birthday.

Leprince-Ringuet was born on 27 March 1901 in Alès, a mining town in southern France. In 1920, he graduated from Ecole Polytechnique in Paris and completed his engineering studies, specializing in telecommunications, at the French telecommunication school Ecole Supérieure d'Electricité in Paris before beginning, in 1925, a career as an engineer laying and servicing submarine cables.

In 1929, he decided to switch fully to conducting research in the laboratory of Maurice de Broglie, the brother of Louis de Broglie. The lab's main activity was shifting from x rays to nuclear physics, and Leprince-Ringuet started to develop the relevant instrumentation. He received his doctorate in physics from the University of Paris and soon collaborated with Pierre Auger's group on cosmic-ray studies in the high mountains, happy, as he said, to "leave for the open skies after work carried on in a basement."

In 1933, Leprince-Ringuet joined Auger on a ship sailing from Hamburg, Germany, to Buenos Aires, Argentina, with 100 particle detectors onboard. At that time, the nature of cosmic rays was unknown. Charged particles, unlike gamma rays, are deflected by Earth's magnetic field, which varies with latitude. Auger and Leprince-Ringuet hoped, therefore, that studying the variation of cosmic-ray intensity with latitude would reveal what cosmic rays consisted of. The experiment favored particles and was Leprince-Ringuet's first main involvement in the field of cosmic rays, in which he eventually acquired a worldwide reputation.

LOUIS LEPRINCE-RINGUET

After several experiments with Auger on mountain peaks and with balloon flights, Leprince-Ringuet developed his own laboratory for cosmic-ray research in 1936, when he became a professor, with a chair of physics, at Ecole Polytechnique. He attracted to his laboratory a host of young and brilliant researchers, among them Bernard Gregory, who became the director general of CERN in the late 1960s, and André Lagarrigue, famous for the discovery of the neutral current interaction in the early 1970s. Leprince-Ringuet played an important role in the revival of physics research in France after World War II.

Even though his mountain work with cosmic rays was slowed down by the war, Leprince-Ringuet continued his research, which bloomed and had culminated by the time of the Bagnères-de-Bigorre conference in 1953. At that watershed conference, he presented the summary of a talk covering the important results obtained with the many surprising particles discovered. He is credited for finding evidence for a heavy particle and also for coining the term hyperon.

Leprince-Ringuet was also saying farewell to cosmic-ray research at that conference. Realizing the impending and overwhelming competing power of accelerators in the GeV range, he decided to reorient his laboratory toward accelerator physics. He effectively argued for the construction of bubble chambers at Saclay, which resulted in a plan for two French bubble chambers, one filled with hydrogen and the other with heavy liquid, to be installed at CERN as the proton synchrotron was commissioned in 1959. Commonly heard at the time was this: "There are 13 CERN members, those with a flag at the entry and Ecole Polytechnique!" This effort eventually led to the development of the giant Gargamelle chamber in the late 1960s and the discovery there of the neutral-current weak interactions in 1973.

In 1959, Leprince-Ringuet succeeded Frédéric Joliot-Curie at the Collège de France as professor and became head of two large laboratories, there and one at Ecole Polytechnique. He retired as the Collège de France's chair of physics and as head of the lab at Ecole Polytechnique in 1972.

In 1991, still remembered as a physicist on mountaintops, Leprince-Ringuet was one of the two guests of honor at the dedication of the newly established "Refuge des Cosmiques" (Cosmic Refuge) near Mont Blanc in the Alps in remembrance of the cosmic-ray work done during the 1940s in the old refuge, which the new one replaced. He shared the honor of dedicating the refuge with author Roger Frison-Roche.

Leprince-Ringuet was a man of many interests. As a member of the French Academy of Sciences and of the French Atomic Energy Commission's governing board, he had the means to exert his influence. He advocated strongly for the creation of CERN and remained its indefatigable supporter. He was vice chair (1956–69) and chair (1964–66) of CERN's scientific policy committee. He was elected to the French Academy in 1966. He also was a champion of outreach, engaging in activities involving ecology and sustainable sources of energy.

When a special symposium was held at Ecole Polytechnique to celebrate Leprince-Ringuet's 96th birthday, it took not less than six contributors to do justice to his achievements in many fields, ranging from science, to art, to tennis. Many physicists are much indebted to him for his guidance, for developing very good research con-