with the award for chemistry. **Jerrold E. Marsden** of Caltech received the award for mathematics and informatics.

Paul Ching-Wu Chu, T. L. L. Temple Chair of Science, professor of physics, and director of the Texas Center for Superconductivity at the University of Houston, will become the president of the Hong Kong University of Science and Technology (HKUST) in July. He will still maintain his association with the center as T. L. L. Temple Chair of Science and chief science adviser, without drawing a salary, to continue his research on high-temperature superconductivity. Chu will succeed outgoing HKUST president **Chia-Wei Woo**, who left the presidency at San Francisco State University in 1988 to plan the establishment of HKUST, which opened in 1991. Woo says he plans to "continue to engage in education, science, and technology activities, including US–China cooperation in this arena."

OBITUARIES

Herbert Friedman

Herbert Friedman died of cancer at his home in Arlington, Virginia, on 9 September 2000. He was recognized as a pioneer in the space sciences for his contributions to solar physics, aeronomy, and astronomy. But he also made fundamental advances in the application of x rays to material analysis.

Friedman was born in Brooklyn, New York, on 21 June 1916. He entered Brooklyn College in 1932 with the intention of majoring in art, but ended up obtaining a bachelor's degree in physics in 1936. His graduate work involved the characterization of materials using x-ray diffraction techniques. He received his PhD in physics at Johns Hopkins University in 1940.

That same year, he joined the Naval Research Laboratory, where he spent his entire professional career. Until around 1950, his research at NRL was dedicated to laboratory x-ray analysis, much of it involving the application of x-ray-sensitive Geiger counters—for example, the characterization of thin films and the development of x-ray fluorescence analysis. He also developed the gamma-ray-sensitive Geiger counters that were used by NRL to detect the first Soviet nuclear explosion in 1949. In 1945, Friedman received the US Navy's Distinguished Civilian Service Award for the wartime development of a technique for cutting and tuning radio-frequency crystals using their Bragg reflection characteristics.

By 1950, he had switched to the newly emerging field of observations from space using sounding rockets. Friedman's first experiment, a V-2 rocket launched from the White Sands Missile Range in 1949, involved observing solar x-ray and ultraviolet radiation using Geiger counters to reveal the source of the ionization of the upper atmosphere. During the next 10 years, Friedman continued his program of solar and atmospheric investigations. He arranged for campaigns of shipboard rocket launches to study solar x rays. He obtained the first x-ray image of the Sun with a pinhole camera; flew the first Bragg spectrometer for measuring hard x rays; and developed and flew SOLRAD, the first satellite dedicated to long-term monitoring of the Sun.

HERBERT FRIEDMAN

In 1955, Friedman shifted his research to "nighttime" astronomy, as was evident in a rocket flight that used collimated Geiger counters sensitive in the mid-ultraviolet. These instruments revealed significant emission associated with the Milky Way.

Following the discovery in 1962 of cosmic x-ray sources, Friedman responded with a rocket flight in early 1963 that unambiguously confirmed the presence of discrete sources of x rays and of a diffuse x-ray background. In 1964, he conducted one of the more noteworthy experiments involving the use of sounding rockets: the observation of the Crab Nebula as it was being occulted by the moon. This experiment demonstrated positively that the Crab Nebula was a source of x rays and that the emission was associated with the nebula itself. Actually, the result was a considerable disappointment to Friedman, who was hoping to observe emission from a pointlike feature near the center of the nebula that might have been the neutron-star remnant of the supernova explosion responsible for creating the nebula.

Friedman's genius as a scientist lay in devising simple experiments that resolved critical problems. It is difficult to find other individuals with his string of success over such a broad range of science, barely touched on here. He had little interest in large space missions, even though early in his career he had been involved with and directed major enterprises, such as the search for nuclear debris and his ship campaigns to launch rockets. But by the time such missions were becoming feasible in the 1960s, he was putting most of his energy into community service. In the 1970s, Friedman turned to writing. His first book was *Amazing Universe* (National Geographic Society, 1975), followed by *Sun and Earth* (Freeman, 1985) and *Astronomer's Universe: Stars, Galaxies, and Cosmos* (Norton, 1998).

Friedman was a great science statesman and spokesperson. During his lifetime, he garnered virtually every science award, including the Eddington Medal of the Royal Astronomical Society (1964), the National Medal of Science (1968), the William Bowie Medal of the American Geophysical Society (1981), the Henry Norris Russell Award of the American Astronomical Society (1983), and the Wolf Foundation Prize in Physics (1987). He was elected a member of the National Academy of Sciences in 1960. His service to science included membership on President Richard Nixon's Science Advisory Committee, the General Advisory Committee to the Atomic Energy Commission, and the Space Science and Governing Boards of NAS. In the spring of 2000, after the onset of his illness, he organized a symposium for the American Philosophical Society, "Ballistic Missile Defense, Space, and the Danger of Nuclear War," that included talks by Richard Garwin, Gregory Canavan, Roald Sagdeev, and others.

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