

"important contributions to fundamental mathematics" in probability theory, nonlinear partial differential equations, spectral theory, and dynamical systems. His work has centered on reinterpreting descriptive models of large-scale physical behavior within a statistical mechanics context. Early in his career, he focused on describing—in quantum mechanical terms—the stability of matter in complex (many-body) systems. He redirected his research to explain the macroscopic properties of fluids based on the microscopic behavior of their constituent particles—the hydrodynamic limit. He developed the concept of "relative entropy" to derive descriptive formulas of fluid behavior from basic principles of statistical mechanics.

AAS Presents Awards in New York

During the 196th meeting of the American Astronomical Society held in Rochester in June, several individuals were recognized for their contributions to astronomy and astrophysics.

The Henry Norris Russell Lectureship, AAS's highest honor, went this year to **Donald Lynden-Bell**, professor of astrophysics at the University of Cambridge. According to the award citation, Lynden-Bell "taught us how to understand the rich properties of disks around planets, stars, black holes, and galaxies" and demonstrated what scientists may learn from studying the motions of gas clouds around the Milky Way, galaxies within the local group, and the nearby universe through the thermal background radiation. Lynden-Bell also "communicated to us all the pleasure and importance of considering the fundamental basis for our subject within the sciences of heat, matter, and gravitation."

Frank Shu received the 2000 Danie Heineman Prize for Astrophysics, given jointly by AAS and the American Institute of Physics. He was recognized for "shaping our current understanding of star formation, for his research on an unusually large array of topics, including the origin of spiral structure in galaxies, stellar dynamics, the evolution of close binary stars, planetary rings, and composition of meteorites, and for his contributions as an educator and leader of the astronomical community." Shu is University Professor in the astronomy department at the University of California, Berkeley.

The Beatrice M. Tinsley Prize for

2000 was presented to **Charles Alcock** for his work as principal investigator on the project to search for massive compact halo objects (MACHOs). According to AAS, "the search for dark matter in the galactic halo through gravitational micro-lensing by the MACHO project team was one of the most challenging astronomical projects ever undertaken." The project "was successfully developed and led by Charles Alcock in the face of considerable skepticism about the feasibility of carrying out such a massive survey." The MACHO project not only provided data in the search for dark matter, but has raised questions about the stellar mass function and has contributed insights into the study of variable stars. Alcock is director of the Institute of Geophysics and Planetary Physics at Lawrence Livermore National Laboratory.

Harold McNamara, professor of astronomy at Brigham Young University in Provo, Utah, garnered the 2000 George Van Biesbroeck Prize. AAS acknowledged McNamara as "the effective editor of the *Publications of the Astronomical Society of the Pacific* in 1969–91, during which time that journal grew by more than a factor of three. In 1988 he started the *ASP Conference Series* that now numbers about 200 volumes. That series has provided good quality, rapid, and inexpensive astronomical publications."

The 2000 Helen B. Warner Prize was awarded to **Wayne Hu**. He was honored for clarifying our understanding of how fluctuations in the microwave background radiation are formed under a range of cosmological assumptions and for demonstrating how observations of galaxies from large surveys can lead to complementary information covering more recent epochs. "Through his deep understanding of the fundamental physics and his skill in communication, Dr. Hu's work is having a strong influence on our understanding of cosmology." Hu will be assistant professor of astronomy and astrophysics at the University of Chicago in September.

Kirpal Nandra received the Newton Lacy Pierce Prize for 2000 in recognition of his use of data from an assortment of x-ray satellites to identify reflection spectra and broadened iron lines from accretion disks in active galactic nuclei. "His leadership and careful analyses are having a major impact on our growing understanding of the properties of massive black holes and on how gas accretes onto them." Nandra works at NASA's Goddard Space Flight Center as research scientist for the Universities

Space Research Association's Cooperative Program in Space Science.

IN BRIEF

David J. Gross, director of the Institute for Theoretical Physics at the University of California, Santa Barbara, and **Harry B. Gray**, professor of chemistry and director of the Beckman Institute at Caltech, each received the Harvey Prize in Science and Technology, awarded in June by the Technion–Israel Institute of Technology in Haifa, Israel. Gross was recognized for "his many contributions to all aspects of elementary particle physics and, in particular, the discovery of the 'Asymptotic Freedom' property of the strong interactions among the most elementary constituents of matter." Gray's award was for his "pioneering contributions to inorganic and bioinorganic chemistry... especially his studies of reaction mechanisms and the nature of the chemical bond in transition metal complexes and of the long-range electron transfer in proteins."

James C. White II has been named executive director of the Astronomical Society of the Pacific. He has been editor of the society's magazine *Mercury* and *The Universe in the Classroom*, its teachers' newsletter, and was associate professor of astronomy at Middle Tennessee State University, Murfreesboro. White began his new post in July.

France Cordova, professor of physics and vice chancellor for research at the University of California, Santa Barbara, has been selected as a 2000 laureate by the Kilby Awards Foundation. The foundation's mission is "to identify, celebrate and provide heroic role models for future generations."

Tel Aviv University in May awarded the Sackler Prize in Physical Sciences to **Juan Maldacena** and **Michael Douglas**. Maldacena, professor of physics at Harvard University, and Douglas, professor of physics at Rutgers University, are sharing the \$36 000 prize. The pair was recognized for "their crucial contributions to theoretical high-energy physics through their work on string theory."

James Lake, director of strategic nuclear business development at the Idaho National Engineering and Environmental Laboratory, has been named president of the 11 000-member American Nuclear Society (ANS). A member of ANS since 1967, he began his yearlong term in June.

Joseph V. Martinez has accepted a position as senior adviser for scientific institutional outreach at the US Department of Energy (DOE), following 25 years as the first manager of DOE's Atomic, Molecular and Optical Physics Program in the Office of Basic Energy Sciences.

In May the International Center of Photography in New York City presented its 16th Annual Infinity Award for Applied Photography to the **Hubble Heritage Program**, based at the Space Telescope Science Institute in Baltimore, Maryland. Each month, the

program provides the public with a new snapshot taken by the Hubble Telescope's visible-light camera.

Jacques Vanier received the Society Award for technical achievement from the Institute of Electrical and Electronics Engineers Instrumentation and Measurement Society last May. The society acknowledged Vanier's "outstanding contributions to and leadership in the science of metrology." A retired principal research officer with the National Research Council of Canada, he is adjunct professor of physics at the University of Montreal.

nance (devised with Chen Ning Yang in 1962), and his 1972 paper with Abraham Pais, giving the implications of weak neutral currents for inclusive neutrino reactions (which is how the existence of neutral currents was first established). In a more theoretical mode, Treiman collaborated with Curtis Callan on the Callan-Treiman relations for kaon decay, with David Gross on an influential paper that coined the term "twist" for the difference between the dimension and spin of an operator, and with Benjamin Lee, Tony Zee, and myself on a paper that systematically tied together the anomaly predictions for multiple photon and pion processes.

Equally important to Treiman's impact was his outstanding ability as a teacher and mentor to two dozen graduate students over three decades, starting with Steven Weinberg and Nicola Khuri in 1957. His students, building on his basic philosophy, contributed much of the current edifice of the Standard Model. Treiman's teaching style has been termed Socratic. He was always willing to engage in a dialogue on any serious topic in physics, and one always came away from such discussions with valuable insights.

For his contributions as an educator, Treiman was honored in 1995 with the Oersted Medal of the American Association of Physics Teachers. Another honor was his election to the National Academy of Sciences in 1972. He served the scientific community through participation on numerous accelerator program committees and HEPAP, chairmanship of Princeton's physics department, and later, chairmanship of the Princeton University Research Board. He was also an active participant in JASON, advising on national security issues. He wrote (or cowrote) several books, the most recent being *The Odd Quantum*, which was published in late 1999 by Princeton University Press. Also notable for the insight it gives into both his career and the golden period of particle physics is his essay "A Life in Particle Physics," published in the 1996 *Annual Reviews of Nuclear and Particle Science* (volume 46, page 1).

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Ivan Kuščer

Ivan Kuščer, a theoretical physicist who was associated with the University of Ljubljana in Slovenia for more than 50 years, died of cancer on 31 January 2000 in Ljubljana.

OBITUARIES

Sam Bard Treiman

Sam Bard Treiman, a major contributor to the development of particle physics, both through his research and his mentoring of students, died on 30 November 1999 of leukemia at Sloan-Kettering Memorial Hospital in New York. Treiman, who was the Eugene Higgins Professor of Physics Emeritus at Princeton University, had been on the faculty there for nearly five decades.

Treiman was born on 27 May 1925 in Chicago to immigrant parents. In 1942 he entered Northwestern University on a scholarship to study chemical engineering, but a freshman physics course taught by Hartland Snyder persuaded him that his real interests lay in physics. After two years at Northwestern, Treiman joined the US Navy, and spent the last year of World War II in the Philippines fixing radar equipment and reading voluminously. In 1946 he enrolled at the University of Chicago, where he earned a BS in 1949, an MS in 1950, and a PhD in physics in 1952.

Although Treiman's thesis dealt with cosmic radiation, his interests soon shifted to the new particles that were being discovered in cosmic-ray experiments. He evolved a research style of working closely with experimentalists, and many of his papers are exemplars of particle phenomenology. By the mid-1950s Treiman had acquired an abiding interest in weak interactions. He would preach to his students that "the place to learn about the strong interactions is through the weak and electromagnetic interactions of the strongly interacting particles; the problem is half as complicated." The history of the subsequent development of the Standard Model showed this philosophy to be prophetic.



SAM BARD TREIMAN

After the discovery of parity violation in weak interactions, Treiman, in a 1957 collaboration with J. David Jackson and Henry Wyld, worked out the definitive formula for allowed beta decay, taking into account the possible violation of time reversal symmetry, as well as parity. In 1958 Treiman embarked with Marvin Goldberger on a dispersion relations analysis of pion and nucleon beta decay, a major outcome of which was the famed Goldberger-Treiman relation for the charged pion decay amplitude. Subsequent reformulations of their derivation led to the hypothesis of the partially conserved axial vector current and, at a deeper level, to our understanding of the spontaneously broken chiral symmetry of the strong interactions.

An important facet of Treiman's research was his ability to devise simple, incisive experimental tests for important theoretical hypotheses. Prime examples are what became known as the Treiman-Yang angle test for single pion exchange domi-