Lawrence Craig Evans, professor of mathematics at UCB

Matthew P. A. Fisher, professor of physics and a permanent member at the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara

Donald Glaser, professor of physics and neurobiology at UCB

Paul Houston, professor of chemistry at Cornell University

Randall Hulet, Fayez Sarofim Professor of Physics at Rice University

Thomas Katz, professor in the department of chemistry at Columbia University

Joseph Kirschvink, professor in the division of geological and planetary sciences at Caltech

Michael L. Klein, director of the Laboratory for Research on the Structure of Matter at the University of Pennsylvania

Donald Lamb Jr, Louis Block Professor in Astronomy and Astrophysics at the Enrico Fermi Institute and the University of Chicago

Julio Ottino, professor in the department of chemical engineering at Northwestern University

S. George Philander, professor of geosciences at Princeton

George Rieke, professor of astronomy and planetary sciences at the University of Arizona, Tucson

R. G. Hamish Robertson, professor of physics at the University of Washington, Seattle

Alexander Szalay, Alumni Centennial Professor in the department of physics and astronomy at Johns Hopkins University in Baltimore, Maryland

Lynne Talley, professor of oceanography at the University of California, San Diego's Scripps Institution of Oceanography

Kathleen Taylor, chair of the board of directors of the Centre of Automotive Materials and Manufacturing in Kingston, Ontario, Canada

Ellen Williams, director of the materials research science and engineering center, University of Maryland, College Park.

These foreign honorary members are physicists or work in physics-related fields:

J. Richard Bond, director of the Canadian Institute for Theoretical Astrophysics in Toronto

Konrad Mauersberger, director of atmospheric physics at the Max Planck Institute for Nuclear Physics in Heidelberg, Germany

William Unruh, professor of theoretical physics at the University of British Columbia in Vancouver, Canada.

In Brief

Robert Dynes will become president of the University of California's nine-campus system in October. Dynes, chancellor of the University of California, San Diego, will succeed **Richard Atkinson**, who is retiring after eight years in the position.

In July, **Richard G. Kron** became the third director of the Sloan Digital Sky Survey, a collaboration of 13 institutions worldwide and more than 200 astronomers working to map, in detail, one-fourth of the entire sky. Kron, a professor in the University of Chicago's department of astronomy and astrophysics and a scientist at Fermilab, succeeds **John Peoples**, who retired on 30 June.

The Institute for Nuclear Research of the Russian Academy of Sciences bestowed the M. A. Markov Prize on **Thomas J. Bowles**, **Vladimir Gavrin**, and **Vadim Kuzmin** at a two-day symposium at the institute in Moscow this past May. The award recognizes the trio for their "outstanding contributions to fundamental physics and the development of research on the solar neutrino problem." Bowles, whose work has been in neutrino physics and fundamental symmetries, is a fellow at Los Alamos National Laboratory. Gavrin and Kuzmin are both with the institute: Gavrin heads the Gallium–Germanium Neutrino Telescope Laboratory at the Baksan Neutrino Observatory and Kuzmin is head of the laboratory for particle physics and cosmology in the theory division.

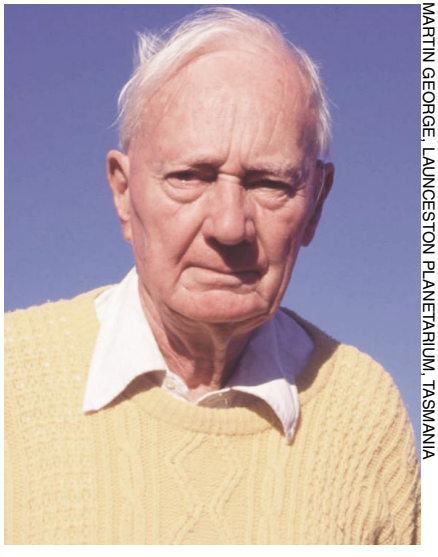
Last month, the International Association for the Physical Sciences of the Oceans awarded the 2003 Prince Albert I Medal in Physical Oceanography to **Klaus Wyrtki** during the International Union of Geodesy and Geophysics General Assembly in Sapporo, Japan. Wyrtki, emeritus professor of oceanography at the University of Hawaii, Manoa, was cited for his "excellence in the physical sciences of the oceans."

Obituaries

Grote Reber

Grote Reber, radio astronomy pioneer and the first person to map the radio sky, died on 20 December 2002 in Ouse, Tasmania, Australia, of cancer, two days short of his 91st birthday. During his career, Reber was not dependent on any institution. Unable to secure support from US federal agencies, he relied on his own funds and modest support from the Research Corp in New York City. His discoveries led to the postwar development of radio astronomy, which transformed our view of the universe.

Reber was born on 22 December 1911 and grew up in Wheaton, Illinois. He graduated in 1933 with a BS in electrical engineering from the Armour Institute of Technology (later the Illinois Institute of Technology). During the Depression, Karl Jansky, physicist and radio engineer at Bell Laboratories, searched for the origin of a strange form of radio static at 20.6 MHz. Jansky's discovery that it emanated from the general direction of the constellation Sagittarius was virtually ignored by the astronomy community. Reber, a radio amateur, had heard of Jansky's "star noise" and decided to investigate. By using public transportation instead of buying a car, Reber was able to afford the parts for his radio telescope. He got books



MARTIN GEORGE, LAUNCESTON PLANETARIUM, TASMANIA

Grote Reber

on optics from the public library and, in 1936, built a 9.6-meter parabolic dish in his backyard. Reasoning that higher frequencies give better angular resolution and assuming a thermal origin of the radio noise, Reber used his skills as a radio engineer to investigate the radio sky at a frequency 160 times higher than Jansky had used.

By 1937, the antenna was ready. That same year, Fred Whipple, with graduate student Jesse Greenstein,

attempted (unsuccessfully by a factor of 100 000) to explain Jansky's radio flux from the center of our galaxy as hot dust. By 1938, Reber made his first observation using a homemade receiver, but the receiver, operating at 3.3 GHz, found nothing. He then opted for lower frequencies at which he could build receivers with less internal noise and higher sensitivity. After a succession of failures at 910 MHz, he moved to a lower frequency of 160 MHz. Catching a few hours' sleep after dinner, Reber observed at night to avoid car ignition static and worked during the day at his job designing receivers at the Stewart Warner radio factory in Chicago.

In early April 1939, he successfully detected galactic radio noise at 160 MHz. Reber published those preliminary results, which confirmed Jansky's detection of radio emission from the plane of our galaxy, in 1940. In his article, which appeared in the *Astrophysical Journal*, he remarked that, based on the hot dust hypothesis, the intensity was weaker than expected. After a stint at the National Bureau of Standards during World War II, he built a new receiver and undertook a full survey of the sky. Eventually, Reber had sufficient data to make a contour map of radio flux. He had difficulty, though, getting these observations published: Astronomers were skeptical and some even thought Reber's map of the radio sky was a hoax.

Otto Struve, editor of the *Astrophysical Journal*, sent Reber's contour map manuscript to astronomers and radio engineers for review, but it fell between fields. (Reber once remarked, "If an astronomer wanted a radio, he would go to the store and buy one.") So Struve sent two astrophysicists, Louis Henyey and Philip Keenan, to examine Reber's setup in Wheaton. They concluded that Reber's research was credible. His contour map, published in the journal in 1944, compares favorably with modern maps. A companion article by Henyey and Keenan explored the idea that bremsstrahlung in ionized hydrogen was responsible; they found that unreasonably high temperatures were required. It was not until after the war that the origin of this radio noise was finally explained as synchrotron radiation from energetic electrons in the galactic magnetic field.

By 1944, news of Jansky's and Reber's observations had reached German-occupied Holland. In a mental leap from his world of optical astronomy and dynamics, Jan Oort mentioned to Henrick van de Hulst the possibility that spectral radio lines might exist. That conversation led to van de Hulst's suggestion in 1945 of the 1420-MHz line from hyperfine splitting in the ground state of neutral hydrogen. The HI line was later (1951) detected by "Doc" Ewen and Ed Purcell at Harvard University, thus beginning a new era of discovery.

During his investigations in 1946, Reber discovered surprisingly intense storms of radio noise from the Sun. He made sensitive observations at 480 MHz and detected the galactic noise, but at a flux lower than at 160 MHz. In 1955, he traveled to Tasmania to pursue radio astronomy at the much lower frequencies that might penetrate the ionosphere during solar minimum. There, in a pasture near Bothwell, he built an electronically steerable one-square-kilometer array that operated at 2 MHz. While other scientists pushed to microwave frequencies seeking higher resolution and molecular lines in the new science of radio astronomy, Reber characteristically went the other way. With data from his array and a similar one in Ottawa, he found evidence of absorption by ionized gas in the Galaxy.

Reber's scientific curiosity extended far beyond astronomy: His experiments on the handedness of vine growth were published in botanical journals and his work on cosmic rays was published in 1966. He also published research in radio circuitry, ionospheric physics, and carbon dating of aboriginal campfire sites. He was active in a variety of issues involving science and society. He argued against the increased use of fossil fuels and against "big science." But it was the stubborn persistence of this solitary amateur experimentalist and his explorations of the radio universe that ushered in a new era in astrophysics. Reber transformed Jansky's faint hiss static into a flux-frequency map of the sky that astronomers could understand. He catalyzed and focused the dramatic growth in radio astronomy worldwide, leading to a revisionist view of our universe as a violent stage on which scenarios involving collapsed objects and jets of relativistic particles are played out.

Awards normally bestowed on professional astronomers were presented to Reber, including the Henry Norris Russell Lectureship of the American Astronomical Society (1962) and the Catherine Wolfe Bruce Gold Medal of the Astronomical Society of the Pacific (1962). In 1963, he received the Franklin Institute's Cresson Medal.

Reber's scientific curiosity was most likely sparked at a young age at home. His mother, Harriet Grote, was an elementary school teacher in Wheaton and had earlier played another important role in astronomical history: Among her seventh and eighth grade students at Longfellow School in Wheaton was young Edwin Hubble.

J. Anthony Tyson
Lucent Technologies' Bell Labs
Murray Hill, New Jersey

Peter Gabriel Bergmann

Peter Gabriel Bergmann, who introduced general relativity into modern physics through his influential book *Introduction to the Theory of Relativity* (Prentice Hall, 1942), died on 19 October 2002 in Seattle, Washington, following a lengthy illness.

Peter was born in Berlin, Germany, on 24 March 1915. His mother was a pediatrician and his father would later be a professor of chemistry at the Rockefeller Institute for Medical Research. Peter began his undergraduate studies in theoretical physics at the University of Freiburg in 1931. Concerned that Peter would not be able to continue his studies in Nazi Germany, his mother secretly wrote to Albert Einstein in the summer of 1933 to ask whether he would consider accepting her son as a PhD candidate. Einstein demurred and suggested that Peter study with Wolfgang Pauli first. After studying at Freiburg for two years, Peter left Germany for Prague. He received his PhD in physics in 1936 under Philipp Frank at the German University in Prague. His thesis, "The Harmonic Oscillator in a Spherical Space," began his work in general relativity.

Following a strong recommendation from Frank and without knowing of his mother's earlier contact with Einstein, the 21-year-old postdoc arrived in Princeton, New Jersey, in 1936 and worked as a research assistant to Einstein at the Institute for Advanced Study until 1941. A fruit of their collaboration was their paper "On a Generalization of Kaluza's Theory of Electricity," which, unlike Theodore Kaluza's 1919 paper, ascribed physical reality to the fifth dimension. The letters between Einstein and Peter during the time they worked on their paper reveal the seminal contributions of the young physicist who was introducing a new point of view.

In 1942, when Peter was 27, his book *Introduction to the Theory of Relativity*, with a foreword by Einstein, was published. Einstein wrote: "Much