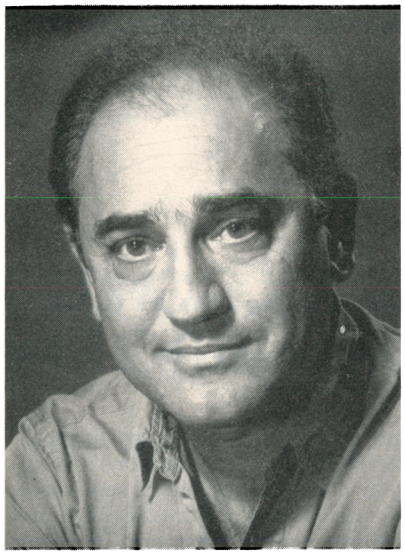
Richard R. Ernst



Alexander Pines

obtained that the muon is a heavy electron.

Telegdi also produced a precise value of the fine-structure constant by measuring the hyperfine structure of "muonium" (the bound muon–electron system). Through a series of experiments on neutral kaons, he clarified many aspects of the K_S-K_L complex. In a 1981 experiment analogous to Goldhaber's electron-neutrino experiment, Telegdi, with Laszlo Grenacs and others, measured the helicity of the ν_μ. Telegdi also established an upper limit on the magnitude of the hypothetical "second class" currents in beta decay.

Telegdi received his PhD in physics from ETH in 1950. From 1951 to 1976 he was on the physics faculty at the University of Chicago; for the last four years of that period he held the title of Enrico Fermi Distinguished Service Professor. After leaving Chicago, Telegdi became a physics professor at ETH. In 1980 he accepted an additional appointment as a visiting professor at Caltech. He retired from ETH in 1989.

Ernst dramatically increased the usefulness of nmr in 1965, when he developed, with Weston A. Anderson, the technique of Fourier-transform nmr spectroscopy. Ernst and Anderson suggested that rather than wasting time sweeping through the entire spectrum of frequencies, most of which produced no signal, one could apply a single magnetic pulse to a sample and subject the resulting data to a Fourier transform to convert them from the time domain into the frequency domain. This technique made possible nmr studies of biomolecules and low-sensitivity nuclei in liquid solutions. In the 1970s, following up on a suggestion by Jean Jeener, Ernst and his research group developed two-dimensional Fourier spectroscopy, which opened up new possibilities in molecular biology, chemistry and materials science. Kurt Wüthrich and others have applied this technique to create three-dimensional models of biomolecules in solution. Two- and three-dimensional nmr are now standard techniques for structural studies of biological macromolecules. Also in the 1970s, Ernst introduced nmr Fourier tomography, an imaging technique that became the basis for much of the magnetic resonance imaging used for medical applications.

Ernst received his PhD in physical chemistry from ETH in 1962. He worked at Varian Associates in Palo Alto, California, until 1968, when he returned to ETH as a member of the faculty. He has been a professor of physical chemistry there since 1972.

Pines, while still a graduate student at MIT with John Waugh, helped introduce high-resolution nmr of dilute spins in solids using Hartmann–Hahn cross-polarization and spin decoupling. By most accounts, the spectra of adamantane and benzene Pines and Waugh produced marked the beginning of high-resolution solid-state nmr of carbon-13 in chemistry. Today the technology they developed is widely used in commercial instrumentation for the study of spin-$\frac{1}{2}$ systems, including carbon-13, nitrogen-15, silicon-29 and phosphorus-31. In the 1970s Pines devised the theory of, and the experimental means to observe, high-multiple quantum transitions in liquid crystals and solids. According to the Wolf Foundation, this work "has led to a truly coherent picture of nuclear spin dynamics, and has opened up new exciting possibilities for studying the structures of molecules and molecular clusters in solids." In multiple-quantum nmr, the molecules in the sample coherently absorb the rf pulses in groups of up to a hundred quanta, rather than one quantum at a time. In developing the technique, Pines and his students demonstrated the selective excitation of n-quantum transitions, creating coherent superpositions of "n spins up and n spins down."

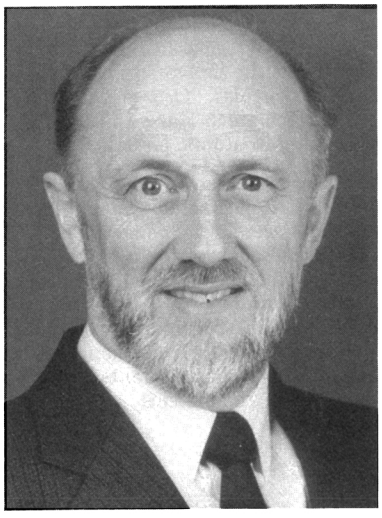
In the last few years Pines has worked on topics including iterative maps, topology and geometric phase, zero-field nmr, time reversal of spin interactions, molecular dynamics in constrained geometries, magnetic-isotope effects, optical pumping, quantum tunneling and the development of superconducting detectors. Most recently, Pines and his coworkers came up with a technique that aims to erase not only inhomogeneities in nmr due to nuclear magnetic dipole moments and anisotropic chemical shifts, but also those due to quadrupole moments. Double-rotation and dynamic-angle spinning (based on icosahedral symmetry) have made possible the use of high-resolution solid-state nmr on nonspherical nuclei, including the important isotopes oxygen-17 and aluminum-27, thereby extending the application of nmr to a wide class of materials including catalysts, minerals, semiconductors, superconductors and polymers.

Pines earned his PhD in chemical physics from MIT in 1972. Since then he has worked at Berkeley, where he is currently a professor of chemistry and a senior scientist at the Lawrence Berkeley Laboratory.

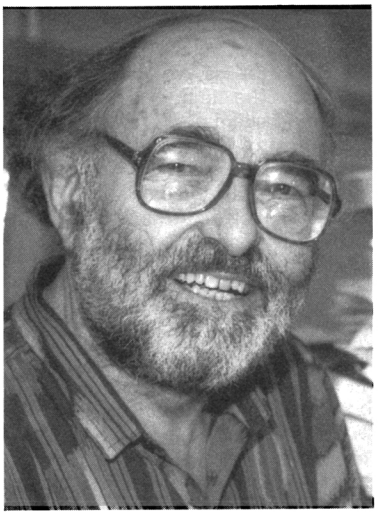
APS AWARDS HONOR OUTSTANDING CONTRIBUTIONS TO PHYSICS

At its April meeting held in Washington, DC, The American Physical Society presented awards to several individuals in recognition of their contributions to physics research, physics and society, and other areas.

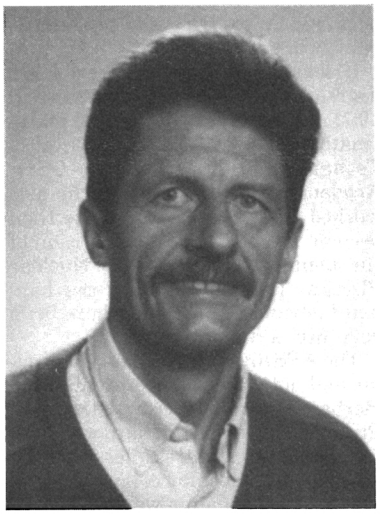
Peter J. Twin of the University of Liverpool received the Tom W. Bonner Prize for, in the words of the award citation, "the discovery and characterization of superdeformed nuclear states at very high spin. His



Peter J. Twin



Gerson Goldhaber



Francois Pierre

leadership in the development of Compton-suppressed germanium detector arrays has been a crucial factor in the development of this new area of nuclear structure." In 1986 Twin and his colleagues discovered the first high-spin band in superdeformed nuclei of dysprosium-152 in experiments at Daresbury Laboratory. More recently he has studied band twinning, the phenomenon in which bands from different nuclei have similar gamma-ray energies.

Twin studied at Liverpool, earning a BS in physics in 1957 and a PhD in nuclear physics in 1964. He then joined the Liverpool faculty, where he is currently a professor of experimental physics. From 1983 to 1987 he was head of the nuclear structure facility at Daresbury Laboratory.

Gerson Goldhaber of Lawrence Berkeley Laboratory and Francois Pierre of CEN—Saclay shared the W. K. H. Panofsky Prize for their 1976 discovery of charmed mesons. The discovery of these particles, which were predicted by the electroweak theory to cancel flavor-changing neutral currents, "furnished dramatic confirmation of the existence of charmed quarks, provided important support for the electroweak theory and elucidated the nature of the narrow resonances J/psi and psi'," the award citation said.

Goldhaber and Pierre were members of the SLAC–LBL collaboration at the SPEAR accelerator at SLAC. In early 1976 Goldhaber and Pierre analyzed the data from electron–positron annihilations at SPEAR and found evidence for the creation and decay of charmed mesons.

Goldhaber earned a MSc from the Hebrew University at Jerusalem in 1947 and a PhD in physics from the University of Wisconsin, Madison, in 1950. In 1953 he joined the faculty of the University of California, Berkeley, where he is currently a professor of physics and a faculty senior scientist at LBL.

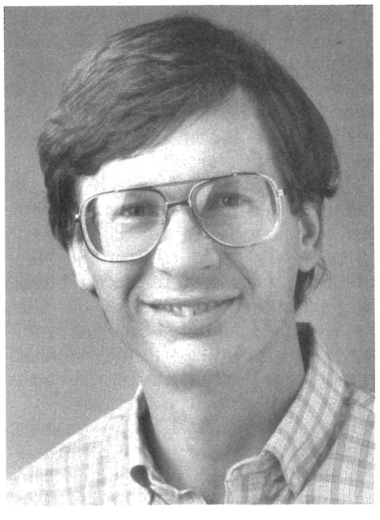
Pierre received a diploma in theoretical physics from L'Ecole Polytechnique in 1966 and a PhD in particle physics from CEN—Saclay in 1973. He has been a physicist at CEN since 1977.

APS presented the J. J. Sakurai Prize to Vladimir N. Gribov of the Landau Institute for Theoretical Physics. Gribov was cited for "his early pioneering work on the high-energy behavior of quantum field theories and his elucidating studies of the global structure of non-Abelian gauge theories." Gribov's research has included the analytic properties of amplitudes in field theory; interactions of hadrons at high energies; and the behavior of total cross sections; he

Vladimir N. Gribov

David E. Pritchard

Chris H. Greene



is currently studying the problem of quark confinement.

Gribov received an undergraduate degree from Leningrad University in 1952 and a DSc in physics and mathematics from the Leningrad Physico-Technical Institute of the USSR Academy of Sciences, where he also worked from 1959 to 1970. He then became head of the theory division of the Leningrad Institute for Nuclear Physics. In 1980 he joined the Landau Institute in Moscow, where he is currently a senior physicist.

The APS division of atomic, molecular and optical physics presented the Herbert P. Broida Prize to David E. Pritchard of MIT. Pritchard was cited for his "monumental studies of energy transfer in molecular collisions; seminal research on atom wave interferometry and atom optics; numerous studies of the forces of light on atoms and their applications to atom cooling and trapping; and the development of single-ion mass spectroscopy." (Some of Pritchard's recent work is described in the news story on page 17.)

Pritchard earned a BS from Caltech in 1962 and a PhD in physics from Harvard University in 1968. He then joined the faculty of MIT, where he is currently a professor of physics.

Chris H. Greene of the University of Colorado, Boulder, received the I. I. Rabi Prize, also given by the atomic, molecular and optical physics division. The division cited Greene for "his many contributions to atomic and molecular theory, including studies of resonance vibronic processes, multiple electron excitations, photoabsorption in external fields and threshold effects of long-range forces." Greene has also worked on electron correlations in atoms and small molecules.

Greene earned a BS from the University of Nebraska in 1976 and an MS and a PhD in physics from the University of Chicago in 1977 and 1980, respectively. From 1981 to 1988 he was on the faculty of Louisiana State University. Since 1989 he has been a professor of physics at the University of Colorado.

The Award for Research in an Undergraduate Institution went this year to Larry R. Hunter of Amherst College. APS cited Hunter for "his outstanding research in atomic physics, particularly his search for the electric dipole moment of the electron, and for his enthusiastic inclusion of undergraduate students at Amherst College in his research program."

Hunter earned a PhD in physics from the University of California, Berkeley, in 1981. He joined the Amherst faculty in 1983 and is now an associate professor of physics.

For his "lifelong effort to stimulate public awareness of the beauty of science and the dangers of its abuses," Victor Weisskopf of MIT received the Forum Award from the APS Forum on Physics and Society. Weisskopf, a particle physicist, has for many years advocated nuclear arms control, and more recently he has been involved in environmental issues.

Weisskopf earned a PhD in physics from the University of Göttingen in 1931. He served on the University of Rochester faculty from 1937 to 1943, and he was a group leader on the Manhattan Project from 1943 to 1946. He then joined MIT, where he is now a professor of physics emeritus. From 1961 to 1965 he served as director-general of CERN.

For "leading and greatly strengthening the Congressional Office of Technology Assessment," John H. Gibbons, the director of OTA, was given the Leo Szilard Award of the Forum on Physics and Society. The award citation said that under Gibbons's leadership, the OTA has become "an institution that has produced balanced, thoughtful and influential assessments of public policy issues dealing with science and technology." (An article on energy policy by Gibbons begins on page 22.)

Gibbons received a PhD in physics from Duke University in 1954. From 1954 to 1975 he was a physicist at Oak Ridge National Laboratory, and from 1975 to 1979 he was a professor of physics at the University of Tennessee. He became head of OTA in 1979.

In addition to the prizes described above, APS presented the 1991 Julius Edgar Lilienfeld Prize to Daniel Kleppner of MIT at the April meeting (see PHYSICS TODAY, April, page 123).

IN BRIEF

Thomas Hemmick, Chris Jacobsen, Chang Kee Jung, Mohammad M. Mohammadi and **Luis Orozco** recently became assistant professors of physics at the State University of New York at Stony Brook. Hemmick, an experimenter working with relativistic heavy ions, was most recently an associate research physicist at Yale University. Jacobsen, who does synchrotron x-ray physics, was formerly a postdoc at SUNY Stony Brook and at the Lawrence Berkeley Laboratory. Jung, a high-energy-physics experimenter, came to Stony Brook from the Stanford Linear Accelerator Center, where he was a postgraduate research physicist. Mohammadi, also an experimenter working in high-energy physics, was most recently an assistant research physicist at the University of California, Los Angeles. Orozco was a research associate at Harvard University working in atomic physics.

J. Murray Gibson, until recently head of the electronic and photonic materials research department at AT&T Bell Laboratories, is now on the faculty of the University of Illinois at Urbana–Champaign. Gibson, whose research is in transmission electron microscopy and surface science, is a professor in the departments of materials science and physics.

OBITUARIES

Howel G. Pugh

Howel G. Pugh died suddenly on 7 November 1989 of complications arising from leukemia. His death marked the end of a distinguished career in nuclear physics, the depth and breadth of which can be seen from the nearly eighty publications that bear his name. Despite his illness, he remained active in the field until almost the hour of his death.

Howel was born in 1933 in Wales, and received both his undergraduate and graduate degrees from the University of Cambridge. Among his early experiments, begun at Harwell and continued at Lawrence Berkeley Laboratory and the University of Maryland, were his pioneering studies of reactions involving the direct knockout of particles (primarily protons and alphas) from the nucleus. This work included a set of collateral experiments on scattering from few-nucleon systems, designed to facilitate an understanding of the reaction mechanism that would make possible the extraction of spectroscopic information. During this period Howel also examined the effects of exchange and spin–orbit potentials in α–α and α–^{3}He scattering and searched for double-spectator processes in d–d scattering.

While at Maryland, where he rose to the rank of full professor, Howel took a sabbatical year in 1973 to participate in experiments on inclusive reactions done at the Intersecting Storage Rings at CERN. He was among the first to realize the usefulness of high-energy heavy-ion collisions, and he attempted at that time to interest CERN in accelerating alpha particles in the ISR (which would produce collisions at a lab energy equivalent to 500 GeV/nucleon); the same interest later led him to co-author a proposal to DOE for an