APS PRIZES MARK TOP PHYSICS ACHIEVEMENTS

Each year The American Physical Society acknowledges outstanding work by presenting a number of prizes and awards. The following individuals were among those who received prizes and awards in 1989 and 1990.

At the APS spring meeting in Washington, DC, the 1990 Tom W. Bonner Prize in nuclear physics was given to Vernon W. Hughes of Yale University. Hughes received the prize in recognition of his "many contributions to fundamental measurements of electroweak and strong interactions . . . in particular his early recognition of the importance of high-energy polarized electron beams and his role in the measurement of the spin-dependent electroweak structure functions of the nucleon."

Hughes earned his PhD in physics from Columbia University in 1950. Since 1954 he has been on faculty at Yale, where he is currently Sterling Professor of Physics.

David J. Wineland of the National Institute of Standards and Technology was this year's recipient of the Davisson–Germer Prize in atomic or surface physics. He received the prize at the spring meeting for his "outstanding contributions to research on trapped ions." Wineland was a member of one of two groups that first demonstrated laser cooling of atomic particles. In subsequent work, Wineland and his group at NIST perfected methods that have "led to the highest resolution radio frequency and optical spectroscopy of any atomic system," and also made "insightful observations of crystallization of strongly coupled plasmas," the award citation said.

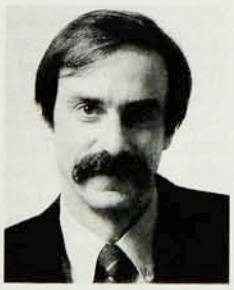
In 1970 Wineland earned his PhD in physics from Harvard University. In 1975 he joined NIST (at that time the National Bureau of Standards), where he is currently project leader for the ion storage group.

This year's Dannie Heineman Prize for Mathematical Physics, which is administered jointly by APS and the American Institute of Physics, was presented to Yakov Sinai of the L. D. Landau Institute for Theoretical Physics in Moscow. Sinai was cited for his "discoveries of new concepts and his proofs of deep mathematical theorems that have become central to our understanding of both dynamical systems and the foundations of statistical mechanics." Sinai has contributed to the theories of quantum chaos, chaos in plasmas and general features of nonlinear systems.

Sinai earned his doctorate in mathematics in 1960 from Moscow State University. Since 1971 he has been a researcher at the Landau Institute and a professor at Moscow State University.

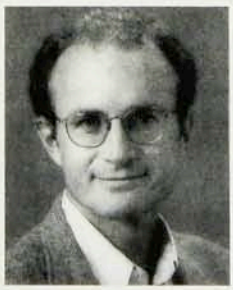
The 1990 W. K. H. Panofsky Prize in experimental particle physics, presented at the spring meeting, went to Michael S. Witherell of the University of California, Santa Barbara. Witherell was chosen for his leadership and analysis that led to "the observation and measurement of an unprecedented number of charmed particles generated via the photo-production process." He contributed to studies of numerous processes involving the pro-

Vernon W. Hughes



David J. Wineland

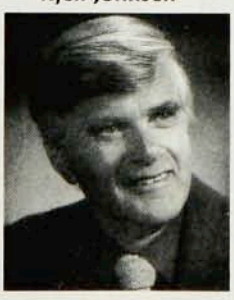
Yakov Sinai



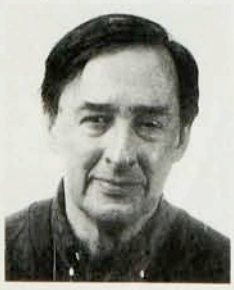
Michael S. Witherell

Toichiro Kinoshita

Arthur V. Phelps

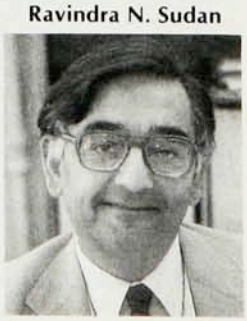


Kjell Johnsen



John L. Lumley

William M. Willmarth



Ravindra N. Sudan

duction and decay of particles carrying the charmed quark.

After receiving his doctorate in physics from the University of Michigan in 1973, Witherell joined the physics faculty at Princeton University. In 1981 he joined the faculty at Santa Barbara, and he became a professor of physics there in 1986.

Also at the spring meeting, Toichiro Kinoshita of Cornell University accepted the 1990 J. J. Sakurai Prize for theoretical particle physics. The citation notes Kinoshita's "theoretical contributions to precision tests of quantum electrodynamics and the electroweak theory, especially his pioneering work on the computation of the lepton anomalous magnetic moments." His theoretical work on the electron anomalous magnetic moment, together with measurements carried out by Hans Dehmelt and his collaborators, provide the most precise value of the fine-structure constant α available at present.

Kinoshita received his PhD in physics from the University of Tokyo in 1952. He joined the Cornell faculty in 1955 and became a professor of theoretical physics in 1964.

This year's Robert R. Wilson Prize for achievement in the physics of particle accelerators went to Kjell Johnsen, formerly a senior physicist at CERN. He was given the prize at the spring meeting for his "seminal contributions to the physics, design, construction and performance of the CERN proton intersecting storage rings," which opened "new frontiers in particle physics." The storage ring device that Johnsen worked on at CERN, a high-energy hadron collider, became a model for some larger machines that are now in operation, the citation said.

Johnsen received his PhD in electrical engineering from the Technical University of Norway in 1954. In 1959 he joined CERN, where he remained until retiring in 1986.

Arthur V. Phelps of the Joint Institute for Laboratory Astrophysics is the first recipient of the Will Allis Prize, given out by the APS division of atomic, molecular and optical physics in honor of Allis, a pioneer in ionized-gas research. The $5000 award, presented biennially, was established last year to recognize and encourage outstanding research into the microscopic and macroscopic behavior of ionized gases (see PHYSICS TODAY, August 1989, page 79).

Phelps received the Allis Prize at the division's May meeting in Monterey, California. The division cited Phelps for his "leadership in the field of gaseous electronics, as evidenced by [his] definitive pioneering studies of electron, ion and atomic collision processes, calculations of electron transport and energy flow in ionized gases, and applications to newly developing technology areas such as gas lasers."

From 1947 to 1951 Phelps was a graduate student at MIT and worked with the microwave gas discharge group, which was led by Allis and S. C. Brown. After receiving his PhD in physics in 1951, Phelps went to work for Westinghouse Corporation. From 1970 to 1988 he was a senior research scientist at the National Institute of Standards and Technology. He is currently a fellow of the Joint Institute for Laboratory Astrophysics, which is cosponsored by NIST and the University of Colorado, Boulder.

The 1990 Fluid Dynamics Prize, administered by the APS division of fluid dynamics, will be awarded at the division's November meeting to John L. Lumley of Cornell University. Lumley is being cited for his "outstanding contributions to the understanding of turbulent flow, in particular, the fundamental structure of turbulent shear flows, the effects of drag-reducing additives . . . and the statistical theory of turbulence." Lumley is also being recognized for his leadership in the international fluid dynamics community.

Lumley earned his PhD in aeronautics from the Johns Hopkins University in 1957. From 1959 to 1977 he was an aerospace engineering professor at Pennsylvania State University. Since 1977 he has been the Willis H. Carrier Professor of Engineering at Cornell.

Last year's Fluid Dynamics Prize went to William W. Willmarth of the University of Michigan. He was chosen for contributing to the understanding of bounded turbulent flow through the design, execution and analysis of turbulent structure experiments, and for developing novel instrumentation and measurement techniques.

Willmarth received his PhD in aeronautical engineering from Caltech in 1954. He has been a professor of aeronautical engineering at the University of Michigan since 1958.

At its November 1989 meeting in Anaheim, California, the APS division of plasma physics presented the James Clerk Maxwell Prize for Plasma Physics to Ravindra N. Sudan of Cornell University. Sudan received the prize for his "wide-ranging contributions to the theory of plasma stability and turbulence, and pioneering work on the generation and propagation of intense ion beams," which have had "considerable impact on ionospheric and magnetospheric physics, on confinement and heating in field-reversed ion rings, and on light-ion-beam drivers for inertial confinement fusion."

Sudan received his PhD in electrical engineering from Imperial College of the University of London in 1955. He joined the Cornell faculty in 1959 and became director of the Laboratory of Plasma Studies and IBM Professor of Engineering in 1975.

Jacob J. Leventhal, a professor of physics at the University of Missouri, St. Louis, received the 1990 APS Award to a Faculty Member for Research in an Undergraduate Institution, which was presented at the spring meeting. Leventhal was cited for his "studies of energy transfer in atomic collisions, for his research on photoionization processes in atoms and molecules, and for his long-term involvement of undergraduate students in his research program." Leventhal received his PhD in physics from the University of Florida in 1965. He joined the University of Missouri faculty in 1968.

The 1990 Dissertation Award in Nuclear Physics, given every other year to a recent PhD recipient in nuclear physics, went to Michael J. Musolf, a postdoctoral fellow at MIT. The citation accompanying the award, which was presented at the spring meeting, acknowledged Musolf's "calculation of the electroweak corrections to low-energy parity-violating neutral-current interactions," which help explain electroweak observables and the radiative corrections to them—"in particular the nature of parity-violating effects in electron and neutrino scattering from nucleons and nuclei." Musolf did his graduate work at Princeton University and received his PhD last year.

The 1990 Forum Award for Promoting Public Understanding of the Relationship of Physics to Society, which is administered by the APS Forum on Physics and Society, was presented at the APS spring meeting to Richard Wilson, a physics professor at Harvard University. Wilson was recognized for his "outstanding research and promotion of public understanding on a broad spectrum of issues dealing with physics, the environment and public health, including his work in reactor safety, estimation of hazards posed by environmental pollution, and pioneering use of comparative risk analysis." Wilson earned his doctorate in physics from Oxford University in 1949. He joined the Harvard physics department in 1955.

The 1990 Leo Szilard Award for

Physics in the Public Interest, also administered by the Forum on Physics and Society, was presented at the spring meeting to Theodore A. Postol of MIT. Postol was chosen for his "incisive technical analysis of national security issues that has been vital for informing the public policy debate, especially with regard to basing modes for ballistic missiles, survivability of submarines, effects of nuclear war, effectiveness of tactical ballistic missiles and implications of accidental launch protection systems." Postol received his doctorate in nuclear engineering in 1975 from MIT, where he is now a professor of science, technology and national security policy.

At its November meeting, the APS division of fluid dynamics will present its 1990 Otto Laporte Award for fluid dynamics to Tony Maxworthy, the Smith International Professor of Mechanical Engineering and a professor of aerospace engineering at the University of Southern California. The award acknowledges Maxworthy's "many contributions to fluid dynamics, especially to the understanding of geophysical flow phenomena gained from simple elegant experiments on rotating and stratified fluids, including studies of vortices, waves, bubbles, turbulence, flow over bottom topography, gravity currents, the motion of bodies and convection." Maxworthy received his PhD in mechanical engineering from Harvard in 1960. In 1967 he joined the faculty of the University of Southern California.

The 1989 Laporte Award went to Chia-Shun Yih, the Stephan P. Timonshenko University Professor of Fluid Mechanics at the University of Michigan. Yih was cited for his contributions to "the understanding of the physics of fluid motions, especially flows of nonhomogeneous and rotating fluids, plume flows with mass–energy diffusion, hydrodynamic stability theory, and linear and nonlinear dispersive waves." He received his PhD in fluid mechanics from the University of Iowa in 1948 and has been on the University of Michigan faculty since 1956.

Last November the APS division of plasma physics awarded the 1989 Excellence in Plasma Physics Research Award to Donald A. Gurnett of the University of Iowa. Gurnett was cited for his "experimental study in space of virtually all the waves known to plasma physics, with special emphasis on planetary radio emissions, as exemplified by his recent research on plasma waves at Uranus (1986), Comet Giacobini–Zinner (1985) and the artificial comet AMPTE (1984)." Gurnett received his physics PhD in

1965 from the University of Iowa, where he is now a professor of physics.

The 1989 Simon Ramo Award, also presented by the APS divison of plasma physics, went to Jon M. McChesney, a senior scientist with General Atomics of San Diego, California, a company involved in basic fusion research and conventional nuclear power. The award, which is given for work performed as part of the recipient's doctoral studies, was presented to McChesney for his "sophisticated measurements showing anomalous ion heating in a tokamak and . . . subsequent explanation in terms of chaos theory, thus demonstrating the relevance of basic research to the fusion effort." McChesney received his PhD in applied physics from Caltech in 1989.

The 1989 Shock Compression Science Award, given every other year by the APS topical group on shock compression of condensed matter physics, was presented to George E. Duvall, a professor of physics at Washington State University. Duvall was recognized for his "outstanding contributions to shock wave physics and his educational and organizational leadership in the shock physics community." Duvall received his physics PhD from MIT in 1948. After holding research positions with General Electric Corporation and Stanford Research Institute, Duvall joined the Washington State faculty in 1964.

IN BRIEF

Michael Stavola has become an associate professor in the physics department of Lehigh University in Bethlehem, Pennsylvania, and **Alan Streater** and **Michelle S. Malcuit** have been appointed assistant professors in the same department. Stavola, who was formerly on the technical staff at AT&T Bell Laboratories, studies the physics of defects in semiconductors. Streater, an atomic and molecular physicist, was previously an assistant professor at Southern Oregon State College. Malcuit, a specialist in nonlinear optics, was most recently a research associate at the Institute of Optics of the University of Rochester.

OBITUARIES

Ernst Ruska

In the 1980s the science community witnessed the semicentennial of the electron microscope, the 80th birthday of its designer, Ernst Ruska, the awarding of his Nobel Prize and, sadly, the reason for these lines, his death on 27 May 1988.

Ruska was born on Christmas Day into a scholarly family—his father was a historian of science and an uncle was an astronomer. His interest in technical subjects led him to study engineering at technical colleges in Munich and Berlin instead of attending a university, even though the latter was in those days regarded as far more prestigious. At the Berlin Technische Hochschule, as part of Max Knoll's project for improving the design of cathode-ray oscillographs, Ruska examined the lens-like behavior of a short coil. Building on the electron-lens work of Hans Busch, Ruska realized that he could focus the electrons with a smaller current if he enclosed the coil in an iron casing in which a narrow gap had been cut. The gap, he reasoned, would allow the field to "leak" into the path of the particles. This idea, which was a crucial step on the road to the electron microscope, led Ruska to construct the first magnetic electron lens to be recognized as such. His lens was much more than a prototype, for although modern versions are made of more homogeneous metal, are machined more accurately and include complex mechanisms for correcting astigmatism and for introducing a specimen or an aperture, the basic design has remained unchanged. Together with his friend and fellow PhD student Bodo von Borries (who later became Ruska's brother-in-law), Ruska patented the *Polschuhlinse* (polepiece lens) in 1932. In 1931 Ruska placed two lenses one above the other and showed that their magnifications (3.6× and 4.8×) multiplied to give an overall value of about 17.3. The first primitive electron microscope had been built.

Support for further development of the microscope was difficult to obtain in the 1930s, not only because of the economic conditions of the time but also because many scientists believed that no specimen could survive inspection by such a device: Placed in a vacuum, bombarded and rapidly heated by electrons, the sample would be burnt to a cinder before any useful information could be gained. In a letter of 8 January 1935, the editor of *Die Naturwissenschaften* unequivocally rejected a paper containing the first electron micrographs of untreated biological specimens. "Reproduction of electron-microscope magnifications," he wrote, "would serve no useful purpose. . . . I am thus unable to make any use of your MS." It was some time before researchers realized that scattering within the specimen is sufficient for image formation (by phase contrast) and that absorption is not necessary. In 1937, however, Ruska and von Borries succeeded in obtaining support from the Siemens Company in Berlin. Two prototypes were ready the following year and a year after that Siemens delivered the first of about 30 commercial versions of the electron microscope.

Ruska and his colleagues spent the immediate postwar years preparing for a new generation of microscopes. In 1954, the Elmiskop-I appeared. (I have no doubt that some readers of this account are still using theirs, though spare parts have become a problem.) This robust instrument was considerably superior to the 1939 microscope: a higher accelerating voltage, a double condenser for illumination control, a device to correct astigmatism, and good stability made it a desirable tool in physics and biology. From 1949 onward, Ruska spent at least part of his time in the Fritz Haber Institute of the Max Planck Society in West Berlin. In 1955 he left Siemens, and from 1957 until 1974 he directed the Electron Microscope Institute of the FHI.

Ruska was a man of method, who kept detailed records of his research activities going back to his student days, and he devoted much of his time in the last years of his life to tracing the early history of the electron microscope. He was naturally sensitive about the fact that the first patent for an electron microscope was taken out not by Knoll, von Borries or himself, but by Reinhold Rüdenberg of Siemens-Schuckert-Werke AG, whose

Ernst Ruska