

In Brief **FREE**



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WE HEAR THAT

National Academy Adds New Members

The National Academy of Engineering has elected 60 new members and 15 foreign associates. Among the new members are the following, working in physics-related fields:

Alexei Abrikosov, a Distinguished Argonne Scientist and leader of the condensed matter theory group at Argonne National Laboratory.

Roger Angel, a Regents Professor at the University of Arizona's Steward Observatory.

Marsha Berger, a professor of computer science and mathematics and associate director of the Courant Institute of Mathematical Sciences at New York University.

Howard Brenner, the Willard H. Dow Professor in MIT's department of chemical engineering.

Robert Byer, a professor of applied physics and director of the Center for Nonlinear Optical Materials at Stanford University.

Moses Chan, the Evan Pugh Professor of Physics at the Pennsylvania State University.

Rita Colwell, director of the National Science Foundation.

Eric Cornell, a senior scientist at the National Institute of Standards and Technology in Boulder, Colorado, and a fellow of JILA and a professor adjunct at the University of Colorado at Boulder.

Francis Dahlen Jr., a professor of geophysics at Princeton University.

Kenneth Eisenthal, a professor of chemistry at Columbia University.

Jean Fréchet, a professor of chemistry at the University of California, Berkeley.

Martha Haynes, a professor of astronomy at Cornell University.

Arthur Jaffe, the Landon T. Clay Professor of Mathematics and Theoretical Science at Harvard University.

William Jury, a professor of soil physics at the University of California, Riverside.

James Kennett, a professor of geological sciences at the University of California, Santa Barbara.

Robert Kraichnan, president and principal investigator of Robert H. Kraichnan Inc, Santa Fe, New Mexico.

Roderick MacKinnon, a professor of neurobiology and biophysics at Rockefeller University and an investigator at the Howard Hughes Med-

ical Institute.

David Nygren, a distinguished scientist at Lawrence Berkeley National Laboratory.

George Papanicolaou, the Robert Grimmett Professor of Mathematics at Stanford University.

Walter Pitman III, an adjunct professor at Columbia University's Lamont-Doherty Earth Observatory.

Akkihebal Ravishankara, program leader of the atmospheric chemical kinetics group at the National Oceanic and Atmospheric Administration.

Douglas Rees, a professor of chemistry at Caltech and an investigator at the Howard Hughes Medical Institute.

Sean Solomon, director of the department of terrestrial magnetism at the Carnegie Institution of Washington.

Leonard Susskind, a professor of physics at Stanford University.

Rainer Weiss, a professor of physics at MIT.

The newly elected foreign associates include the following:

Reinhard Genzel, director of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany.

Roddam Narasimha, director of the National Institute of Advanced Studies and ISRO K. R. Ramanathan Distinguished Professor at the Indian Institute of Science and Jawaharlal Nehru Center for Advanced Scientific Research in Bangalore, India.

A. M. Celal Sengor, a professor of geology at Istanbul Technical University, Turkey.

Nicholas Shackleton, an ad hominem professor of earth sciences at the University of Cambridge and director of the Godwin Institute for Quaternary Research in Cambridge, UK.

Akira Tonomura, senior chief research scientist at Hitachi Ltd's Advanced Research Laboratory in Hatoyama, Japan.

Martinus Veltman, the MacArthur Professor of Theoretical Physics emeritus at the University of Michigan.

IN BRIEF

Last month, **Jacques Vanier** received the 1999 IEEE Instrumentation and Measurement Society Award for technical achievement. An associate professor of physics at the University of Montreal, he was cited for "outstanding contributions to and leadership in the science of metrology

and for dedication to the Instrumentation and Measurement Society."

Among the ten inductees into the National Inventors Hall of Fame last September were **Gerhard M. Sessler** and **James E. West**. They were honored for their work at Bell Laboratories in the 1960s in developing the foil electret microphone.

Larry Smarr is leaving the University of Illinois at Urbana-Champaign this month to become a professor of computer science and engineering at the University of California, San Diego. Smarr was the founding director of both the National Center for Supercomputing Applications and the National Computational Science Alliance.

At the International Conference on Plasma Science in New Orleans last month, **Melissa Douglas** received the 1999 Early Achievement Award from the Nuclear and Plasma Sciences Society of the Institute of Electrical and Electronic Engineers. A researcher at Sandia National Laboratory, she was recognized for her computer simulations that help design the targets of Sandia's Z machine.

Gordon Cates will be leaving Princeton University for the University of Virginia, where, in September, he will begin a joint appointment in the physics department and the medical school.

Michael Riordan and **Lillian H. Hoddeson** have been awarded the Sally Hacker Prize by the Society for the History of Technology for their book, *Crystal Fire: The Birth of the Information Age* (Norton, 1997). Riordan, a 1999–2000 Guggenheim fellow, is a physicist at the Stanford Linear Accelerator Center and an adjunct professor of physics at the University of California, Santa Cruz. Hoddeson, a 2000–01 Guggenheim fellow, is a professor of history and a senior researcher in physics at the University of Illinois at Urbana-Champaign, as well as the Fermilab historian.

In April, **Bill Appleton**, former deputy director for science and technology at Oak Ridge National Laboratory, became the director of Harvard University's Center for Imaging and Mesoscale Structures.

Duncan T. Moore, White House adviser on technology policy and former president of the Optical Soci-

ety of America, received the 2000 National Engineering Award from the American Association of Engineering Societies. Moore was cited “for his multiple contributions in education, industry, and government.”

The UK’s Royal Astronomical Society honored **Patrick Moore** with a special Millennial Award in recognition of his unique contribution to astronomy. Moore has presented “The Sky at Night” on BBC television every month since 1957.

Paul Alivisatos, a professor of chemistry and of materials science and mineral engineering at the University of California, Berkeley, has

been appointed editor of *Nano Letters*, a new journal of the American Chemical Society.

Vigdor Teplitz, a professor of physics at Southern Methodist University, has been named a senior policy analyst with the White House Office of Science and Technology Policy.

Keith Schwab has been named the fourth annual Michelson Postdoctoral Prize Lecturer at Case Western Reserve University. He is currently a senior scientist at the National Security Agency’s Laboratory for Physical Sciences at the University of Maryland. The lectureship is awarded annually to a junior scientist in any field of physics.

OBITUARIES

Fredrik Zachariassen

Fredrik Zachariassen, an internationally known theoretical physicist, died suddenly of a heart attack on 9 December 1999 in Pasadena, California.

Fred was born on 14 June 1931 in Chicago. Admitted to an experimental educational program for gifted students at the University of Chicago, he earned his high school diploma in 1948, his BPhil in 1950 and his BS in physics in 1951. Fred’s choice of career was no doubt influenced by his father, William H. Zachariassen, who was an internationally known physicist and a dominant figure in the Chicago physics department. Fred received his PhD in physics from Caltech in 1956.

Fred’s academic career began with postdoctoral appointments of a year each at MIT, the University of California, Berkeley, and Stanford University. In 1958 he was appointed an assistant professor at Stanford, and in 1960 he accepted a faculty appointment at Caltech. In September 1999 Fred retired from his position as a Caltech physics professor after 39 years of service, and was named professor emeritus.

Fred always required that physics be fun. By that he meant that a problem should be interesting, important, and relevant to experiment and that it have a reasonable chance of being solved. He often constructed simple models that contained the essence of the physics, unencumbered by the complicated mathematical details of the actual problem. Because he was very bright, was a powerful and accurate calculator, and possessed outstanding communication skills, Fred



FREDRIK ZACHARIASSEN

was a valuable collaborator; much of his work was with others.

Fred’s early work involved the use of photons to probe the strong interaction through form factors, meson production, and the role of the π - π interaction in these processes. Much of this work was in collaboration with Sid Drell. This period also marked the beginning of Fred’s collaboration with Marshall Baker, a collaboration that lasted for 40 years.

After Murray Gell-Mann joined the Caltech faculty, he became one of Fred’s frequent collaborators. At the time, Regge poles and trajectory were of great interest, but their existence was based on nonrelativistic quantum mechanics. In an important series of papers, Fred and his colleagues Gell-Mann, Marvin Goldberger, and Francis Low showed that conventional field theory produced Regge poles.

By the late 1960s, particle theo-

rists had accepted the fact that small momentum transfer processes dominated particle production, but no one had managed to figure out the kinematics that would make this possible. Fred and George Zweig showed that the particles produced had to obey an ordering in longitudinal momentum known as strong ordering. These ideas were quickly incorporated into what became the multiperipheral model, which demonstrated that the uniform distribution in rapidity is simply the result of the strong ordering requirement. Fred used to joke that his reason for collaborating with Zweig and his earlier collaboration with Charles Zemach were so that he could be the first author on at least some of his papers.

In the early 1970s, when the Fermilab accelerator and CERN’s Intersecting Storage Rings began to provide data on diffractive phenomena in proton-proton scattering, Fred directed his efforts toward finding a generalization of the idea that diffraction was described by a single Regge pole. In a paper with Jerry Finkelstein and in a series of papers with James Ball, several models were developed that related particle production to diffraction in a manner consistent with basic principles.

After the invention of quantum chromodynamics (QCD) in the early 1970s, Fred began a study of its long-range behavior. Because perturbative methods could not be used in this region, Fred, working with Marshall Baker and James Ball in a collaboration known as BBZ, used a non-perturbative approach with the Schwinger-Dyson equation providing the dynamics. This technique was used in a series of papers to determine the long-range behavior of the quark-antiquark potential. In this picture, QCD at long distances behaves like a dual superconductor. This feature led to calculations of the properties of flux tubes connecting quark-antiquark pairs, the detailed spin- and momentum-dependent potentials between quarks, and predictions for states formed of heavy quark-antiquark pairs.

In spite of the fact that there were few other analytic models of long-distance QCD, the work of BBZ and the importance of understanding confinement were not generally recognized. But in the past five years, two recent developments have revived interest. First, Nathan Seiberg and Edward Witten inferred that dual superconductivity occurs in certain supersymmetric versions of QCD. Second, lattice gauge theory became