Physics News in 1997 Debuts with a New Format

Physics News in 1997, a summary of the previous year's research highlights, appears for the fifth consecutive year as a special section in this issue of APS News, this time in a new format (see insert). The review covers important research highlights of 1997. Highlights in physics and government, physics history, and physics education are also covered. Edited by Phillip Schewe and Ben Stein of the American Institute of Physics (AIP) Public Information Division, the report is published by the APS as a service to its members.

The APS has prepared this end-of-year review for the last 28 years, with the aim of informing science journalists and others of important research in a timely fashion. The text traditionally consisted of articles prepared by various APS divisions and by some of APS's other member societies, published in a full-color booklet. However, in an effort to streamline the process, the text now consists mostly of selected articles from APS's weekly one-page newsletter, Physics News Update. Many of the items will have appeared also in the Physics News section of Physics Today, with some editorial changes. Now, an article can appear in the print version appearing in this issue of APS News.

Physics News Update was also created to provide science writers with brief summaries of breaking news of significant physics research, especially in recent and upcoming issues of Physical Review Letters, according to Schewe. APS members can learn about physics research news throughout the year by obtaining a free e-mail subscription to Update. To subscribe, send an e-mail message to lister@aps.org. Leave the subject line blank and in the body of the letter specify "add physicsnews" to subscribe or "delete physicsnews" to cancel. Members can also view the current Update and all past Updates, and have the use of a searchable seven-year archive, by going to this web address: www.aps.org/physics/updates.

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Blume Guides APS Journals Into Electronic Age

A little more than one year ago

Dr. Martin Ginsberg was an advisor to APS News, and

It is now 1999, and what has been accomplished in the last year as a research associate at AERE is astonishing. With his PhD in physics from Harvard University in 1959 and subsequent years as a research associate at AERE, he is now able to lead him to pursue graduate studies. Blume received his PhD in physics from Harvard University in 1979 and spent two years as a research associate at AERE before becoming deputy divisional director before becoming deputy director in 1984. From 1972 to 1980 he was also a professor of physics at SL-Stony Brook.

Blume's research interests include theoretical solid state physics, magneto- transistors, neutron scattering and synchrotron radiation. His extensive services include stunts as chair of the Physical Review, as an outstanding and dedicated staff of editors. "I think as long as we have people like this around, the future of our journals is secure," he said.

What is the APS doing to encourage more use of the electronic versions of its journals? What are some of the advantages to be gained?

Physicists can now take advantage of the low cost personal subscriptions offered to our membership, or may gain access to journals through their institutions to all print journals to which the institutions subscribe. We also set up a "free fence," where visitors to our electronic journals can view the front page and the table of contents for any issue. We also revised the business plan for the electronic journals. Early on, we met with the pricing subcommittee, asking to make the electronic versions of the journals available to institutional subscribers at no extra charge. The rationale is that it encourages people to use the electronic format and become accustomed to it. We also made available at no charge without a subscription. This gives some valuable information away, but for the APS it is appropriate. It's a teaser, in a marketing approach. You show people a little bit, and if they find it interesting, they will want more, whether they have subscribed. If you don't have a subscription, you would still be able to download an article for a minimal fee.

What must be done in order to reach the goal of producing the electronic versions first?

The present situation in publishing can be compared to the revolution in personal transportation that took place in the 50 years after the founding of the Internal Combustion. The horse and buggy is gradually replaced with the automobile. Our publishing situation is at the stage where the horse and buggy is being replaced with the automobile, but with an automobile that is much like a buggy with annular combustion engine. Only when the automobile was advanced from the gas engine, without touching it on the buggy, did it reach its full potential.

In other words, we have to modify the refereeing process as well. The APS must move as quickly as possible to adopt new ways of working, but should not abandon its own strengths. Peer re- view is essential, but we can enhance the process and make it more effective by using electronic tools. We've been working hard on getting more authors to submit their articles elec- tronically, and we are just beginning to make the refereeing process electronic. In the new system, referees will download entire articles for review, either off an e-print server or off our own internal server.

Do you foresee a time when electronic versions will completely replace printed versions?

No. We must continue to put out the print version, because print provides the only archival medium now recognized as permanent, and because many physicists still prefer to read something on a screen. We can visualize a future in which print distribution disappears, but it's very hard to visualize in which print versions disappear completely. That of course significantly lowers costs, because you don't have any of the shipping costs. With paper copy, electronic versions would still be able to download and print their own journals from the electronic versions.

Q What is the reason that you have not yet decided to have an electronic test version available to a limited number of people?

The Department of Energy cancelled its subscriptions for Physical Review; it's a subscription program, who reserves access to the journals, but by the controller's office, which desires to cut costs. Naturally, they were quite concerned about this. So we are now in a six-month agreement to make available just an electronic subscription of the journals to DOE. Unfortunately, people who program can use it. This is essentially a test run to determine how well the electronic versions are utilized. In the long run, we will be able to provide and Technical Information is interested in the possibility of a large-scale subscription that would cover all of their institutions, not just DOE headwaters. The winning papers would still be able to download and print their own journals from the electronic versions.

Q What is the APS doing in terms of electronic archival storage for its journals?

Q The substantial growth rate of the APS's journals has been accomplished in the last year as a research associate at AERE. Is this exponential rate of growth continuing?

A It seems to be slowing down right now, but there have always been some fluctuations. The number of manuscripts submitted has grown at an annualized 6% per year for a number of years. This rate was probably higher than that. On the other hand, this puts tremendous pressure on our editorial staff, causing us to raise prices occasionally to cover costs. We've been looking at raising our prices at just about 3% right now, as we try to cut back by applying more stringent stand- ards. However, it takes more effort to reject a paper than to publish it.

Continued on page 7.
Physicists to be Honored at the Joint APS/AAPT Spring 1998 Meeting

Sixteen APS prizes and awards will be presented during a special ceremonial session at the Society’s general meeting in Columbia, Missouri, 18-21 April 1998, held in conjunction with the American Association of Physics Teachers. Citations and biographical information for each recipient follows.

1998 HANS A. BETHE PRIZE

Established in 1997, the Bethe Prize is intended to recognize outstanding work in theory, experiment or observation in the areas of astrophysics, nuclear physics, atomic physics, or condensed matter.

John Babbitt Institute for Advanced Study

Citation: “For his fundamental work on all theoretical aspects of the solar neutrino problem and his important contributions to other areas of nuclear astrophysics.”

Babbitt received his PhD from Harvard University in 1961. He was on the faculty of California Institute of Technology and has been a faculty member of the Institute for Advanced Study, Princeton, since 1971. His areas of expertise include models of the solar interior, atomic and molecular physics, stellar structure, and emission and absorption lines. In collaboration with Raymond Davis Jr., he proposed in 1960 that neutrinos from the sun could be detected via a practical chlorine detector. In the subsequent three decades, he has refined theoretical predictions and interpretations of solar neutrino data. Babbitt has served as the 1997 Heineman Prize recipient for the American Astronomical Society and the American Institute of Physics for his work on solar neutrinos.

1998 TOM W. BONNER PRIZE

The Tom W. Bonner Prize was established in 1964 to recognize and encourage outstanding experimental research in nuclear physics, including the development of a method, technique, or device that significantly advances nuclear physics, including the development of a method, technique, or device that significantly advances high-energy nuclear physics.

Joel M. Moss Los Alamos National Laboratory

Citation: “For his pioneering experiments using dimuon production in proton-nucleus interactions which demonstrate that there is no unique enhancement in nuclei, and which delineate the characteristics of chroomium and open charm production in nuclear systems.”

Moss received his PhD in nuclear chemistry from the University of California, Berkeley in 1969. After postdoctoral stints at the Centre d’Études Nucléaires de Saclay, France, and the University of Minnesota, he accepted a faculty position at Texas A&M University in 1973, where he carried out extensive experimental studies of nuclear giant resonances and developed the technique of focal-plane polarimetry using a magnetic spectrograph. In 1979 he accepted a position with Los Alamos National Laboratory, where he further developed the techniques of focal-plane polarimetry, applying them to the study of the nuclear spin rotation function. In 1980, he became spokesman of a new collaboration to study dimuon production in proton-nucleus collisions at much higher energies in two further Fermilab experiments emphasizing aspects of the parton structure of nucleons and nuclei. His current interests are aimed at the future RHIC program, using the PHENIX detector to study high-energy nuclear collisions and the spin structure of the nucleon.

1998 EDWARD A. BOUCHET AWARD

Established in 1996, the Bouchet Award recognizes the outstanding leadership of minority faculty members in the physics profession.

J.D. García, Jr. University of Arizonna

Citation: “For his contributions to the theory of quantum mechanics, including the application of time-dependent calculations to the understanding of complex collisional processes, and for providing an effective role model for all students, demonstrating that balancing service, profession, and family need not compromise excellence.”

Garcia received his BS degree in physics from New Mexico State University in 1975 and his PhD in 1986 from the University of Wisconsin, Madison. He has worked on a variety of areas of atomic physics, including time-dependent Hartree-Fock theory for ion-atom, ion-surface interactions, and binary encounter approximations. A Fulbright Scholar, a NORTEA Fellow, and a recipient of the Peace Commendation Medal, Garcia has served as President of the National Physcial Sciences Consortium, and chaired the ETS Graduate Beyond Exam Committee in Physics. He served on the APS Panel on Public Affairs and on the Committee on International Scientific Affairs. He is currently Chair-elect of the Four Corners Section of the APS and is on the Executive Committee of the Forum on Physics and Society.

1998 JOSEPH A. BURTON AWARD (FORMERLY THE FORUM AWARD)

Established in 1974 by the Forum on Physics and Society, the Burton Award (formerly the Forum Award) is intended to recognize outstanding accomplishments in the endeavor to promote public understanding of major issues involving the interface between physics and society.

Robert Lee Park American Physical Society

Citation: “For telling it like it is with his widely read ‘What’s New’ and through other means on physics-related aspects of science and public policy issues.”

Park began his academic career preparing for law school but after an interlude for the Korean War, he switched to physics at the University of Texas where he received his Bachelors Degree in 1958. He received his PhD in 1964 from Brown University where he studied surface physics. In 1965 he joined Sandia Laboratories and in 1969 became head of the Surface Physics Division. In 1974 he was appointed professor of physics and Director of the Center of Materials Research at the University of Maryland, becoming chair of the Physics and Astronomy Department in 1978. In 1982, during a sabbatical, he joined the Office of Public Affairs in Washington, DC at the request of the APS, and continues to divide his time between the APS and the University of Maryland. He is the author of the What’s New weekly electronic commentaries on science and technology issues, a regular contributor of opinion articles in major newspapers, and a frequent guest on radio and television news programs.

A CENTURY OF PHYSICS

1900 - 1915 Foundations of the New Physics

by Hans Christian von Baeyer

The twentieth century began with a flurry of inventions which, at the appearance of the mass-produced automobile, and transatlantic radio communication. These innovations transformed the world, but the changes sweeping over physics at the same time were far more radical. They brought about not just different lifestyles, but new ways of thinking.

Modern physics, which grew out of classical physics, rests on three pillars: the quantum theory, which governs atoms and their nuclei, Special Relativity, which deals with the interactions between space and time, and General Relativity, which explains gravity. The latter two were the sole creations of Albert Einstein and even the former received a crucial early contribution from him.

Einstein's miracle year came in 1905 when he was 26 years old and working as a patent examiner in Bern, Switzerland. In March he submitted a paper in which he proposed that light, which classical physics treats as a wave phenomenon, could also be thought of as consisting of discrete bits of energy he called quanta. The implied wave-particle duality of light became the cornerstone of the quantum theory. In May, Einstein explained the erratic motion of pollen floating in water due to the jostling of innumerable invisible atoms. When this theory was validated in the laboratory, even the most skeptical of physicists were forced to accept atoms, which until then had been more conceivable, as real, material objects.

In 1906, Einstein submitted his historic paper on the Special Theory of Relativity, which demolished the rigid imaginary scaffolding of space and time that held up classical physics. In the preamble, he declared the troublesome ether hypothesis to be superfluous. In September, as an afterthought, he added the formula E=mc² which would later be used to account for the unexplained enormous energies liberated by radioactivity. In seven frenetic months Einstein had torn down the foundations of physics and begun to build them up anew.

The success of the quantum theory of light, together with the lessons learned from radioactivity and the discoveries of the electron and the atomic nucleus, led to Niels Bohr’s model of the hydrogen atom as a miniature planetary system. It explained the colors of light emitted by hydrogen gas, and the way X-rays originate in rearrangement of electrons deep within the atom.

Although the model was fundamentally flawed (for one thing, undisturbed hydrogen atoms are shaped like balls, not disks), and abandoned by its inventor within six years, it has survived to this day as a popular representation of the atom. But for scientific purposes, what could replace it? Who would find the key to the interior of the atom?

Editor’s Note: To celebrate its centennial, the APS is producing A CENTURY OF PHYSICS, a dramatic illustrated timeline wallchart of over a hundred entries on eleven large posters intended for high schools and colleges. Each poster covers about a decade and is introducing an enthusiastic thumnail essay to provide a glimpse of the historical and scientific context of the time.

In May, APS News will feature the third introductory essay 1915-1924: Physics Extends Its Reach.
The Third International Math and Science Study (TIMSS) shows that U.S. 12th-grade students rank well below students in other countries in science. In addition, statistics from physics shows that the lowest of the 16 participating countries. Clearly, the physics community has a lot of work to do.

We, as a nation, need to face the challenge of preparing our children with a better understanding of science. A workforce that is well educated in science will help ensure that America's global economy will continue to thrive, much of which will be driven by physics-based advanced technology. While the TIMSS results are disappointing, we see them as a challenge to examine our approach to science education and re-commit ourselves to advance and diffuse the knowledge of physics.

We believe that physics requires more time in the high school curriculum. Physics principles should be introduced at an earlier stage of the student's career so that they are acquainted with the wonders of physics and prepared to meet the challenges of the modern world. Presently, most students who take high school physics, only about 25 percent of the high school population, do so only in their senior year. This leaves them poorly equipped to apply an understanding of major scientific principles to the complex, technological world of the future.

We also need to set higher expectations for our students when it comes to science. This can be achieved in part by states adopting standards based on the national standards for science education (developed by the American Association for the Advancement of Science and the National Research Council). Currently, the curriculum presented to U.S. students is "a mile wide and an inch deep." In the future, we need to emphasize understanding the fundamentals of science rather than just recalling facts. This will allow U.S. students to develop the problem-solving skills that will benefit them no matter what careers they choose.

In addition, we need to provide our students with the best teachers. We deplore the structure of American education that forces teachers with insufficient science preparation, especially in physics, to teach courses at the high school level. To address these issues, we need to concentrate on improving professional development, increasing compensation, and simplifying the certification process to make it easier for people trained in science to teach in high schools. Placing greater value on high school science teachers sends a strong message to students that science is an important part of their education.

The American Physical Society (APS) recognizes that in this rapidly changing world all children need to carry the knowledge of math and science with them beyond the classroom. A cooperative effort of many groups is needed. In its own modest response, the APS, together with the American Association of Physics Teachers, launched its Campaign for Physics which raised funds from technology-based companies, physicists from around the United States, and other concerned individuals to improve science education from the kindergarten through 12th grade.

A nationwide APS program, the Teacher-Scientist Alliance, uses Campaign funds to promote fundamental changes in the way we educate our children in science. This program encourages students to learn science by doing it through creative, practical learning and understanding, not just memorization. Guided firmly by the national standards, this program focuses on science education reform in the elementary and middle schools because it is believed that fundamental changes in the way we educate our children begin in the early years. The program has been implemented in 54 school districts in more than 20 states. In addition, we encourage and train scientists and engineers to work with teachers and local school districts to bring this hands-on, inquiry-centered approach into the classroom. This is a start, but certainly more of these kinds of partnerships should be undertaken.

Science, particularly physics, has played a major role in computer technology, space exploration, and the other key industries of the 20th century. These industries have provided the United States with an improved standard of living and a strong economy. The APS is committed to working with others to ensure that U.S. students are given the best science education possible so that they will be able to take the opportunity to expand the horizons of our nation in the 21st century. After all, there is more at stake here than a grade on a report card.

The American Physical Society has changed its charter from that of a scientific society to a sort of religious cult. Last year we, the Council proposed and the members approved by an overwhelming vote, that the Objective of the APS, as defined in Article II of the APS Constitution, be changed to read: "In the firm belief that the advancement of the physical universe will be of benefit to all humanity, the objective of the Society shall be the propagation and diffusion of the knowledge of physics." [New language in italics] Simply put, what distinguishes science from religion is that the one is engaged in a search for truth while the other starts with a commitment of faith in some particular dogma. It is thus strange indeed that the new definition of the APS starts with the phrase "In the firm belief that ..." Even stranger is the unqualified assertion that "an understanding of the nature of the physical universe will be of benefit to all humanity." As a mature physicist and teacher, I look at the world of human conduct and human history in a realistic way. Does the American Physical Society wish to mean to promise or to guarantee that advances in physics will, without doubt or failure, turn out to benefit all humanity? Rationally viewed, the new APS statement is absurd. Most physicists would like to see the fruits of their labors to result in "benefit to all humanity," would hope for this happy outcome and would even expend some effort to help realize this goal. Such sentiments are laudable, but that is not what the new APS words say. One should not brush this off as merely an awkward choice of language. Leaving this new statement in place can be quite damaging. Members of the public who read these words may reasonably conclude that physicists are indeed like the infamous Dr. Frankenstein, who purported his evo-driven research mindless of the awful consequences for others. Furthermore, students of physics and other members of our profession who have not yet adopted the burdens of Social Responsibility in Science may, upon reading the new APS language, feel that they need not bother with such concerns.

Charles Schwartz, Professor Emeritus, U.C. Berkeley

Editor's note: The change to the APS Constitution noted above was proposed and approved by Council in November 1996 and April 1997 respectively and was announced to the membership in the June 1997 issue of APS News, where comments were solicited. Professor Schwartz's was the only negative comment received. Members gave overwhelming (88%) approval to the mission change in their balloting over the summer.

Why God never received a PhD

She had only one major publication.

• It was in Hebrew.

• It had no references.

• It wasn't published in a refereed journal.

• Some even doubt he wrote it by himself.

• It may be true that he created the world, but what has she done since then?

• His cooperative efforts have been quite limited.

• The scientific community has had a hard time replicating her results.

• He never applied to the ethics board for permission to use human subjects.

• When one experiment proved that it didn't work, she denied her subjects.

• When subjects didn't behave as predicted, he deleted them from the sample.

• She rarely came to class. Just told students to read the book.

• Some say he had his son teach the class.

• She expected him to do the two students for learning.

• Although there were only 10 requirements, most of his students failed his tests.

• Her office hours were infrequent and usually held on a mountain top.

• No record of working well with colleagues.
Citation: “For his pioneering contributions to hadronic string models, lattice gauge theories, quantum chromodynamics, and dynamical symmetry breaking.”

1998 ROBERT R. WILSON PRIZE

Established in 1986, the Wilson Prize is intended to recognize and encourage outstanding achievement in the physics of particle accelerators.

Matthew Sands
University of California, Santa Cruz

Citation: “For his many contributions to accelerator technologies and applications, including electron-positron and proton colliders and for his importance as teacher and role model for many generations of scientists.”

1998 OUTSTANDING DOCTORAL THESIS AWARD IN BEAM PHYSICS

Established in 1990 by the Division of Physics in recognition and contributed significantly to the professional development of under-graduate physics students.

Richard W. Peterson
Bethel College

Citation: “For establishing an outstanding re- search program in applied optics involving undergraduate students at Bethel College, and for his work in infrared spectroscopy and incoherent interferometry, holographic interferometry, and interferometric measurements. He is engaged in studies at the MIT-Bates and Jefferson laboratories which use parity violation to determine strange quark contributions to nucleon structure. She is also presently involved in an international collaboration to study deuteron electromagnetic properties through measurement of the deuteron’s tensor polarization in elastic-c d-scattering.”

1998 JULIUS E. LILLENFELD PRIZE

The Lilienfeld Prize was established in 1988 under the terms of a bequest of Beatrice Lilienfeld in memory of her husband, Julius Edgar Lilienfeld to recognize a most outstanding contribution to physics.

Douglas J. Scalapino
University of California, Santa Barbara

Citation: “For his groundbreaking work on computational approaches to the study of quantum many-body problems, particularly those involving strongly correlated electron systems, and his exceptional ability to convey the exer- cise of physics to diverse audiences.”

Scalapino received his PhD from Stanford Univer- sity in 1970 and joined the Stanford University faculty in 1971 as a postdoctoral fellow. In 1974, he became Brown Professor of Physics at the Institute for Advanced Study. His research interests are in string theory, field theory, and high-energy physics. During the last year, he has been working with various collaborators on exact solutions of supersymmetric field theories and string theories in various dimensions.

Witten received his BA at Brandeis University in 1974 and his PhD from Princeton University in 1976. After four years at Harvard University as a postdoctoral fellow and Junior Fellow, he joined the faculty of Princeton Uni- versity in 1980. He has been Professor of Physics at the Institute for Advanced Study since 1987. He is known for his work in elementary particle theory and quantum field theory, and his major contributions to string theory, and their mathematical implications.

1998 NICHOLSON MEDAL

Established in 1993, the Nicholson Medal is intended to honor a physicist who has exhibited extraordinary qualities in such areas as excellence in teaching, development of the quality of life in our society, and fostering international cooperation in physics.

Henry W. Kendall
Massachusetts Institute of Technology

Citation: “For his important role in creating and heading the Union of Concerned Scientists, which has had a lasting impact on many sci- entific issues of concern to society, and for his outstanding moral contributions to these areas and education at all levels.”

Kendall is currently J.A. Stratton Professor of Physics at the Massachusetts Institute of Technology. He received his PhD from MIT in 1948 and taught at Stanford University for five years before returning to MIT in 1951, where he has taught physics ever since. In 1974, President Gerald Ford made him Chairman of the Board of the Union of Con- cerned Scientists, of which he was a founding member. He has contributed to many physics publications and to the Nobel prize in physics in 1990, along with Jerome Friedman and Richard Taylor. Kendall has been active in many other national activities including a member of the National Academy of Sciences, and has testified numerous times before Congress on the threat of nuclear war.

1998 W.K.H. PANOFSKY PRIZE

Established in 1985 by the friends of W.K.H. Panofsky and the Division of Particles and Fields, this prize is awarded annually in rec- ognition of outstanding achievements in experimental particle physics.

David R. Nygren
Lawrence Berkeley National Laboratory

Citation: “For the concept, development, and application of the time projection chamber (TPC), enabling unprecedented studies of com- plex topologies of charged particles produced in high-energy collisions of high and medium nuclear physics.”

Nygren received his PhD in physics from the University of Washington in 1967 and spent two years as research associate at the University of Arizona before joining the faculty there in 1969. He moved to Lawrence Berkeley National Laboratory in 1976, where he is presently a senior physicist. An Executive Committee mem- ber of the APS Division of Particles and Fields, Nygren was instrumental in the development of the time projection chamber concept for tracking and identification of charged particles in high energy electron-positron collisions. Employed by the Stanford Linear Accelerator’s Center’s muon ring and ATLAS and CMS, 3 large detector systems in Japan and Europe, the TPC, concept provides three-dimensional visualizations of complex event structures with high spatial and time resolution, and simultaneously determines the charged particle types.

1999 AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY

Howard Geller
American Council for an Energy Efficient Economy

Citation: “For their significant contributions to enhancing energy efficiency, particularly for applications in buildings, industry, transportation, and household equipment, to optimize energy-efficient appliance standards.”

Geller received his BS in physics from Clark University in 1977 and his MS in mechanical engineering in 1981. During and subsequent to his graduate work, he worked at the Massachusetts Institute of Technology in Princeton’s Center for Energy and Environ- mental Studies. In 1981 he established the American Council for an Energy Efficient Economy in Washington, DC, where he is cur- rently the Executive Director. The Council is devoted to advancing energy efficiency as a means of promoting both economic prosper- ity and environmental protection. Geller has advised and conducted energy conservation studies for utilities, governmental agencies and international agencies, and frequently testifies before Congress on energy efficiency.

Geller received his PhD in physics from the University of California at Berkeley in 1976. He has worked on energy efficiency and en- ergy policy for over 20 years, and co-founded the Energy Program at the Natural Resources Defense Council. He has worked with state and national organizations to develop and implement energy performance standards for new buildings and appliances. He also negotiated the agreements that led to the establishment of the Energy Policy Act of 1992 and Amendments in 1995. A two-time recipient of the Champion of Energy Efficiency Award bestowed by the American Council for an Energy Efficient Economy, Geller was a founding director of the Con- sortium for Energy Efficiency.

1999 ROBERT R. WILSON PRIZE

Established in 1986, the Wilson Prize is intended to recognize and encourage outstanding achievement in the physics of particle accelerators.

Matthew Sands
University of California, Santa Cruz

Citation: “For his pioneering contributions to hadronic string models, lattice gauge theories, quantum chromodynamics, and dynamical symmetry breaking.”

Sands received his PhD from Cornell Uni- versity in 1994 and his MA from Rice University. He then worked at the Naval Ordnance and Los Alamos Laboratories, before moving to CalTech, where he helped build and used a 1.5 GeV electron synchrotron. He was the first to demonstrate the importance of quantum ef- fects in electron accelerators; he proposed a high energy proton synchrotron, using impac- tion from a booster, and co-authored the Feynman Lectures on Physics. In 1963 he be- came Deputy Director for the construction and early operation of SLAC; in charge of the design of SPEAR, and wrote a monograph on electron storage rings. From 1969 until 1985 he taught at the University of Santa Cruz, where he is now Professor Emeritus.

1999 OUTSTANDING DOCTORAL THESIS AWARD IN BEAM PHYSICS

Established in 1990 by the Division of Physics of Beams, this award is supported by the Uni- versity Research Association. It is intended to recognize and encourage outstanding quality and achievement in beam physics and engineering.

Bita Ghaffari
University of Michigan

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Representatives from the APS, the European Physical Society and UNESCO, among other organizations, attended a planning workshop late last year to explore means for enhancing collaboration among scientists from developing and industrial nations in Africa.

Convened by the UNESCO Physics Action Council (PAC) and the APS, the meeting was held on 27-28 November at UNESCO’s headquarters in Paris, France. The discussions focused on a variety of issues, including the status of physical societies in Western Africa, and the role of the International Center for Theoretical Physics (ICTP) in Trieste, Italy, in promoting and supporting laser science centers. The ICTP currently supports two affiliated centers in laser science in Africa: one at the University of Cape Coast in Ghana and the other at the University Cheikh Anta Diop in Dakar, Senegal.

Reasoning that the applied aspects of such research hold significant value for these nations and any potential collaborators, both centers have developed strong programs for student training, and the Cape Coast Center has outreach programs for K-12 students and teachers.

“Laser science is a discipline of vigorous basic research and great practical potential in such areas as telecommunications, health, agronomy, and plant biology and industrial processing,” said Ahmadou Wague, a professor at the University Cheikh Anta Diop’s Laser and Atomic Physics Center in Dakar. “It is our contention that while scientists in developing countries can benefit from scientific liaison with their colleagues in the industrial north, scientists and institutions in the north can benefit from the application and work of scientists in the south.”

Other important issues were the promotion of scientific collaboration between African research centers and those in North America, Europe and Asia; the improvement of telecommunications to promote permanent links among distant research facilities; the development of a regularized program of scholarly exchanges; and the broadening of interdisciplinary science contacts to include agricultural science, agronomy, industrial processing and biomedical applications.

One of the highest priorities, according to Irving Leech, APS director of international scientific affairs, is the need to establish permanent connections with African government leaders of science, technology, academics, industry and finance. Investment in science, technology and education in these developing countries is traditionally low: approximately 1% to 2% GDP level in Africa, which is roughly 10% of the GDP fractional investment made by developed countries. There is little impetus among governments in both the developing and industrialized nations to make such investment, and national priorities remain centered on such areas as agronomy and health.

For basic science to be supported, there must be a clear and demonstrable connection between the work of such scientists and the most compelling needs of society, amply apparent in such areas of technology as telecommunications. “Only when government officials and the general public are informed of the connection between science and technology and industrial development, quality of life and prosperity, will attitudes change,” said Wague. “Developing countries face serious economic exigencies which will hinder development unless these issues are fully explored and taken into consideration when setting national priorities,” he said.

The participants also reached agreement on the organization of a workshop on spectroscopy and applications originally developed by the Department of Physics at University Cheikh Anta Diop in Dakar, Senegal. LLNL Physicist, Dr. Ronnie Shepherd. Seated: LLNL Physicist, Dr. Ronnie Shepherd. Standing: Prof. Ahmadou Wague from the Department of Physics at University Cheikh Anta Diop in Dakar, Senegal. Location: Ultra-Short Pulse Laser Facility at LLNL.

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The proposed program will include sections on high-resolution spectroscopy, atomic and molecular spectroscopy, liquid phase structure studies, molecular ion and helium ion spectroscopy, studies of rapid reactions, applications of lasers, applications of Raman and other spectroscopies to industrial pollution and other environmental problems, differential absorption techniques to detect atmospheric pollutants, and the development of Internet telecommunications for worldwide scientific collaboration. The African Laser Atomic and Molecular Sciences Network previously organized four pan-African workshops on lasers and applications in 1991, 1993, 1994 and 1996. A fifth workshop is planned for Botswana this August.

A program of long-term scholarly exchanges is also an important priority for numerous reasons. First, African scientists could materially contribute to the work of facilities in industrialized nations, thereby benefiting both themselves and their hosts. They would also be able to continue collaboration through electronic means to maintain their scientific commitments. Furthermore, they could contribute ideas and applications to the interdisciplinary communities associated with host institutions in such areas as agronomy, health sciences and industrial applications. Finally, students and post-doctoral scientists could benefit from exposure to the scientific programs of major centers in the northern hemisphere.

Telecommunications was identified as the key to maintaining scientific connections between African centers and those in developed countries. African nations are already making large and sustained investments in network infrastructure and Internet access. While high-capacity connections to the Dakar center were possible, broadband access for the Cape Coast center is problematic. Microwave connections between the center and Accra are not possible because of the cost of installing towers between the two cities. PAC is making every effort to convince local authorities of the necessity for such a connection, and is consulting the largest commercial ISP provider in Accra about the most appropriate means of achieving the required connectivity.
Units' Leadership Convene at APS Headquarters

Seventy APS members, representing 5 forums, 7 topical groups, 14 divisions, 6 sections, and one committee, gathered at APS Headquarters in College Park, Maryland, on January 24 for the annual APS unit convention. The purpose of this pre-meeting dinner was unit participation in the upcoming APS Centennial celebration in Atlanta, Georgia next year, specifically the types of sessions and exhibits each planned to organize. The meeting opened with a series of small group meetings on such issues as improving unit membership, ways to increase participation, and ways to use online services available for unit use, and a summary of current unit accounting and financial reporting procedures. Various APS officers reported on APS activities, both internal and external. Physicians, physicists, scientists, and engineers, and a variety of interesting people and publications. The APS Centennial Staff, led by Francine Kennedy, Brian Schwartz, and Sherrie Precise, concluded by supplying the attendees with an update on current plans for the celebration. Finally, the unit representatives provided short reports based on their discussion of their plans for symposia and exhibits.

Gibbons Retires as Science Adviser; Replaced by NSF’s Lane

In February, John Gibbons, Assistant to the President for Science and Technology, and Director of the Office of Science and Technology Policy for the last five years, announced his resignation, effective March 15. Before coming to the White House, Gibbons was the Director of the congressional Office of Technology Assessment. President Clinton announced his intention to nominate NSF Director Neal Lane as Gibbons’ replacement. Replacing Lane will be Rita Colwell, currently the President of the University of Maryland-Biotechnology Institute. “I think this would be a really reverse advicer ever served in more trying times for science than did Dr. Gibbons,” said Rep. George Brown, Jr. (D-CA) of the resignation. “Crowded by efforts to shrink the deficit, shouted at by ideologically driven voices of irrationality, and sometimes prodded by friends who position of the President’s personal’, Jack’s term was not all sweetness and light. But Jack spoke forcefully for reason and legislation, and he will be remembered as a principled advocate for science in a time when apparently no one might have capitalized the enterprise.”

Colwell, nominated as the new NSF director, has a PhD in marine microbiology from the University of Washington. She has served on the National Science Board and has been the president of the American Society for Microbiology, the International Union of Microbiological Societies, and the American Association for the Advancement of Science.

National Science and Technology Week To Be Held in April

The National Science Foundation will sponsor National Science and Technology Week April 26 - May 2, focusing on the theme of “Polar Connections,” which will be promoted in the Arctic and Antarctic regions on the rest of the world. Established in 1985 to increase general public awareness of the importance of science and technology, with the aim, in particular of attracting young people to science and engineering careers, NSTW ’98 scheduling traps, that is expected to impact future electronic journal service called...
In Recognition of Voluntary Contributions to the American Physical Society

The Following Programs are Funded Annually from Contributions of Members

Consortial Student Fellowship Program, an annual competition, selects and supports physicists to spend a year on Capitol Hill working with an individual legislator or standing in for his or her staff member.

Mass Media Fellowship Program to promote public understanding and appreciation of science and technology and to sharpen the ability of scientists to communicate complex scientific issues to a broad public. Applications are accepted from physicists supported for ten weeks over the summer in major news media organizations.

Academic-Industrial-Government Round Tables, have the dual goals of improving post-secondary physics education and promoting regional economic development.

APS Panel on Public Outreach. Sponsors activities for the Society on public policy issues that have a technical dimension of interest to physicists.

Physics Planning Committee works with the APS Office of Public Affairs to plan the Society’s governmental relations programs.

International Activities
Supports Physicists in Countries with Currency and Economic Restrictions

Matching Membership Program brings the benefits of APS membership to physicists in developing and dollar-poor countries.

APS Library Outreach Program makes APS journals available at greatly reduced prices to physicists in dollar-poor countries.

Reciprocal Agreements between the APS and other physics societies around the world help promote open communication among physicists internationally.

Human Rights.
The APS supports activities on behalf of the human rights and scientific and technological exchange and to sharpen the ability of scientists to communicate complex scientific issues to a broad public.

For Your Annual Contribution to the American Physical Society

The American Physical Society is pleased to recognize the following members who provided a voluntary contribution in support of the Society's education and outreach programs in conjunction with their membership renewal invoice in 1997. For more information about APS contributions supported programs or ways to give to The American Physical Society, please contact Darlene Logan, Director of Development, (301) 203-3224 or e-mail at logand@d.aps.org. Our thanks to all annual contributors who help us continue and expand these very worthwhile programs.

Keith Dow
March 11
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April 24

APS News April 1998

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In Education & Outreach Programs

Improve Science Education and Physics Opportunities for All

Teacher-Scientist Alliance Institute
This program provides dramatic support to the systemic reform of science education at the elementary school level. It mobilizes scientists to work with school district leaders and teachers as they implement hands-on inquiry based teaching techniques.

High School Teachers' Days
A special one-day program for high school teachers operated by the APS in the locale of many of its national meetings.

Women and Minority Faculty: Symposiums and Workshops provided for women and minority physicists to visit and speak at educational institutions.

Roster of Women and Minorities in Physics
This database of over 4,000 women and minority physicists is maintained by prospective employers to identify women and minority candidates for position vacancies.

Minority Scholarship Program for undergraduate physics majors. It provides financial and role model assistance to talented minority students majoring in physics.

Public Affairs and Public Information Activities
Help Shape National Science Policy and Contribute Expertise to the Solution of National Problems

APS Public Information Office publishes weekly the lively electronic newsletter, What's New

APS Public Information Office convenes the position of the Society and its members on issues of science policy directly to members of Congress and the Administration.

Thank you!
The Task Force and the APS. All responses should be sent by 30 April 1998. All responses will be held in complete confidentiality by both the Task Force and the APS. All responses should be sent by 30 April 1998.

PhD ‘Family-Tree’ Contest

APS News is holding a special Centennial PhD or “equivalent” lineage contest, in which entrants are asked to trace their professional “family tree” — i.e., the production of doctoral level physicists by their thesis advisors — as far back as possible. Prizes will be awarded to those who can trace their PhD lineage back the farthest, who have the most “generations,” most Nobel Laureates, and other categories to be determined by the selection panel. Winners will receive prizes, and the most impressive or interesting lineages will be published in a future issue of APS News. See page 3 of the March 1998 issue of APS News for more details.

Entries should be sent to: Editor, APS News, The American Physical Society, College Park, MD 20740 or via E-mail to: letters@aps.org.

APRIL 1998

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1. International Affairs page updated

Meetings

March 1998 Meeting Virtual Pressroom with lay language pages
• April 1998 Meeting Program
• DAMOP Meeting Program

Units

• FiAP page revamped
• New York State Section, Topical Group on Magnetism, DMP pages updated
• Forum on International Physics announcements

Call for Nominations for 1999 APS Prizes and Awards

Members are invited to nominate candidates to the respective committees charged with the privilege of recommending the recipients. A brief description of each prize and award is given in the March APS News issue, along with the addresses of the selection committee chairs to whom nominations should be sent. Please refer to the APS Membership Directory, pages xxi-xxxvi, for complete information regarding rules and eligibility requirements for individual prizes and awards or visit the Prize and Awards page on the APS web site at http://www.aps.org. Unless specified differently, the deadline for receipt of nominations is July 1, 1998.

Prizes:

Hans A. Bethe Prize
Herbert P. Broida Prize
Tom W. Bonner Prize in Nuclear Physics
Oliver W. Buckley Condensed Matter Physics Prize
Davidson-Germer Prize
Dannie Heineman Prize for Mathematical Physics
High Polymer Physics Prize
Irving Langmuir Prize
Julia E. Lilienfield Prize
James C. McGroddy Prize for New Materials
Lars Onsager Prize
George E. Palke Prize
W.K.H. Panofsky Prize
Earle K. Plyler Prize
Prize to a Faculty Member for Research in an Undergraduate Institution
J.J. Rabi Prize
Annesu Rahman Prize
J.J. Sakurai Prize
Arthur L. Schawlow Prize in Laser Science
Robert R. Wilson Prize

Awards:

David Adler Lectureship Award
Apker Award (Deadline is June 15, 1998)
Edward A. Bouchet Award
Award for Outstanding Doctoral Thesis Research in Beam Physics
John H. Dillon Medal
Joseph A. Burton Forum Award
Joseph T. Keithley Award
Maria Goepert-Mayer Award
Dissertation in Nuclear Physics Award
Shock Compression Award
Leo Szilard Award for Physics in the Public Interest
John Wheeler Award
Francis M. Pipkin Award
Nicholas Metropolis Award for Outstanding Thesis Work in Computational Physics
Dissertation in Nuclear Physics Award

Now Appearing in RMP...

Reviews of Modern Physics is a quarterly journal featuring review articles and colloquia on a wide range of topics in physics. Titles and brief descriptions of the articles in the October 1997 issue are provided below.

Instantons in QCD

T. Schäfer and E. V. Shuryak review what has been learned about instantons, the localized classical field configurations of non-Abelian gauge theories.

Classical monopoles

Newton, SU(2) space, gravomagnetic lensing, and atomic spectra.

Point scatterers for classical waves

Pedro de Vries and co-authors present a Green’s formalism for electromagnetic wave propagation in an inhomogeneous medium, with a view toward application to new classes of optical media.

Hamiltonian description of the ideal fluid

In these summer school lectures, P. J. Morrison starts from simple finite-dimensional systems to show how the Hamiltonian variational principle and associated mathematics can be applied to the dynamics of ideal fluids. Among the examples are derivations of stability criteria for fluid motion.

Coherent phonon polaritons as probes of anharmonic phonons in ferroelectrics

H. J. Bakker and co-authors describe how ultrashort multiburst laser spectroscopy is used to elucidate phonon couplings in ferroelectrics.

Results from deuteron-tritium tokamak confinement experiments

H. R. Haefely reviews the physics results of the first generation of plasma fusion experiments that used fuels suited for power generation.

Moon-Earth-Sun: The oldest three-body problem

Martin C. Gutzwiller presents his perspective on the conceptual origins of renormalization group theory and its role in the theory of critical phenomena.

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The Back Page

Thoughts on Science, Technology, and Human Well-Being in the Next Fifty Years
by John P. Holdren, John F. Kennedy School of Government, Harvard University

In the decades ahead we need simultaneously to try to better understand these climate change challenges, those increased investments in the science of climate and climate-change impacts, and to reduce the probability of unpredictable changes in the climate. We also need to move to the ‘business as usual’ emissions trajectory to a much smaller degree. We will be extremely difficult to do much better than holding atmospheric carbon dioxide to a doubling of its preindustrial concentration, but it will certainly be extremely dangerous to do much worse.

The needed technological improvements can be brought about through a combination of R&D to expand and improve the array of available emissions-reducing technologies plus incentives to deploy the best ones available. These technologies will sharply lower the energy intensity of economic activity by increasing the efficiencies with which energy is transformed and used, as well as lowering the carbon intensity of energy supply through the deployment of lower-carbon and zero-carbon energy sources (renewables, fusion). But if we can get it to work, 50% of the projected emissions (if we can fix the problems that have affected it) and through capture and sequestration of the carbon dioxide from the remaining fuels (that continue to be used).

Biodiversity

We do not even know the number of species on the planet to within a factor of three; it is thought that there are between 1 million and 5 million of those species that have already been named and named. There is reason to believe that the rate of extinction of species is accelerating, but we do not know the range thanks to the difficulty of monitoring of all nuclear-weapon-usuable materials, including those in use in civilian energy systems, will be an essential part of the elimination effort. These ingredients of an adequate verification regime for elimination of nuclear weapons will not materialize overnight. But we are already moving in these directions in connection with the cuts in nuclear warheads already achieved or under negotiation, and another half century should not be too little to accomplish all that is required.

Greenhouse Gases, Climate Change, and Sustainable Energy Supply

The greenhouse gas most responsible for the growing threat of human-induced disruption of climate is carbon dioxide, something that is almost entirely coming mostly from the combustion of fossil fuels. Before the industrial revolution, when no fossil fuels were being burned, the concentration of carbon dioxide in the global atmosphere was about 280 parts per million (ppm). In 1998 civilization’s fossil fuel burning will release about 6.3 billion tons of carbon, and the atmosphere’s concentration will reach 565 parts per million, 30 percent above the preindustrial level. Under “business as usual,” annual emissions from fossil fuel burning in 2048 will total around 15 billion tons of carbon per year, and the atmospheric concentration will continue to rise up to a third of the species in tropical forests — the largest reservoir of biodiversity on the planet — may be lost over the next several decades.

The species making up the biota are the indispensable foundation of the environmental goods and services on which, no less than on economic goods and services, the well-being of every inhabitant of the planet depends: the cycling of nutrients, the building and maintenance of soils, the protection of air quality, the control of many agents and vectors of human disease, and much more. This biodiversity also contains the key to the evolution of genetic information, from which new food crops, drugs, vaccines, and other valuable products could come.

But since most of this genetic information has not even been cataloged, much less analyzed, it should be apparent that the current epidemic of extinctions amounts to burning down a unique and irreplaceable library without ever having read the books. I say “irreplaceable” because, notwithstanding the wonders of biotechnology, there is no reason now to think that we will be able to reconstruct the genetic information in species lost before they have been discovered, not to mention the information created by the evolutionary complex of the ecosystems of which these species were a part.

There is a tremendous task ahead for science — in building understanding of what the biodiversity of the planet is, how it works, and what it does — and a great need in coming decades for improvements in the science and technology and our institutions in arranging to meet human needs and aspirations for increased economic productivity and quality of life by destroying the indispensable foundation of well-being provided by the biota.

Population

In mid-1998 there will be about 5.5 billion people on the planet. At that pace we will be as many times as many as in 1948. Because the rate of population growth has been falling, we will not see the same 2.5-fold growth in the next 50 years as we saw in the 50 years before World War II. Hence current nuclear war or global pandemic, the figure in 2048 will probably be between 8 billion and 8.5 billion people, and by 2098 between 9 and 12 billion. Most of the challenges that civilizing will need to overcome in the next century — particularly the challenges of sustainably supplying the water, food, energy, housing, health care, education, employment opportunities, and other ingredients of a fulfilling life for all of the world’s people — will be considerably more difficult if the 2048 population is at the high end of this range than it is at the low end.

Accordingly, as part of our strategy for addressing all of these other challenges, we should strive for the lower end of the range of mid-21st century population possibilities and for a peak population thereafter that does not exceed 9 billion. In doing so, we should bring to bear both the relevant insights of social science (about, for example, the effects on desired family size of economic and social development, including especially improvements in the status and education of women) and the capabilities of modern — and doubtless still improving — techniques to avoid unwanted births.

Conclusion

The sluggishness with which society is today addressing these problems, notwithstanding abundant information about their character and consequences, says something about the effectiveness (or, more accurately, the lack of) those of us who have long been laboring at the intersection of science, technology, and policy. It also says something about the inertia of our educational system, which clearly needs to do more in developing the skills of the populace in relation to numeracy, earth-system science, interdisciplinarity, and envisioning both the consequences of a “business as usual” future and pathways toward more promising alternatives.


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