FEATURING PHYSICS NEWS IN 1997

APS NEWS

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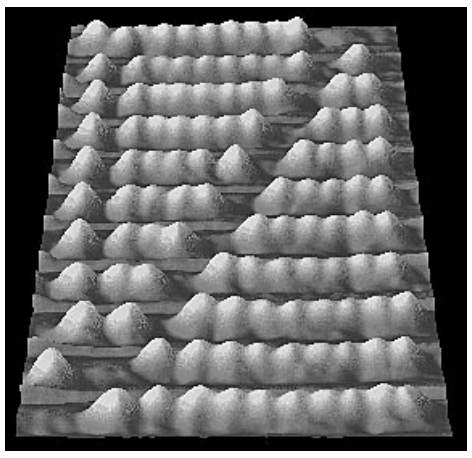
Physics News in 1997 Debuts with a New Format



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.

AIP 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 AIP'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 AIP's weekly one-page newsletter, *Physics News Update*. Many of the items will have appeared also in the Physics Update section of *Physics Today*, with some editorial changes. Nor will a separate booklet be published. Instead, a web version of the year-end review will be made available, with the only 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 listserv@aip.org. Leave the subject line blank and in the body of the letter specify *add physnews* to subscribe or *delete physnews* 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.aip.org/physnews/update.

Physicists do it with Uncertainty

Bumper Sticker & Tee-Shirt Slogan Contest

Got a catchy, physics-related slogan you've always wanted to see on a T-shirt, bumper sticker, or coffee mug? *APS News* challenges its readers for the best such slogans. For example, APS Associate Executive Officer, Barrie Ripin, who brought you the limerick contest a year ago, said he is certain that physicists can do bumper stickers "relatively well." Ooh! Submissions can be in the form of text and/or graphics. There will be a number of categories for winning, including most humorous, most clever, best graphic, best public image, loudest groan from the judges, etc.. Finalist and winning entries will appear in a future issue of *APS News*. The best will be used on T-shirts, bumper stickers, and other products that will be available for purchase at the APS Centennial Meeting in March 1999 in Atlanta Georgia. The deadline for entries is June 30, 1998. Submissions should be sent to: APS News Editor, The American Physical Society, One Physics Ellipse, College Park, MD 20740; Fax 301-209-0865, E-mail: TEESHIRT@aps.org

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NEW

Physical Review Focus

The APS announces *Physical Review Focus*, a free on-line service that explains selected research articles from the APS journals at a level accessible to most APS members. The web site provides short, readable explanations, roughly at the level of a first year physics graduate student. Initially, *PR Focus* will select approximately two papers per week from *Physical Review Letters*, but it is expected to cover all of the APS journals eventually.

Since the main goal of the service is to improve communication among physicists from different specialties, the selection criteria will differ from those of a research journal. Papers will often be chosen based on educational value and intrinsic interest to non-specialists, rather than simply on scientific merit. Research that is particularly well-covered by other sources may also be passed over in favor of less-publicized work.

"*PRL* was once supposed to be accessible to everyone in physics," says Martin Blume, the APS Editor-In-Chief, who has directed plans for the project. "*PRL* was a place for rapid publications of broad interest, but today—although authors still submit their most significant work to *PRL*—they write mainly for their close colleagues." Blume hopes *PR Focus* will "make a dent in the comprehensibility gap" among physicists. He adds that *PRL* is among the best physics journals in the world and he would like *PR Focus* to improve public visibility for the most broadly interesting scientific results.

The *PR Focus* web site went "live" on 16 March, the first day of the APS March Meeting, featuring stories on condensed matter and high energy physics. One article explains a report of the first quantitative analysis of superconducting vortices using a relatively new time-resolved imaging technique. The second story reviews the three latest papers on the top quark mass from the large Fermilab collaborations.

The idea for such an on-line publication has been circulating at APS since 1996, under the tentative title *Highlights*. The title was changed to *PR Focus* to better reflect the nature of the selection process. David Ehrenstein has been hired as the writer and editor and the URL is [http://publish.aps.org/FOCUS/], which is also accessible from the APS home page [http://www.aps.org] under the Research Journals button.

Meet the *PR Focus* Editor

The APS has hired David Ehrenstein, a physicist and science writer, to develop a new electronic journal featuring physics highlights. Ehrenstein joined the Society in February, and will work with APS Editor-in-Chief Martin Blume to develop *Physical Review Focus*, initially designed to be a web-based electronic journal focusing mainly on articles appearing in *Physical Review Letters*. As the project develops, coverage of relevant articles in other APS journals will also be included, and a print counterpart may be added.

Ehrenstein received his PhD in biological physics from the University of Illinois in 1994, working under Hans Frauenfelder on the physics of myoglobin and other proteins. He spent the next two years as a postdoctoral fellow studying the biophysics of the inner ear and as a part-time science writer at the National Institutes of Health. Prior to joining the APS staff, Ehrenstein was an intern at *Science* magazine, where he authored research news and science policy articles for the magazine and the *ScienceNOW* web site. His prior experience also includes a summer stint in 1993 as a radio journalist for *Science Update*, a nationally broadcast radio program produced by the American Association for the Advancement of Science.

Blume Guides APS Journals Into Electronic Age

A little more than one year has passed since Martin Blume, a condensed matter physicist at Brookhaven National Laboratory, took over as APS editor-in-chief, and his tenure thus far has yielded impressive results. As of July 1, 1997, all of the *Physical Review* and *Physical Review Letters* are available electronically, and many new features, such as searching and linking, are now possible on-line. Blume envisions an even brighter electronic future for the Society's publishing activities.

The APS Editor-in-Chief has responsibility for the research journals published by the Society, including the large editorial and journal support staff located in Ridge, New York. Responsibilities include preserving and enhancing the quality of APS journals, leading APS efforts in electronic publishing, working with senior editors to set journal policies, and handling appeals and ethics cases involving authors.

Like many of today's professional physicists, Blume's interest in science dates back to his childhood. He was fascinated by chemistry sets and eventually proved to be quite proficient in mathematics. "I can still see the look on the face of the track coach when I told him I couldn't go out for the track team because the math team met at the same time," he said. "You know, there are no cheerleaders on math teams!" As an undergraduate at Princeton, his interest turned from mathematics to physics, eventually leading him to pursue graduate studies.

Blume received his PhD in physics from Harvard University in 1959 and spent the following year as a Fulbright Fellow at Tokyo University. After two years as a research associate at AERE in Harwell, England, he joined the staff of Brookhaven, where he headed the solid state physics group and chaired the National Synchrotron Light Source Department before becoming deputy director in 1984. From 1972 to 1980 he was also a professor of physics at SUNY-Stony Brook.

Blume's research interests include theoretical solid state physics, magnetism, phase transitions, slow neutron scattering and synchrotron radiation. His extensive APS service includes stints as chair of the Panel on Public Affairs and Nominating Committee, as well as service with the Forum on Physics and Society and on the APS Council and Executive Board. He has also served on the editorial board of the *Physical Review* in addition to several other publications.

Blume credits much of what has been accomplished in the last year as the fulfillment of efforts begun by his predecessor, Benjamin Bederson (New York University), as well 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 very positive," he said.

Q 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?

A Physicists can now take advantage of the low cost personal subscriptions offered to our membership, or may gain on-line access through their institutions to all print journals to which the institutions subscribe. We also set up a "free fee line", 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've also made the abstracts available without charge. This gives some valuable information away, but for the APS it's appropriate. It's a teaser, in terms of a marketing approach. You show people a little bit, and if they find it interesting, they will want to read more, whereas if they just see the title, they might not take a chance on looking at the entire article. One of the things that we will be moving toward in the next year is Pay-Per-View, which means if you don't have a subscription, you would still be able to download an article for a minimal use fee.

Q Now that the journals are all on-line, what other steps does the Society plan to take in terms of electronic publishing?

A The on-line availability of our journals is but a step toward a hazily defined future. Many pieces of this future are already in place. Paul Ginsparg's e-print archive at Los Alamos embodies these modes of distribution, and gives scientists the results of research at a very rapid pace. While the papers are unrefereed (though there is the possibility of commenting on submitted e-prints) they can be used by editors and referees to supplement their own knowledge of the papers being reviewed. The APS has formed an agreement for use of Ginsberg's e-print site. (See *APS News*, March 1998).

We also recently announced the first of what will become a new, all-electronic journal series: *Physical Review Special Topics* (see *APS News*, March 1998). The first in this series is titled *Accelerators and Beams*. This is both a new journal and an opportunity for us to work on electronic journals without having to accommodate a previous print version. We have put our journals on-line by completing the printing process and then making a few additions so that they can be posted on the Internet. This is a smart way of getting on-line quickly, but clearly the wrong way to do things. Print should be a derivative of the electronic version, and not the other way around. Only then can we take advantage of the many enhancements, cost savings and speedup of publication potentially made possible by electronic submission, refereeing, and distribution.

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

A 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 *Physical Review*. The horse and buggy was gradually replaced with the automobile. Our publishing situation is at the stage where the horse and buggy is being replaced, but with an automobile that looks like a buggy with an internal combustion engine. Only when the automobile was designed from the ground up, without basing it on the buggy, did it reach its full potential.

In other words, we have to modify the entire process. The APS must move as quickly as possible to adopt new ways of working, but should not abandon its own strengths. Peer review 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 electronically, and we are just beginning to make the refereeing process electronic. In the new system, referees will download articles for review, either off an e-print server or off our own internal server.

Q Do you foresee a time when electronic versions will completely replace print versions of the journals?

A 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 it to reading something on a screen. We can visualize a future in which print distribution disappears, but it's very hard to visualize one in which print versions disappears completely. That of course significantly lowers costs, because you don't have any of the shipping costs. Those wanting paper copies would still be able to download and print their own journals from the electronic versions.

Q What is the rationale behind the Society's recent agreement with the Department of Energy for electronic subscriptions to APS journals?

A The Department of Energy cancelled its subscriptions for *Physical Review*, not by the program people, who require access to the journals, but by the controller's office, which desires to cut costs. Naturally, they were quite concerned about this. So we now have a six-month agreement to make available just an electronic subscription of the journals to DOE headquarters, so that the program people can use it. This is essentially a test run to determine how well the electronic versions are utilized. In the long run, the DOE's Office of Scientific and Technical Information is interested in the possibility of a large-scale subscription that would cover all of their institutions, not just DOE headquarters.

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

A We are continuing to work on the *Physical Review Online Archive* (PROLA), and we expect to have an early test version available publicly very soon. We have it available in a few pilot sites, but it's not yet widely distributed because we're working to make the system more robust. Then, we will go back in time to include all articles published in *Physical Review* since 1985. We have the capability to go back as far as 1975 without much travail. Ultimately we would like to go back to 1893, including the entire contents of the journal since its inception in the on-line archive.

Q The substantial growth rate of the APS journals has been a marked concern in recent years. Is this exponential rate of growth continuing?

A It seems to be slowing down right now, but there have always been minor fluctuations. The number of manuscripts submitted has grown at approximately 6% per year for a number of years. It's currently down to about 4%. On the other hand, this puts tremendous pressure on our editorial staff, causing us to raise prices occasionally to cover costs. The number of published articles is growing at about 3% right now, as we try to cut back by applying more stringent standards. However, it takes more effort to reject a paper than to publish it,

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APS News

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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 Columbus, Ohio, 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, nuclear astrophysics, or closely related fields.

John Bahcall
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."

Bahcall received his PhD from Harvard University in 1961. He was on the faculty of California Institute of Technology and has been a Professor of Natural Sciences at the Institute for Advanced Study, Princeton, since 1971. His areas of expertise include models of the galaxy, dark matter, atomic and nuclear physics applied to astronomical systems, stellar evolution, and quasar emission and absorption lines. In collaboration with Raymond Davis Jr., he proposed in 1964 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 detectors. Bahcall was also awarded the 1994 Heineman Prize by 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 contributes in a general way to nuclear physics research.

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 antiquark enhancement in nuclei, and which delineate the characteristics of charmonium 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'Etudes Nuclaires 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 response function. In 1986 he became spokesman of a new collaboration to study dimuon production in proton-nucleus collisions and subsequently played major roles 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 1994, the Bouchet Award (formerly the Visiting Minority Lectureship) is sponsored by the Research Corporation. It is intended to promote the participation of under-represented minorities in physics by publicizing the lecturer's work and career development to the physics community, especially to young minority physics students.

J.D. Garcia, Jr.
University of Arizona

Citation: "For his contributions to the theory of quantum methods, 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 1957 and his PhD in 1966 from the University of Wisconsin, Madison. He has worked on a variety of areas of atomic physics, including time-dependent Hartfree-Frock theory for ion-atom, ion-surface interactions, and binary encounter approximations. A Fulbright Scholar, a NORDITA Fellow, and a recipient of the Air Force Commendation Medal, Garcia has served as President of the National Physical Sciences Consortium, and chaired the ETS Graduate Record 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 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 interruption 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, Park opened an 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 commentary on science policy issues, is a regular contributor of opinion articles in major newspapers, and a frequent guest on radio and television news programs.

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A century of physics

1900 - 1915 Foundations of the New Physics

by Hans Christian von Baeyer

Albert Einstein

Permission granted by the Albert Einstein Archives, the Hebrew University of Jerusalem, Israel

The twentieth century began with a flurry of inventions such as the airplane, 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 relationship 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 as due to the jostling of innumerable invisible atoms. When this theory was verified in the laboratory, even the most skeptical of physicists were forced to accept atoms, which until then had been mere conjecture, as real, material objects.

In June of the same year 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 $E=mc^2$ 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.

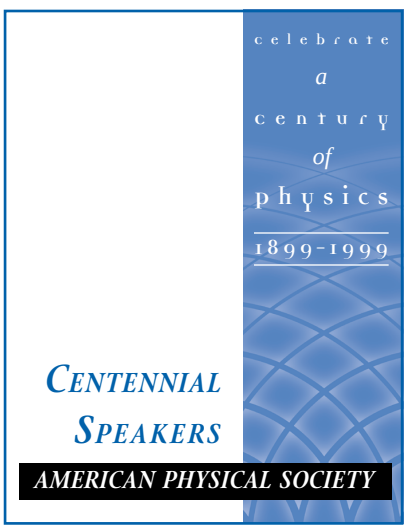
The success of the quantum theory of light, together with the lessons learned from radioactivity and the discoveries of the electron and the atomic nucleus, led to Niels Bohr's model of the hydrogen atom as a miniature planetary system. It explained the colors of light emitted by hydrogen gas, and the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

CENTENNIAL SPEAKERS BOOKLET



To spread the Centennial celebration around the country, the APS plans to encourage Centennial talks to be given at institutions across the U.S. with the publication of a special speaker's booklet. The Centennial Committee, working with the APS divisions, forums, topical groups, sections and committees, has identified 230 excellent speakers willing to give colloquia, seminars, and general talks on physics and history of physics topics from an historical, societal, cultural, developmental and/or a technological context. Speakers were nominated not only for their specific physics acumen, but also for their reputations as interesting and talented speakers.

The booklet will list the topic and geographical location for each speaker, and will be widely distributed to college and university physics departments, encouraging the recipients to schedule one or more talks at their institution to celebrate the Centennial during the fall of 1998 and the centennial year 1999. "We hope that all physics departments will include one or more Centennial talks in their regular colloquium series during the 1998-1999 academic year, and the fall of 1999," said Centennial Director Franmarie Kennedy, adding that the booklet is intended as the Society's Centennial gift to the US physics community.

OPINION

APS VIEWS

Third International Math and Science Study

12th Grade Advanced Science Results

a Statement by Andrew Sessler, APS President

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, U.S. student performance in physics is rated 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 be better prepared to succeed in the global economy of the 21st century, 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." To rectify this situation, the state standards 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 6th 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 attitudes about science develop during these years. To date, 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, aerospace, medicine and 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 have 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.

TIMSS Synopsis

A press release with Sessler's statement above was made shortly after the announcement that US 12th-graders perform poorly in math and science compared to the international community, according to findings from the large Third International Mathematics and Science Study (TIMSS). The TIMSS assessment was given to a half-million students - in fourth grade, eighth grade, and at the end of their secondary education - in 1995. The data gathered was analyzed and presented by the Education Department's National Center for Education Statistics (NCES) in three reports. The three reports from the TIMSS study are available on the Internet at http://www.nces.ed.gov/timss/. U.S. twelfth-graders performed among the lowest of 21 countries on the assessment of mathematical and scientific general knowledge, and physics in particular.

LETTERS

The Real Answer to Post-Modern Multiculturalism

Social Biologists working at the National Institute of Sociobiological Health Therapy (NISHT) have discovered a link between postmodernism and the Latour-Jakob syndrome, also known as madkow disease. The research began by noting the resemblance between the spongy texture of postmodern thought and the spongy texture of brains of animals infected with madkow disease. This conjecture was confirmed by an experiment in which parrots that had been taught to speak normally were fed food infected with the carriers of the Latour-Jakob syndrome. In a very short time they had forgotten normal speech completely and were capable only of dictating articles suitable for publication in "Social Text." A new method of noninvasive testing using extra-sensory perception has revealed that infection with the postmodern-thought virus produces holes in the language instincts of infected educators and makes them insist that Holistic Language or Hole Language is the only way to teach reading.

The madkow virus is now also believed to be the source of a number of Sokalled Wars. The war between the Lunatic Left and the Righteous Right is also attributed to infection of the Lunatic Left by madkow virus and of the Righteous Right by a related strain.

Although there is so far no known cure for postmodernism, evidence is already accumulating that the natural immunity to the disease has been recovered by European humanists, where the disease started.

NISHT is of course not to be confused with the National Institute and Center for Holistic Thought (NICHT). In the German literature it is emphasized that "NISHT ist nicht NICHT und NICHT ist nicht NISHT". In Yiddish this becomes "NISHT iz nisht NICHT und NICHT iz nisht NISHT".

Harry J. Lipkin
Weizmann Inst., Israel

The APS: A Scientific Society or Cult?

The American Physical Society has changed its charter from that of a scientific society to a sort of religious cult. Last year 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 an understanding of the nature of the physical universe will be of benefit to all humanity* the objective of the Society shall be the advancement 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 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 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 pursued his ego-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, UC Berkeley

For the full text, contact schwartz@physics.berkeley.edu

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 written negative comment received. Members gave overwhelming (89%) 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 she 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 went awry she tried to cover it by drowning 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 expelled her first 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.

APS Prizes and Awards (continued from page 3)

1998 DANNIE HEINEMAN PRIZE

Endowed by the Heineman Foundation for Research, Educational, Charitable, and Scientific Purposes, Incorporated, in 1959, the Heineman Prize is intended to recognize outstanding publications in the field of mathematical physics.

Nathan Seiberg
Edward Witten
Institute for Advanced Study

Citation: "For their decisive advances in elucidating the dynamics of strongly coupled supersymmetric field and string theories. The deep physical and mathematical consequences of the electric-magnetic duality they exploited have broadened the scope of mathematical physics."

Seiberg completed his undergraduate education in 1977 at Tel-Aviv University and received his PhD from The Weizmann Institute of Science in Israel in 1982. He spent several years as a member at the Institute for Advanced Study in Princeton, NJ, and was a Professor of Physics at The Weizmann Institute for Science and at Rutgers University. Currently he is a Professor at the Institute for Advanced Study. His research interests are in string theory, field theory and particle physics phenomenology. 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 1971 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 University. He has been Professor of Physics at the Institute for Advanced Study since 1987. He is known for his work in elementary particle theory, especially quantum field theory and string theory, and their mathematical implications.

1998 JULIUS E. LILIENFELD 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 ground-breaking 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 excitement of physics to diverse audiences."

Scalapino received his PhD from Stanford University in 1961. After working as a postdoctoral fellow at the University of Pennsylvania, he joined the faculty there, leaving in 1969 to join the faculty of the University of California, Santa Barbara, where he has remained ever since. In 1979, along with his colleagues, he drafted the proposal that led the NSF to establish the Institute of Theoretical Physics at UCSB. His research has focused on strongly correlated electron materials and the use of numerical methods to determine their physical properties. His main interest recently has been to understand the properties of the high-T^c superconductors and their pairing mechanism.

1998 MARIA GOEPPERT-MAYER AWARD

Established in 1985 by the General Electric Foundation to recognize outstanding achievement by a woman physicist in the early years of her career, the Maria Goeppert-Mayer Award includes a generous travel allowance to provide opportunities for the recipient to present her achievements to others through public lectures at four institutions of her choice.

Elizabeth J. Beise
University of Maryland

Citation: "For important and challenging electron scattering studies of the structure of the nucleon and few-nucleon systems, and her outstanding experimental skills and leadership ability in all phases of these studies."

Beise received her PhD in experimental nuclear physics from MIT in 1988. She spent two years as a postdoctoral fellow and two additional years as a senior research fellow in the Kellogg Radiation Laboratory at Caltech, where she became interested in parity violation. In 1993 she joined the faculty at the University of Maryland. Her research interests currently focus on using electron scattering to help elucidate the structure of the nucleon and light nuclei through the use of parity violation and polarization observables. She is engaged in experiments at the MIT-Bates and Jefferson laboratories which use parity violating elastic scattering to identify strange quark contributions to nucleon structure. She also is presently involved in an international collaboration to study deuteron electromagnetic properties through measurement of the deuteron's tensor polarization in elastic e-d scattering.

1997 NICHOLSON MEDAL

Established in 1993, the Nicholson Medal is intended to honor a physicist who has exhibited extraordinary qualities in such areas as education, the improvement 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 leading the Union of Concerned Scientists, which has had a lasting impact on many scientific issues of concern to society, and for his outstanding personal 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 1955 and taught at Stanford University for five years before returning to MIT in 1961, where he has remained ever since. Since 1974, he has been Chairman of the Board of the Union of Concerned Scientists, of which he was a founding member. He was awarded the Nobel prize in physics in 1990, along with Jerome Friedman and Richard Taylor. Kendall has been active in writing, analysis and public activities on US energy and defense issues and in the global issues of environmental pressures, resource management and population growth. He served for a decade as a consultant to the Defense Department on classified matters through membership in the Jason Group of the Institute for Defense Analyses. He has testified numerous times before Congress on the threat of nuclear war, energy policy, nuclear power issues, controlling oil well fires, anti-personnel mine clearing and other matters.

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 recognition 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 complex topologies of charged particles produced in high energy collisions of interest to both high energy and nuclear physics."

Nygren received his PhD in physics from the University of Washington in 1967 and spent two years as research associate at Columbia University before joining the faculty there in 1969. He moved to Lawrence Berkeley National Laboratory in 1973, where he is presently a senior physicist. An Executive Committee member 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 PEP storage ring, as well as several other large detector systems in Japan and Europe, the TPC concept provides three-dimensional images of complex events with high resolution, and simultaneously determines the charged particle types.

1998 PRIZE FOR RESEARCH IN AN UNDERGRADUATE INSTITUTION

Established in 1984 by a grant from the Research Corporation, this prize is intended to honor a physicist whose research in an undergraduate setting has achieved wide recognition and contributed significantly to physics, and who has contributed substantially to the professional development of undergraduate physics students.

Richard W. Peterson
Bethel College

Citation: "For establishing an outstanding research program in applied optics involving undergraduate students at Bethel College, and for his work in infrared spectroscopy and interferometry, holographic interferometry, plasma diagnostics, optical and acoustical measurements, and instructional laboratory experiments in optics."

Peterson received his PhD in physics from Michigan State University in 1969 and worked for two years on a postdoctoral fellow in optical plasma diagnostics at Los Alamos National Laboratory. While on the faculty at Western Illinois University from 1971 to 1980, he continued his work with near and far-infrared interferometry, as well as holographic measurements of plasma and vibratory motion. Since moving to Bethel College in 1980, he has developed new methods of performing interferometric measurements in real-time using heterodyne direct phase detection and stroboscopic, real-time holography. Currently secretary of the American Association of Physics Teachers, Peterson has worked with Bethel students and faculty members as a principal investigator in a 3M and Imation project to perfect interferometric quality control techniques during the production of magnetic media surfaces.

1998 J.J. SAKURAI PRIZE

Established in 1984 by contributions from the friends of J.J. Sakurai, this prize is awarded annually in recognition of outstanding achievements in particle theory.

Leonard Susskind
Stanford University

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

Susskind received his PhD from Cornell University in 1965. Following a year of postdoctoral fellowship at the University of California at Berkeley, he held the position of Professor of Physics at the Belfer Graduate School of Science in New York, Tel Aviv University in Israel, and is currently Professor of Physics at Stanford University. His numerous research contributions have included the discovery of string theory in 1969; the development of theories of quark confinement in 1972-73; the development of Hamiltonian lattice gauge theory in 1974; an independent discovery of Sakharov's theory of baryogenesis in 1980; and the introduction of string theory into the quantum theory of black holes in the mid- to late-1980s. In 1996, he discovered Matrix Theory as a nonperturbative starting point for string theory.

1998 LEO SZILARD AWARD

This award was established in 1974 by the Forum on Physics and Society in recognition of Leo Szilard's concern for the social consequences of science. Its purpose is to recognize outstanding accomplishments by a physicist in promoting the use of physics for the benefit of society in such areas as the environment, arms control, and science policy.

Howard Geller
American Council for an Energy Efficient Economy

David Goldstein
Natural Resources Defense Council

Citation: "For their significant contributions to enhancing efficient energy use, particularly for applying physics and economics to optimize energy-efficient appliance standards."

Geller received his BS in physics from Clark University in 1977 and his MS in mechanical engineering from Princeton University in 1979. During and subsequent to his graduate work, he collaborated with faculty and researchers in Princeton's Center for Energy and Environmental Studies. In 1981 he established the American Council for an Energy Efficient Economy in Washington, DC, where he is currently the Executive Director. The Council is devoted to advancing energy efficiency as a means of promoting both economic prosperity 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.

Goldstein received his PhD in physics from the University of California at Berkeley in 1978. He has worked on energy efficiency and energy policy since the early 1970s, and currently co-directs the Energy Program at the Natural Resources Defense Council. He has worked with state-regional, and national organizations to develop and implement energy efficiency standards for new buildings and appliances. He also negotiated the agreements that led to the National Appliance Energy Conservation Act of 1987 and Amendments in 1988. A two-time recipient of the Champion of Energy Efficiency Award bestowed by the American Council for an Energy Efficient Economy, Goldstein was a founding director of the Consortium for Energy Efficiency.

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 physics and the development of electron-positron and proton colliders and for his importance as teacher and role model for many generations of scientists."

Sands received his BA from Clark University in 1940 and his MA from Rice University. He then worked at the Naval Ordnance and Los Alamos Laboratories, where he co-authored a book on pulse electronics. He received his PhD from MIT in 1948 for work on cosmic rays, and then joined the MIT faculty. In 1950 he moved to CalTech, where he helped build and used a 1.5 Gev electron synchrotron. He was the first to demonstrate the importance of quantum effects in electron accelerators; he proposed a high energy proton synchtrotron, using injection from a booster; and co-authored the Feynman Lectures on Physics. In 1963 he became Deputy Director for the construction and early operation of SLAC; worked on the design of SPEAR; and wrote a monograph on electron storage rings. From 1969 until 1985 he taught at the University of California, Santa Cruz, where he is now Professor Emeritus.

1998 OUTSTANDING DOCTORAL THESIS RESEARCH IN BEAM PHYSICS

Established in 1990 by the Division of Physics of Beams, this award is supported by the Universities Research Association. It is intended to recognize doctoral thesis research of outstanding quality and achievement in beam physics and engineering.

Bita Ghaffari
University of Michigan

continued on page 7

INTERNATIONAL NEWS

Workshop Explores Collaborations in Africa

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 Cheik Anta Diop in Dakar, Senegal reasoning that the applied aspects of such research held significant value for these nations and any potential collaborators. Both centers have also 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 Cheik 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 Lerch, APS director of international scientific affairs, is the need to establish communication 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 impulse 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 EPS, now rescheduled for early December 1998 in Dakar. The APS Executive Board agreed to endorse such a workshop at its November 1997 meeting. 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 medical lasers, applications of Raman and other spectroscopies to industrial pollution and other environmental problems, differential absorption techniques to detect atmospheric pollutions, 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.

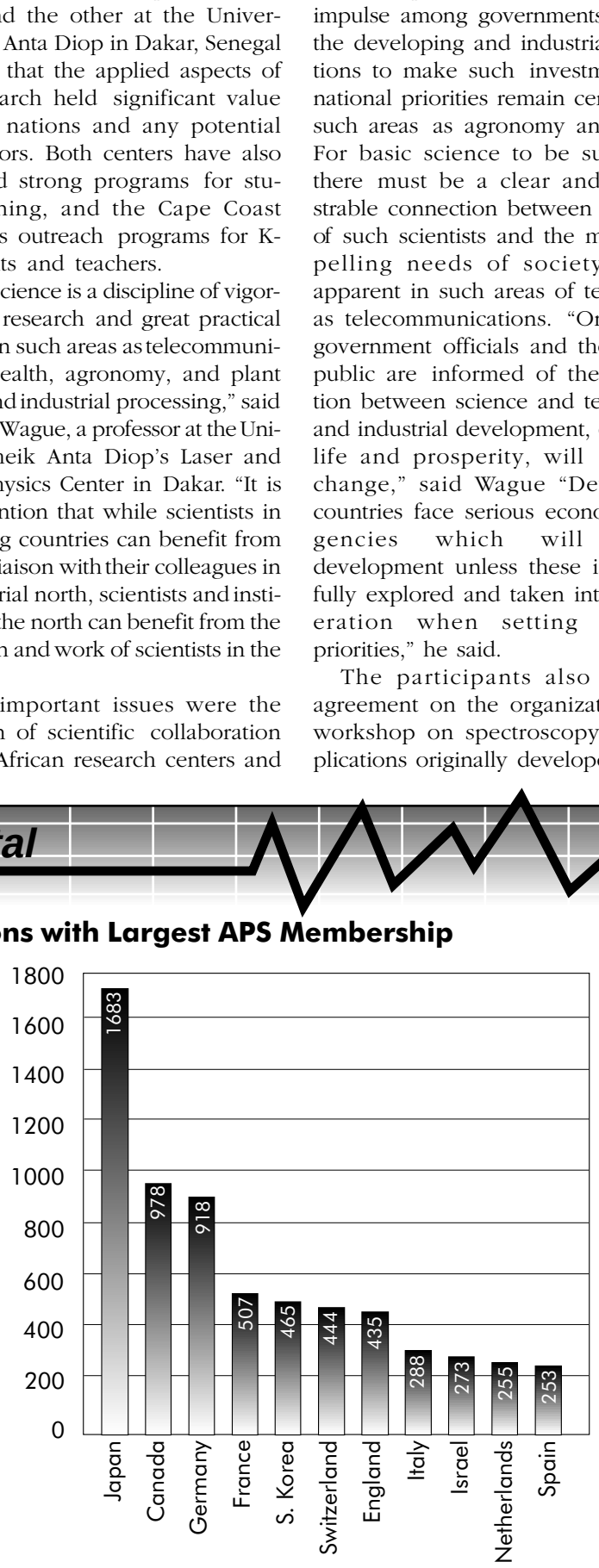
A program of long-term scholarly exchanges is also an important priority for numerous reasons. First, African scientists could materially contribute to the work of facilities in industrialized nations, thereby benefitting both themselves and their hosts. They would also be able to continue collaboration 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, broad band 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 necessicity for such a connection, and is consulting the largest commercial ISP provider in Accra about the most appropriate means of achieving the required connectivity.

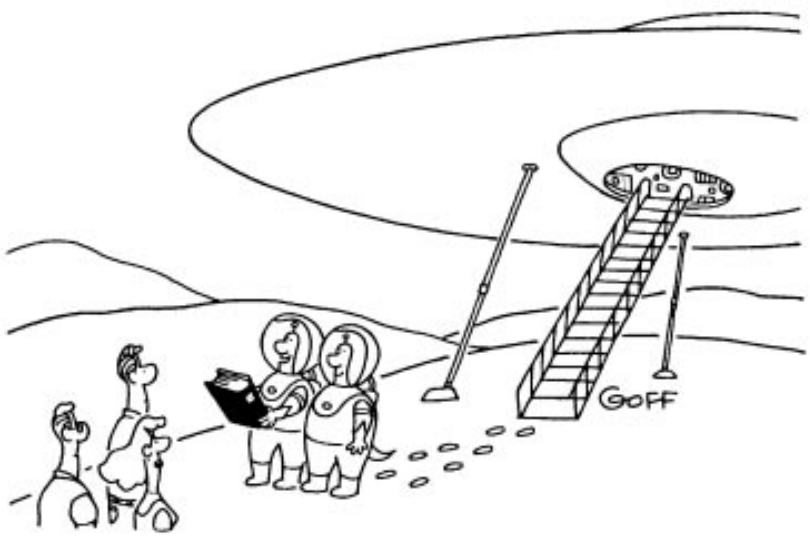
Seated: LLNL Physicist, Dr. Ronnie Shepherd. **Standing:** Prof. Ahmadou Wague from the Department of Physics at University Cheikh Amta Diop in Dakar, Senegal. **Location:** Ultra-Short Pulse Laser Facility at LLNL.

Factal

Nations with Largest APS Membership



Total APS membership is 40,767 of which 78% have mailing addresses in the USA and 22% reside outside the US. Eleven nations with the next largest APS membership are shown above. Central and South American nations with notable APS memberships include: Mexico (157), Brazil (148), Argentina (106), Chile (50), Venezuela (29), and Columbia (21).



"Here's your guide to the universe. You'll like this part: we used one of your software user manuals as a style guide."

IN BRIEF

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 convocation. The principal topic under discussion 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, meetings and newsletters, as well as the types of information services available for unit use, and a summary of current unit accounting and financial reporting procedures. Various APS officers reported on APS activities, finances and publications. The APS Centennial Staff, led by Franmarie Kennedy, Brian Schwartz, and Sherrie Preische, 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 don't think any science advisor 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 thought he should do more, Jack's term was not all sweetness and light. But Jack spoke forcefully for reasoned policy and legislation, and he will be remembered as a principled advocate for science in a time when irrational forces might have capsized 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," relating impact of the science and engineering research undertaken in the Arctic and Antartic regions on the rest of the world. Established in 1985 to increase general public awareness of the importance of science and technology, the event has since been expanded to include observance on national, regional and local levels.

The current program features public participation through extensive media coverage, and through public events and activities to engage audiences in science and technology, with the aim, in particular of attracting young people to science and engineering careers. Several sites in the NSTW Regional Network will be distributing Teaching Activities packets this month, containing innovative, hands-on science, mathematics and technology learning activities for students in elementary and middle school grade levels. Information on NSTW '98, as well as updates on scheduled plans and events, can be obtained by contacting the NSF, Room 1245, 4201 Wilson Boulevard, Arlington, VA 22230; phone: 1-800-682-2716; E-mail: nstw@nsf.gov. This information is also available on the NSTW Web site: http://www.nsf.gov/od/lpa/nstw/start.htm

OMISSION

The "In Brief" item on recipients of the NSF PECASE awards in the January 1998 issue of APS NEWS omitted two APS members who were honored: Daniel van der Weide of the University of Delaware, who was honored for his pioneering research on nanoscale-dimension electronic circuits and development of a Web-based virtual laboratory providing student access to advanced scientific instrumentation; and Daniel Lathrop of Emory University, who was honored for his innovative contributions to research and education of undergraduates in nonlinear properties of fluid interfaces relevant to understanding turbulence, optical fibers and black holes. The complete list of NSF awardees can be found at http://www.nsf.gov/pubs/1997/pr9765/pr9765.txt

New APS Fellows

Two new APS Fellows, nominated by the Forum on History, should be added to the list of new Fellows published in the March 1998 issue of *APS News*.

Schweber, Silvan S.
Brandeis University
Forum on History
For his deep analysis of the historical development of fundamental physics, particularly in this century, and its relation to the broader intellectual and social context.

Siegel, Daniel M.
University of Wisconsin
Forum on History
For his unique, detailed study of the nature and development of Maxwell's electromagnetic theory as a high point in nineteenth century physics.

Blume Q & A *(continued from page 2)*

and our editorial staff becomes significantly burdened as a consequence.

Q Is the APS still struggling with the issue of how best to handle pricing, as well as distribution, of its electronic products?

A Yes. The distribution of physics journals has been largely unchanged since the founding of the *Physical Review* in 1893. But we are in the midst of a revolution in the distribution of the results of scientific research, and physicists are playing a major role, both technologically and conceptually, in that revolution. One example of this is the CD-ROM version of the splendid centenary collection of two hundred important *Physical Review* papers, containing not only the 200 papers selected for printing, but also 800 more that were worthy of note, but which could not be printed without busting the budget and the backs of the librarians who have to shelve the volume.

The new electronic journal will be distributed without charge, and we are still exploring options of how best to finance the endeavor. At first we were looking at submittal charges and publication charges. The problem is that individual scientists have to pay this out of their research budgets. Then the idea came along that we go to a number of the largest accelerator laboratories and ask them for a contribution, in lieu of publication charges for their institution. So we are hoping to do this with sponsorship.

Q What would you personally like to see happen in the Society's publishing activities in the next few years?

A I would like to see greater communications in physics, especially in light of the fact that it's very difficult for many people to read *Physical Review Letters*. In fact, we've just engaged a science writer, David Ehrenstein, who will be writing a new all electronic journal service called *Physical Review Focus*. (See the article about *PR Focus* on page 1.) Initially, *PR Focus* will be a website with short readable versions of articles appearing in PRL. It is aimed at professional physicists, so that when you use the term "wave function," you don't have to explain it. This can go in a number of different directions and we expect to expand it, but we're starting modestly. At first there will simply be an electronic version.

Q What are some of the potential barriers to the future of electronic distribution of scientific information?

A Electronic distribution will not succeed if the Internet becomes a toll version of the Long Island Expressway. A robust, reliable, fast, cheap Internet is required for the entire electronic enterprise to work. Right now it is cheap, but neither fast nor reliable, especially where international transmissions are involved. Nor do we have assurance that the low cost will continue, particularly since telecommunications companies regard the Internet as a potential source of considerable revenue. In addition, improvements in connectivity are often matched by a disproportionate increase in public access, leading to reduced speed and even gridlock. It may therefore be necessary to arrange for an international research network separate from the public one. This was, of course, the origin of the Internet, and would simply take us back to its roots.

There are remarkable possibilities in the electronic future, but many economic, technological, and sociological potholes to be avoided if those possibilities are to be realized. The APS is intent on being in the forefront of the new era; we don't want to be the blacksmiths of this revolution. We must do this while maintaining the high quality of the published research that has been our focus for the past one hundred years.

Prizes and Awards *(continued from page 5)*

1998 DISSERTATION IN NUCLEAR PHYSICS AWARD

Established in 1985 by the Division of Nuclear Physics, this award is intended to recognize a recent PhD in nuclear physics.

Yury G. Kolomensky
University of Massachusetts

Citation: "For development and study of the positron trapping mechanism in a class of Penning traps, that is expected to impact future positronium and anti-hydrogen research."

Dr Ghaffari majored as an undergraduate in Research Physics and in Mathematics at Eastern Michigan University. She completed her PhD in 1997 with Dr. Ralph Conti as her advisor. She built and optimized a positron accumulator, intended for a series of atomic physics experiments with positronium. The anomalous efficient accumulation observed in this cylindrical Penning trap prompted detailed simulation of the charged particle behavior, leading to the discovery of chaotic transport in such systems. This work provided a physical explanation for the source of this transport and may be used to better understand and improve the performance of other charged particle traps and magnetic beams.

Dr. Ghaffari received the University of Michigan Terwilliger award for best dissertation in physics and the outstanding dissertation award at the 1997 International Conference on Positron Annihilation. She is working on further study of the nuances and possible application of this transport at Rice University.

Citation: "For experimental work employing spin-dependent deep inelastic scattering which resulted in the most precise determination of spin-dependent structure functions of the neutron and led to a better understanding of the dynamics of quarks and gluons."

Kolomensky received his BS degree in physics from St. Petersburg Technical University in Russia in May of 1991. He received his MS in 1994 and a PhD in nuclear physics from the University of Massachusetts in 1997. His thesis research was based at the Stanford Linear Accelerator Center, where he was involved in the precision measurements of the nucleon spin structure functions. Upon completing his PhD, Kolomensky joined the High Energy Physics group at CalTech as a postdoctoral fellow. His primary research interests are in conducting novel tests of the Standard Model. He is a member of the BaBar collaboration at SLAC, which will study the properties of CP violation in beta decays, and is developing software for the online system and particle identification.

1997 Apker Award

(Non-PhD granting Institution)

Cameron Geddes

Recipient of the 1997 Apker Award for undergraduate achievement in a non-PhD granting department will also be honored at the banquet at the April Meeting. See January 1998 issue of APS News for a description of Gedde's achievements.

In Recognition of Voluntary Contributions to the American Physical Society

The Following Programs are Funded Through Annual Contributions from Members

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 are special one-day programs for high school teachers operated by the APS in the locale of many of its national meetings.

Women and Minorities Speaker Programs. Subsidies are 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 used 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*.

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Announcements

Physical Review E Survey

A Task Force of APS, chaired by R. Stephen Berry of the University of Chicago, is currently carrying out a review of *Physical Review E*, part of the regular reviews of all APS journals. As part of this review, a survey is being sent to a sample of the APS membership including graduate students, subscribers, and recent *Physical Review E* authors and referees. It is also being posted online through the APS research journals home page [http://publish.aps.org/] for any and all interested people to pass their views on to the Task Force. In particular, even those who are retired, or have never subscribed to *Physical Review E*, or do not read it can still provide much information that would be useful to the Task Force in its examination of the journal and in making its recommendations. 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.

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
Davisson-Germer Prize
Dannie Heineman Prize for Mathematical Physics
High Polymer Physics Prize
Irving Langmuir Prize
Julius E. Lilienfield Prize
James C. McGroddy Prize for New Materials
Lars Onsager Prize
George E. Pake Prize
W.K.H. Panofsky Prize
Earle K. Plyler Prize
Prize to a Faculty Member for Research in an Undergraduate Institution
I.I. Rabi Prize
Aneesur 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 F. Keithley Award
Maria Goeppert-Mayer Award
Dissertation in Nuclear Physics Award
Shock Compression Award
Leo Szilard Award for Physics in the Public Interest
John Wheatley Award
Francis M. Pipkin Award
Nicholas Metropolis Award for Outstanding Thesis Work in Computational Physics
Dissertation in Nuclear Physics Award

CAUGHT IN THE WEB

Notable additions to the APS Web Server. The APS Web Server can be found at http://www.aps.org

APS News Online latest edition

APS Committees and Governance
- International Affairs page updated

Meetings
- March 1998 Meeting Virtual Pressroom with lay language papers
- 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

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. Many aspects of the dynamics, including light-hadron spectroscopy and phase transitions, can be associated with them.

Classical monopoles:
Newton, NUT-space, gravomagnetic lensing, and atomic spectra
D. Lynden-Bell and *M. Nouri-Zonoz* discuss various aspects of monopole dynamics, including the spectrum of the hydrogenic monopole and the effect of gravomagnetic monopoles on astronomical observables.

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 multipulse laser spectroscopy is used to elucidate phonon couplings in ferroelectrics.

Results from deuterium-tritium tokamak confinement experiments
R. J. Hawryluk 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 takes the reader on a journey through the history of the Moon-Earth-Sun three-body problem, starting with the ancient observations and ending with the post-Apollo ephemerides.

RMP Colloquia:
Renormalization group theory: its basis and formulation in statistical physics *Michael E. Fisher* presents his perspective on the conceptual origins of renormalization group theory and its roots 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

Rather than trying to predict what the world will be like in 2048, I want to focus on what I think society ought to be STRIVING FOR, over the next 50 years, in terms of four threats to human well-being on which current science sheds light and to which future science and technology, intelligently applied, can help provide the answers. Posed as challenges, the four issues I want to address are:

(1) Eliminating weapons of mass destruction;
(2) Meeting global energy needs while limiting the atmospheric concentration of carbon dioxide to less than twice its preindustrial value;
(3) Sharply reducing the global rate of loss of biodiversity; and
(4) Preventing the population of the planet from exceeding 9 billion people.

These challenges are interrelated (in more ways than there is space here to discuss); and they are all essential parts of the larger agenda of fashioning, over the next half century, an environmentally sustainable and politically stabilizing prosperity for all of the world's inhabitants. Failure in meeting any one of the four challenges is likely to put at risk that larger agenda and, in so doing, to risk denying to large numbers of our descendants the life-enhancing benefits that the advance of science and technology along other fronts would otherwise be bringing.

Weapons of Mass Destruction

The end of the Cold War has brought with it a widespread but alas wholly unwarranted complacency about the dangers still posed to the human condition by chemical, biological, and nuclear weapons.

To be sure, a global ban on chemical weapons has recently been agreed, joining a similar ban on biological weapons agreed 25 years earlier; more than 180 nations are parties to the recently indefinitely extended Nuclear Non-Proliferation Treaty; a comprehensive ban on nuclear weapons testing has been signed by most of the world's nations; and the United States and Russia are embarked on nuclear-force reductions that - assuming implementation of the START II agreement - will reduce the number of nuclear weapons in these two nations' stockpiles to between one-third and one-fourth of their respective peak Cold War values.

But, the world does not yet have in place either the technology or the institutions for reliable monitoring and verification of compliance of either the chemical or the biological weapons convention; the safeguards on nuclear facilities that could be used to violate the Nuclear Non-Proliferation Treaty are far from comprehensive; it is quite clear that a number of countries have violated these agreements or intend to do so (and, of course, some others never signed them); even after START II the United States and Russia may retain something in the range of 10,000 nuclear weapons each; and the danger of "leakage" of nuclear bombs or bomb-usable materials into the hands of terrorists or black marketeers has quite clearly GROWN in the post-Cold-War era, largely because of reduced reliability of the protection for these deadly commodities under current conditions in Russia.

Meanwhile, the United States - while it denounces the aspirations of potential proliferator states to acquire weapons of mass destruction of any kind - continues to assert its own need and right to retain a nuclear arsenal of some size indefinitely, and so far has refused to renounce even the option of first use of its nuclear weapons against nonnuclear threats or attacks. We do not seem to be much troubled by the inconsistencies of asserting a need and right for the United States to wield weapons of mass destruction while denying that any nation besides us and the four other officially certified nuclear-weapon states has reason or right to possess such weapons — whether nuclear, chemical, or biological — including the reason of wanting them as a counter to ours.

I am not asserting here that there is no political or military advantage to the United States from being able to threaten to use nuclear weapons against a country that does not have them, as we have implicitly threatened Iraq more than once. I am simply asserting that those advantages come at too high a cost. The cost of ANY country's insisting on retaining weapons of mass destruction of ANY kind is the provision of a continuing incentive to MANY countries to acquire weapons of mass destruction of one kind or another.

I believe the logic of this is implacable. In the long run, we are either going to have a world in which NO nations have weapons of mass destruction, or a world in which MANY nations do. And, in a world in which many nations have these weapons, the probability that some of the weapons will be set off (whether by accident or by design, by nations or by terrorists) becomes much too large. If we cannot get rid of weapons of mass destruction in the next fifty years, there will be too high a chance that they will get rid of altogether too many of us.

Of course, to confidently verify a prohibition of nuclear weapons will require large improvements in the science and technology of verification, as well as a general increase in transparency and openness in scientific, industrial, and governmental activities around the world. The most pains-taking protection and monitoring of all nuclear-weapon-usable 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 weaponry 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, some of it emitted by deforestation but mostly coming 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 atmospheric concentration will reach 365 parts per million, 30 percent above the preindustrial level. Under "business as usual", annual emissions from fossil-fuel burning in 2048 would total around 15 billion tons of carbon per year, and the atmospheric concentration of carbon dioxide would reach 500 to 550 parts per million. The momentum of the business-as-usual trajectory, moreover, would be carrying us rapidly toward a tripling or more of the preindustrial concentration in the second half of the next century.

Growth of this magnitude in carbon-dioxide concentrations, combined with hard-to-avoid increases in other greenhouse gases such as methane and nitrous oxide, is likely to entail severely disruptive changes in climate in many regions, including the United States. The productivity of farms and forests, the patterns of disease, the magnitude of damages from storms and floods, and the livability of our cities in summer are all likely to be adversely affected.

In the decades ahead we need simultaneously to try to better understand these climate-change liabilities, through increased investments in the science of climate and climate-change impacts, and to reduce the probability of intolerable outcomes by using advanced technologies to move off of the "business as usual" emissions trajectory to a much lower one. It will be extremely difficult to do much better than holding atmospheric carbon dioxide to a doubling of its preindustrial concentration; but it will 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 use of lower-carbon and zero-carbon energy sources (renewables, fusion if we can make it work, and fission if we can fix the problems that have afflicted it) and through capture and sequestration of the carbon dioxide from the fossil 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 10 million and 30 million, of which fewer than two million have been identified and named. There is reason to believe that the rate of extinction of species is in the range of 1,000 times (give or take maybe a factor of 10) the average extinction rate prior to major human influence. The Global Biodiversity Assessment estimated that 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.

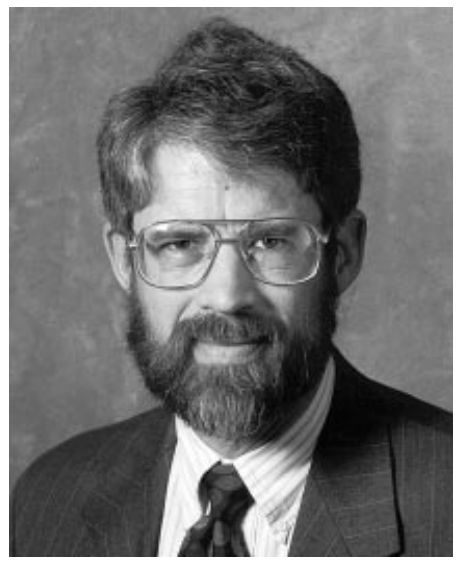
The species making up the biota are the indispensable foundation of the environmental goods and services on which, no less than on economic goods and services, the well-being of every person on the planet depends: the cycling of nutrients, the building and maintenance of soils, the purification of air and water, the natural control of many agents and vectors of human disease, and much more. This biodiversity also constitutes a vast library 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 residing in the coevolved complexity 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 tremendous task for our technology and our institutions in arranging to meet human needs and aspirations for increased economic prosperity without destroying the indispensable foundation of well-being provided by the biota.

Population

In mid-1998 there will be about 5.9 billion people on the planet, nearly two and a half 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 we saw in the last 50. Instead, barring nuclear war or global pandemic, the figure in 2048 will probably be between 8 billion and 10 billion people...and by 2098 between 9 and 12 billion. Most of the challenges that civilization will need to overcome in the next century — particularly the challenges of supplying sustainably the food, water, 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 if 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 improvable — contraceptive technologies 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 it) 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 the institutions of public-policy formation that would need to be energized in order to mount a serious attack on these problems. And it says something, finally, about our educational system, which clearly needs to do better in developing the skills of the populace in relation to numeracy, earth-system science, interdisciplinary thinking, and envisioning both the consequences of a "business as usual" future and pathways toward more promising alternatives.

Based on address at 150th Anniversary Meeting of the American Association for the Advancement of Science, Philadelphia, 15 February 1998.

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