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Highlights from Washington, DC

Atom Laser, CEBAF Results Mark 1997 Spring Meeting

Approximately 1,500 physicists assembled in Washington, DC, for the 1997 Joint Spring Meeting of the APS and the American Association of Physics Teachers (AAPT), 18-21 April. The most varied of APS meetings because of the number of APS divisions represented in the program, the Spring Meeting explored current topics in particle physics, astrophysics, fluids, particle beams, physics of beams, nuclear physics, applications, and atomic, molecular and optical physics.

Topics of technical sessions included the first experimental results from the Thomas Jefferson National Accelerator Facility, formerly CEBAF (see page 2); the first detailed energy spectrum of an active galaxy nucleus (see page 4), and the world's first atom laser, using a Bose-Einstein condensate as its center (see page4). General interest sessions included such topics as the biological effects of low-dose radiation, the future of science and technology in North America (see page 4), trends in federal support of science education, and highlights of the 100-year anniversary of the discovery of the electron. In addition, the AAPT organized several sessions devoted to issues in education, some in conjunction with APS committees or units, including a Monday morning session devoted to national science education standards, co-sponsored with the APS Forum on Education (FED).

Another prominent feature was a special plenary session on Sunday afternoon. The session was led off by a stirring memorial of C.S. Wu by colleague T.D. Lee. This was followed by an address by APS Past President Robert Schrieffer of the National High Magnetic Field Lab in Florida, reviewing the many ways in which high-temperature superconductivity is more complicated than its colder counterpart. Michael Turner of the University of Chicago and Fermilab addressed what he calls the two most pressing issues in cosmology today: the nature of dark matter and the origin of the tiny inhomogeneities (perhaps starting out as tiny quantum disruptions or fluctuations) that would later grow into the galaxy clusters observed in the present universe. Finally, Mark Spano of the Naval Surface Warfare Center discussed progress in understanding, and even controlling, chaos. These studies have already been usefully applied to actual physical systems such as lasers, chemical reactions, combustion engines, hearts, and brain tissue.

On the Wednesday evening prior to the start of the meeting, the APS organized an exhibit and reception featuring recent applications of fundamental physics. Scientists from laboratories around the nation presented information on global positioning, medical instrumentation and optical communications, as well as such future technologies as laser tweezers, Bose condensates, scanning tunneling microscopy, and nanotechnologies.

The traditional ceremonial banquet for the bestowal of prizes and awards was held Saturday evening, preceded by a reception hosted by APS President D. Allan Bromley (Yale University). Fourteen APS prizes and awards were presented, and the recipients gave lectures on their respective award-winning topics at various sessions throughout the week. Citations and brief biographies of the recipients appeared in the April 1997 issue of *APS News*.

Margaret Mary Murnane received the Maria Goeppert-Mayer Award

Technical Sessions

Search for Neutrino Oscillations

Two years ago at this meeting a group of physicists from Los Alamos presented evidence for neutrino oscillation, the transformation of neutrinos from one type to another, in an experiment in which a beam of neutrinos strikes a target. The Los Alamos team, represented by William Louis, and the collaboration at the Super-Kamiokande neutrino detector, represented by Kenneth K. Young of the University of Washington, recently concluded major new data analyses. Kamiokande also searches for neutrinos from the sun, from distant supernovas, and from the decay of protons. Based on the first 100 days of research in Japan, Young reported that there are hints that not only does the neutrino have mass and can change its form ("flavor"), but it may also be more abundant at night than during the day, and more plentiful during certain times of the year. If the neutrino is found to have mass, it could constitute part of the dark matter that is believed to comprise as much as 90% of the universe.

Anti-Hydrogen Atoms

David Christian of Fermilab reported on an experiment in which anti-hydrogen atoms are produced when a gas jet is passed through an antiproton beam. Anti-atoms are produced at a rate of about one atom a day when the machine is on. Although these atoms (like those produced at the CERN lab in Geneva) have not been captured, a plan has been formulated at Fermilab for both increasing the production rate and for passing newly-made anti-H's through a strong magnet which will help to differentiate different excited-state species. At a later session, Walter Oelert of the Julich Institute of Nuclear Physics, a participant in the CERN experiment, reported on further analysis of his data and discussed the future of anti-hydrogen research at CERN, which recently announced that it will build a new facility, the Antiproton Decelerator, partly for this purpose.

Proton-Neutron Correlations

It is a little-known fact that all nuclei are superconductors, with protons that pair up with other protons and neutrons that form pairs with other neutrons. In nuclei with equal numbers of neutrons and protons, physicists believe that neutron-proton pairs can form to create a new kind of superconductivity. According to Stuart Pittel, who spoke at a Saturday morning session, these superconducting effects are believed to influence the mass of nuclei such as Chromium-48 or Tin-100 (with equal numbers of protons and neutrons) and affect the rate at which proton-neutron pairs flow between nuclei which are close together. The proton-neutron correlations are also expected to be important for single- and double-beta decays, radioactive processes in which

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APS Spring Meeting Incorporates CAM'97

Beginning in 1994, the APS, the Sociedad Mexicana de Fisica (SMF) and the Canadian Association of Physicists (CAP) agreed to hold periodic joint meetings for the purpose of bringing together the North American physics community. Held concurrently with the usual program of the Joint APS/AAPT April Meeting in 1997, CAM97 (for Canadian-American-Mexican physical societies) represents the third in a series of these joint meetings. The first was held in Cancun in September 1994, followed by a second meeting, held in Quebec City, June 1995, in conjunction with the 50th anniversary congress of CAP.

At CAM97, physicists from the three North American Societies participated in a variety of sessions and forums on science and society. A special plenary session honoring these cooperative ventures was held on the first day of the meeting (see page 8). Entitled "The Future of Science and Technology in North America," the session's keynote speaker was Dr. Mary L. Good, under secretary for technology of the U.S. Department of Commerce's Technology Administration. Good stressed the need for initiating and strengthening partnerships among the public and private sectors and academia as a means of enhancing US participation in the rapid

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CAM session speakers Beverly Robertson, Mary Good, D. Allan Bromley, and Carmen Cisneros (at microphone).

About 1,000 APS Spring Meeting attendees going to the CAM reception at the Smithsonian Institution.

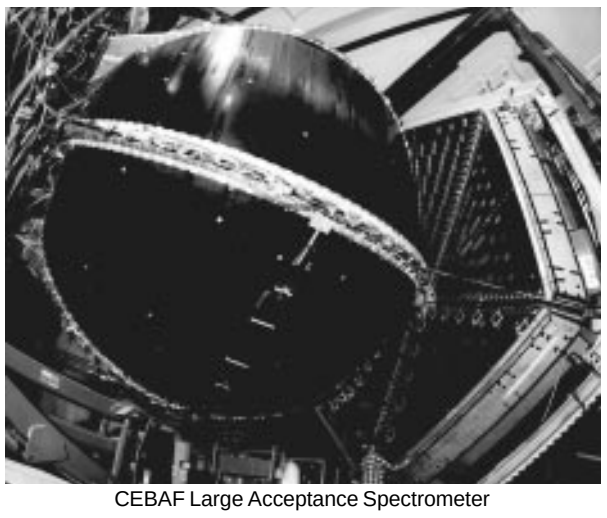
IN THIS ISSUE

Scientists Report First Experimental Results from Jefferson Lab

Certain to be one of the most important new experimental nuclear physics facilities in the world, the Thomas Jefferson National Accelerator Facility in Newport News, Virginia, produces high energy electron beams that collide with nuclei in order to study the boundary between the physics of the nucleus and the physics of protons and neutrons (composed of quarks held together by particles known as gluons). At a Friday afternoon session at the APS/AAPT Spring Meeting in Washington, DC, researchers presented some of the first experimental results obtained from Jefferson Laboratory by four large team-conducted projects. The experiments, selected by a panel of internationally prominent physicists, focused on achieving a definitive quark-based understanding of the atomic nucleus.

The main machine at the $600 million laboratory is the Continuous Electron Beam Accelerator Facility (CEBAF), an underground tunnel almost a mile in circumference which accelerates continuous streams of electrons to energies of 4 GeV. A maximum energy of 8 GeV is planned for the future. The electrons are then diverted to one of three experimental halls where they collide with fixed targets containing nuclei, while house-sized arrays of electronic data-gathering equipment track, measure and record what occurs. Director Hermann A. Grunder describes it as a research tool designed "not so much to smash atoms as to dissect them." Because the beams are continuous rather than intermittent, experimenters can avoid unwanted, confusing signals ("background noise") in the electronic evidence they are studying. "Instead, they can dissect nuclei with a scalpel-like precision unattainable in previous 'atom smashers,'" said Grunder.

Exploring how gamma rays break up deuterons, Haiyan Gao of Argonne National Laboratory presented measurements showing that the quark substructure inside the deuteron must be taken into account to properly understand the breakup process, known as "photodisintegration." The deuteron is a simple nucleus consisting of just a proton and a neutron, each made up of three quarks, which enables it to be probed for useful data without too much complexity. The probing was done with photons extracted from the electron beam. When a photon disintegrates a deuteron, all of the deuteron's quarks are temporarily forced into a cluster of pure quark matter. Deuterons were thus probed in 1968 at SLAC to provide proof that quarks exist. According to Gao, her experiment reproduced the old 1968 picture, enlarged it and clarified its details.


CEBAF Large Acceptance Spectrometer

Describing experiments in which electrons collide with hydrogen, deuterium, and carbon nuclei, Keith Baker of Jefferson Lab and Hampton University reported on the production of kaons, two-quark states that contain a strange quark. The experiments observed the transfer of electron energy to clusters of three ordinary quarks: two "up" and one "down." As the deposited energy causes one of these ordinary quarks to be stretched away from its partners, two exotic new quarks are formed: a "strange" quark and an "antistrange" quark. Together, the antistrange quark and the stretched "up" quark form an easily detectable kaon, Baker reported. And when detected in the precise experimental environment of Jefferson Lab, kaons yield vital new data about how quarks are made out of energy and how antimatter is produced.

Finally, Rolf Ent of Jefferson Lab described how electron collisions with nuclei are ejecting protons at a greater rate than anticipated by theory, based on the recently completed baseline-establishing experiment on photon propogation in nuclei. This information is crucial to future experiments to test and validate quantum chromodynamics at high energies, where nuclei often behave differently than they do at lower energies. A team of scientists from Caltech conducted an inclusive electron scattering experiment from nuclei which also helped prepare a baseline for interpreting deviations from conventional expectations that QCD predicts will appear at high energy.

APS Units Have Option of Holding Electronic Elections

The APS Executive Board approved a motion at its April meeting authorizing APS units to conduct electronic elections, provided that unit members are assured of the opportunity to vote whether or not they have Web access, and that procedures are in place to prevent members from inadvertently voting more than once. The decision was based on a report from the APS Forum on Physics and Society (FPS). FPS requested permission last November to conduct an experiment for one election with a combined paper and Web page ballot, which took place between December 1996 and early March 1997. The experiment was very successful. Voter turnout rose to 18 percent, compared with the 5 to 8 percent in recent years, and the procedure did not prove to be excessively time-consuming.

The turnout for annual APS elections within the units is generally low, usually below 20 percent of the eligible membership, according to Barrett Ripin, APS Associate Executive Officer. Marc Sher of William & Mary College, a member of the FPS Executive Committee initiated the electronic election effort. He believes a significant factor in the low member participation is the large number of steps it takes in order to vote. "One must get the ballot, find the candidate statements, read them, vote, find an envelope, and address, stamp and mail it," he said. "Allowing voting via the Web reduces the number of needed steps, thus improving participation." An online ballot enables voters to make their choices with a few clicks of the mouse, with candidate statements and biographies linked to their names on the ballot. The Texas Section of the APS tried a different approach to electronic balloting. In their election last fall, they sent email ballots to members with email addresses on file and paper ballots to all others. Their ballot return rate also approximately doubled from traditional paper-only elections.

Of course, issues about security and anonymity when voting electronically were of paramount concern. To that end, Sher designed a system in which two files are made when processing a vote. One contains the name and email address of the voter, as well as the machine IP number they voted from and time of vote, and assigns a voter number. The other file contains only the voter number and which votes were cast. Because one can't determine for whom any individual voted without looking at both files, Sher believes it is at least as anonymous as the current paper system. The system also automatically checks for duplicate votes. Requiring an APS membership number would further improve security, but since many APS members don't know what their number is, this would defeat much of the purpose of electronic elections, according to Sher.

Units interested in holding electronic elections may contact APS Executive Officer Judy Franz for guidance. Sher has software available for this purpose.

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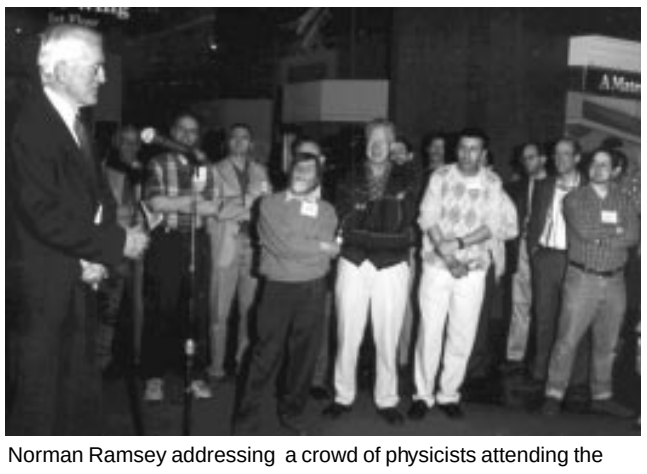
CAM'97 *(Continued from page 1)*

globalization of today's R&D climate. She was followed by remarks from the three CAM Society presidents: Dr. Carmen Cisneros (SMF), Dr. Beverly E. Robertson (CAP) and Dr. D. Allan Bromley (APS).

A special reception honoring the CAP and the SMF was held at the National Museum of American History of the Smithsonian Institution on Saturday evening of the second day of the meeting. Exhibits included commemorative displays celebrating the 100th anniversary of the electron and the 50th anniversary of the transistor. The reception was open to all meeting registrants and featured a short program which included remarks by the three society presidents and reminiscences about J.J. Thompson, discoverer of the electron, from Dr. Samuel Devons of the Nevis Laboratory at Columbia University and Dr. Norman F. Ramsey of the Lyman Physics Laboratory at Harvard University.


Norman Ramsey addressing a crowd of physicists attending the April Meeting Smithsonian Institution Reception.

INSIDE THE BELTWAY

Scientists and Politicians Joined at the Hip

by Michael S. Lubell, APS Director of Public Affairs

For politicians as well as physicists, life after the end of the Cold War is fraught with complications. Public attitudes have changed dramatically, and woe unto anyone who fails to recognize it.

For more than four decades the threat posed by Communism provided an umbrella under which physics research flourished in America. What was good for physics was good for national defense and good for the nation. The public forgave the scientific elite their eccentricities and their arrogance so long as America remained secure.

American politicians also had an easier time during this era. The Iron Curtain might have been maintained by our Soviet adversaries to keep the Russian and Eastern European people in the dark, but it also provided wonderful political cover for our own elected officials. So long as they cloaked their actions under the guise of national security, they could expect the average American voter to forgive them many of their transgressions.

Welcome to the 1990's. The external threat is gone and the public memory is short. American voters have become more fickle and less tolerant of actions they don't immediately perceive as being in their best interest. For scientists and politicians, alike, the message is clear: Shape up or be shown the door.

The message seems to be getting through. For both communities, 1997 is rapidly becoming a watershed year. Scientists have long been known in Washington for building protective walls around their individual disciplines and, when necessary, taking dead aim at their colleagues in other allied areas. But last March, in an unprecedented display of unity, the leaders of 23 professional societies agreed to break down the internal barriers and endorse a Joint Statement on Scientific Research.

By June, the list of endorsements had grown to 46. Members of the media and members of Congress, many of whom had greeted the initial announcement with skepticism, had begun to take notice. And with good reason.

The message had substance. The sciences are interdependent, and federal investments in research, which are critical to our nation's future economy and quality of life, have been on a precipitous downward slide. What is needed is a commitment to reverse the trend, beginning with a 7 percent increase for Fiscal Year 1998.

The message also had clout. More than 1.5 million scientists, mathematicians and engineers were singing from the same score. Translate those numbers into votes and you can see why Capitol Hill might pay attention.

Fortuitously, the message struck a political resonance. After two years of lobbing grenades at each other, both parties paused to take stock of the damage they had inflicted and discovered that neither had suffered so much in the eyes of the public as had the institution of democracy itself. For his part, after the 1996 ballots had been counted, President Clinton said that he was committed to seeking common ground. So too did the Republicans, but they called it "bipartisanship."

Although science had not escaped the partisan battles of the 104th Congress, it had the advantage of a legacy of bipartisan support, lasting for almost half a century. It became a natural point around which both political parties could once again unite. The Science Committee, under the guidance of its new chairman James Sensenbrenner (R-WI), reported out a series of authorization bills with virtually no internal dissent. The committee recommended increases for R&D that averaged 3 percent, with some basic research programs exceeding 7 percent.

The Senate, too, began to respond to the science drum beat. At the suggestion of Bill Frist (R-TN) and with the cooperation of Joseph Lieberman (D-CT), a bipartisan Senate S&T Caucus came to life, its initial membership filled out by Pete V. Domenici (R-NM) and Jay Rockefeller (D-WV). And early in the congressional session, Phil Gramm (R-TX) offered a resolution that would double federal investments in civilian research over ten years, which amounts to a 7 percent annual boost.

The President also began to send out strong signals. Having barely mentioned science during his first term, he began to interject it into his speeches. By late spring it had achieved sufficient prominence to become a central theme of his Morgan State commencement address. (see Back Page, pg 12)

Of course, speeches, resolutions and even authorization bills do not produce tangible results. It's the appropriations bills that tell the real story. As 1996 Oscar winner Cuba Gooding, Jr. said in *Jerry Maguire*, "Show me the money!"

And here science is on a collision course with the political realities of the 1990's. Without the cover of a foreign threat, lawmakers are under the domestic gun to reduce taxes, cut the deficit and preserve popular programs, all at the same time. Omit one of these, and you're dead politically.

Ask George Bush, who preserved entitlements and put into place a 5-year $593-billion deficit reduction plan. But he raised taxes, and he lost the Presidency as a result.

Ask Bill Clinton, who preserved entitlements and put into place a 5-year $487-billion deficit reduction program. But he did not deliver a middle-class tax cut, and the Democrats lost control of Congress in 1994.

Ask Newt Gingrich, who pushed bills through the 104th Congress to cut taxes and reduce the deficit. But he also made entitlements a target, and Bill Clinton swept to a second term in 1996, with the GOP nearly losing control of the House in the process.

Three lessons taught; three lessons learned. The result is the bipartisan budget deal that cleared Congress in June. It cuts taxes, purportedly shaves $204 billion from the deficit over 5 years and essentially preserves entitlements.

It also squeezes all the juice out of the discretionary orange, leaving science to vie for the remaining pulp with

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IN BRIEF

- A tentative program for the centenary celebration of the APS, to be held 20-26 March 1999 in Atlanta, Georgia, was presented to the APS Council at its April meeting. Plans currently include a symposium on the global impact of 20th century physics, two plenary sessions on the contributions and future of physics, and as many as 30 centennial symposia organized by individual APS units. Special events contemplated for the centennial include a Nobel Prize exhibit and dinner at the Fernbank Museum of Natural History honoring Nobel Laureates in attendance, a ceremonial dinner with a keynote address on the cultural impact of physics in the 20th century, physics exhibits and other events for students, teachers and the public throughout the week.

  A number of special projects are also under development to commemorate the event. For example, the APS is developing a centennial speakers booklet containing a list of individuals willing to give interesting colloquia with an emphasis on the historical, social, cultural and political impacts of physics. The list will cover a broad range of topics and include speakers from around the country and from academia, government, and industry. The booklet will be distributed to all physics departments and other interested institutions in the spring of 1998. A wall chart is being designed to point out highlights of physics advances of the past century. The wall chart, which will be quite large, four feet by twenty-seven feet, will be given to all high schools in the U.S. as a gift. In addition, the APS and AIP are jointly working to produce a coffee table book intended to capture the essence of 20th century physics, designed for the general public and distributed through commercial bookstores. Anyone with wonderful pictures of physics related activities should contact APS Executive Officer, Judy Franz.

- At its April meeting, the APS Executive Board approved a request by the APS Committee on Minorities (COM) to provide $5,000 to support an online archive of minority physicists, similar to the archive under development on contributions of 20th century women to physics. The site will be implemented at Hampton University. According to Cynthia Keppel, a COM member and professor at Hampton University who will be responsible for the archive, the APS funds will go toward purchasing a computer to house the website and providing a small stipend for a part-time student to help maintain the site, adding links, upgrades and managing any paperwork required to back up research reports. Hampton will hire a consultant at no cost to the APS to design the site, and will send out an initial call for submissions. The university's local Society of Physics Students club and its advisor (Keppel) will help research the submissions.

- In 1993, APS Council approved a motion to include the presidents or designees of certain foreign physical societies at Council meetings as international advisors. The original group included the Canadian Association of Physics (CAP), the European Physical Society, The Physical Society of Japan (JPS) and the Sociedad Mexicana de Fisica (SMF). This policy was revised last year. CAP and SMF, neighboring societies, will have permanent advisor status. But beginning this year, the president of the APS designates additional international advisors on an annual basis for his or her term of office. In addition to the presidents of CAP and SMF, APS President D. Allan Bromley invited the current president of the Chinese Physical Society (CPS), Dr. Chen Jia-er, and the president of JPS, Dr. Fumiko Yonezawa, to participate at Council at both the April and November 1997 sessions.

- Nine new members of the National Science Board (NSB) were confirmed by the Senate in May, and were sworn in by Jack Gibbons, President Clinton's science advisor. The newly confirmed members include: John A. Armstrong; Mary K. Gaillard; M.R.C. Greenwood; Stanley V. Jaskolski; Eamon M. Kelly; Jane Lubchenco; Vera C. Rubin; Bob Suzuki; and Richard Tapia. The National Science Board was established by Congress in 1950 to serve both as an independent national science policy body and to oversee and guide activities of the National Science Foundation (NSF). The board consists of 24 members and the NSF director, who is an ex-officio member. Members serve six-year terms. Full titles and affiliations of all NSB members may be found at http://www.nsf.gov/home/nsb/members.htm

- The median physicist is 46 years old and makes $65,000 a year, according to a report issued in April by the AIP Education and Employment Statistics Division, entitled, "Society Membership Survey: Salaries 1996." Those who work at federal labs made the most (median $78,500), even more than in industry (median $77,000); those at 4-year colleges made the least, with a median of $49,200. Geographically, median salaries ranged from $70,000 (Pacific states) to $56,200 (East South Central). New PhD's earn $31,000 at universities and $39,600 at federal labs. Salaries for female physicists who have earned their PhD in the past 10 years are comparable to salaries for male physicists with similar experience. A copy of the report can be obtained from the AIP Education and Employment Statistics Division, 301-209-3069; email: rchu@aip.acp.org.

- The American Institute of Physics has signed an agreement with Springer-Verlag New York, Inc. under which Springer will publish and distribute AIP Press books worldwide. Springer will build upon its physics book publishing programs by this new addition. Under this agreement, Springer acquired the AIP Press current and backlist titles and will distribute them internationally under the dual logos of Springer and AIP Press.

Researchers Report on New Results for BEC Experiments

Since 1995, scientists have been creating a new state of matter, Bose-Einstein condensates of atoms, in which a sufficiently densely packed collection of gas atoms is cooled to such low temperatures that they enter a single quantum state and effectively act as a single entity, or "superatom." During a Sunday morning session at the APS/AAPT Spring Meeting in Washington, DC, three researchers spoke on the latest results from recent experiments using BEC condensates, which were first predicted by Albert Einstein in 1925.

Randy Hulet of Rice University reported that BECs of lithium atoms are different from other BECs in that the lithium atoms attract rather than repel each other, and are limited to a size of approximately 1500 atoms. According to some predictions, adding more atoms than this would cause the BEC to undergo a "macroscopic quantum tunneling," in which the condensate would collectively transform from a low-density to a high-density state, forming molecules which would then release excess heat and cause the BEC to blow apart.

Hulet said that the observation of a limited condensate number is already an indication that this phenomenon is happening, but the Rice team is attempting to directly observe the collapse and its aftermath. "Physicists are excited because of the opportunity to study quantum mechanics on a macroscopic scale," he said, adding that this tunneling effect usually applies only to single microscopic particles, not to collections of many atoms, like a BEC.

Studying BECs of rubidium atoms, Eric Cornell of NIST and the University of Colorado discussed experiments confirming that BECs are significantly more uniform in density than comparable clouds of cold atoms in a non-BEC state. He also described how the frequencies of sound waves in BECs unexpectedly depend upon temperature, something which current theory does not explain. The results were obtained using a double-magneto-optic trap (MOT) system, which increases the number of atoms in the condensate by multiple transfers between two connected MOTs. Cornell's team also condensed both spin states of rubidium using a sympathetic cooling technique, and studies the interactions between them.

Eric Cornell and Wolfgang Ketterle accepting the 1997 APS I.I. Rabi Prize from APS President D. Allan Bromley.

Using laser light to excite a specific spot on his cigar-shaped BEC of sodium atoms, Wolfgang Ketterle of MIT described how the resulting disturbance in a typical condensate propagates at about 5 millimeters per second, roughly 70,000 times slower than the speed of sound in air. In one experiment, two condensates were created in a double-well potential formed by magnetic and optical forces. After switching off the potential and letting the condensates expand and overlap, the MIT group observed high contrast matter-wave interference fringes, demonstrating that Bose condensed atoms are coherent and show long-range correlations. Ketterle presented videos of the world's first "atom laser," first announced in January 1997 — a device that produces coherent beams of atoms highly analogous to laser light beams.

DPB/FIAP Session Explores Industrial Applications of Neutrons

Since the earliest experiments defining the properties of the neutron, accelerators have played an important role in providing neutrons for research and applications. Various researchers described specific examples of how neutrons are used for engineering magnetic materials, for measuring stress in machine parts, and for studying polymer processes in real-time during a Sunday morning session at the APS/AAPT Spring Meeting in Washington, DC. The session was jointly organized by the APS Division of Physics of Beams and the APS Forum on Industrial and Applied Physics.

Neutrons have provided an incisive tool for investigating the structure and morphology of materials ranging from complex fluids to magnetic multilayers to superconductors. Virtually every microscopic-level detail that is known about magnetic materials has been learned by scattering neutrons from them. For example, little would be known about excitations in quantum fluids, the spin-density- wave state of chromium, electronic back-donation in the bonding of organometallic compounds, or the conformation of proteins and DNA in nucleosomes without neutron scattering. This is because neutrons not only can penetrate deeply into materials, but they also have a magnetic moment which can probe an object's magnetic properties.

For many years, neutrons produced at accelerator facilities have complemented capabilities available from reactor-based sources. Now, however, according to James B. Ball (Oak Ridge National Laboratory), with the declining availability of reactor facilities, upgrades of existing accelerator facilities and proposed new, more powerful accelerator-based sources will be called upon to provide the necessary neutron capabilities. In April 1997, the APS Council issued a statement that expressed concern about an impending shortage of state-of-the-art neutron source facilities in the U.S. The text of this statement may be found on the APS home page (www.aps.org) under the Governance button.

Argonne's IPNS and the ISIS facility at Rutherford Appleton Laboratory in the U.S. are the two most powerful existing sources. The addition of another target is under discussion for ISIS, but Ball reported that the prognosis for approval was "not too promising." Over the next few years, several new neutron scattering spectrometers will be built at the Los Alamos Neutron Science Center (LANSCE), with plans to increase the neutron flux by a factor of three. Ball also discussed plans for next-generation facilities, namely the European Spallation Source, and the National Spallation Neutron Source, a next-generation facility at Oak Ridge proposed to be constructed by 2004.

According to Thomas Russell of the University of Massachusetts, Amherst, unique insight into the characteristics of bulk materials can also be gained by neutrons. More recently, neutron reflectivity has emerged as a premiere tool for the study of surfaces and interfaces. However, the flux limitations of current reactor and spallation sources have limited studies to the static, equilibrium behavior of materials. The next generation of neutron sources will increase neutron flux levels by more than an order of magnitude, leading to unprecedented advances in understanding not only the static behavior, but also kinetic and dynamic responses of materials.

Increasingly in recent years, neutrons are being applied to strategic or applied research, and product development. Roger Pynn of Los Alamos National Laboratory described several recent experiments conducted at LANSCE in temperature and particle velocity measurement in reacting high explosives; radiographic imaging with protons; chemical bonding in metal-dihydride complexes; and the structure of thin adhesive layers. These experiments have found many diverse applications, from the manufacture of beer cans, the development of new ceramic-reinforced metallics for the aerospace industry, and dynamic imaging of weapons hydrotests.

Joel McKeown of AECL Accelerators reported on recent advances in linac-based technology for industrial radiation processing, including applications such as sterilization and food irradiation. There are currently three such machines in operation, two of which are being used commercially.

Gamma Rays Provide Detailed Energy Spectrum of AGN

An excess of TeV-energy gamma rays from galaxy Markarian 421 may oblige astronomers to revise their models of active galactic nuclei (AGN). The discovery challenges existing concepts of the acceleration processes close to black holes and how radiation is absorbed in space, and indicates that the universe is not as opaque as previously thought.

Last year Mrk421 rewarded patient observers with the most explosive gamma display ever, with a flux ten times higher than that of the much closer Crab Nebula, the strongest known steady gamma source in the sky. At a Friday afternoon session at the APS/AAPT Spring meeting in Washington, DC, Trevor Weekes of the Whipple Observatory presented the first detailed spectrum for Mrk421. He reported that the flux of gammas falls off at the highest energies (up past 6 TeV), but not nearly as fast as one would have expected. Weekes suggested that the anticipated effect of two sources of attenuation, dust near the AGN and the amorphous population of infrared photons in intergalactic space, may have been overestimated.

The very-high-energy gamma rays from galaxies are produced in the interaction of cosmic particles of even greater energy with ambient particles or photons in the jets apparently emanating from each pole. These cosmic particles are accelerated by a process derived from the enormous gravity of a black hole to energies in excess of those attained by man-made particle accelerators. Theoretical astrophysicists have yet to explain the processes involved.

Even more difficult to explain is how the gamma rays, once produced, can escape from the jet without interacting with lower energy photos and degrading in energy as a result. Once clear of the galaxy, the gamma rays must traverse vast regions of intergalactic space, where they could be absorbed by interacting with infrared radiation from galaxies formed in the early universe. However, the recent observations suggest that the density of infrared photons is much less than previously predicted.

"We saw many more very high energy gamma ray photons from this source than we thought we would," said James Gaidos, a professor of astrophysics at Purdue University and a member of the research team. "We had believed there were more low-energy photons out there to absorb the gamma rays, but so many are getting through to us from such a large distance that it appears there's much less interaction taking place." Since low energy photons were created in the universe at the time of galaxy formation, the number of observed photons imparts information on how the galaxies formed. A reduced number of such photons thus has direct implications for current theories of the history of the universe, particularly for galaxy formation.

Many suspect that AGNs, quasars, and indeed all the most violent celestial objects in the universe share a common energy-production architecture: a black hole, supplied by a surrounding accretion disk, broadcasting powerful jets of matter in two polar directions. Mrk421 (400 million light years away) is the closest such object whose jet axis is aimed directly at us.

Because of the shielding effect of the earth's atmosphere, gamma rays must generally be detected by earth-orbiting gamma ray telescopes such as the Compton Gamma Ray Observatory. However, if the energy is sufficiently great (TeV) they can be seen indirectly with sensitive telescopes on mountain tops. Gamma ray collision with an air molecule generates a cascade of light-emitting particles which can be detected by large optical detectors such as the Whipple Observatory's 10- meter optical reflector.

Announcing the Carl E. Anderson Distinguished Academic-Industrial Fellowship

Carl E. Anderson

A special APS Executive Board luncheon program was held on April 18, 1997 to announce the Carl E. Anderson Distinguished Academic-Industrial Fellowship which will be made possible through a generous bequest by Dr. Charlotte Anderson in memory of her late husband. The program was held at the J. W. Marriott in Washington, DC and included a number of special guests who gathered with the Board to pay tribute to the accomplishments of Carl E. Anderson.

The annual fellowship will allow for academic-industrial interaction by many outstanding physicists in the field of lasers and optics, which was Carl Anderson's primary field of research. As chair of the special program, Allan Bromley applauded Charlotte Anderson for her appreciation of the opportunities afforded by greater academic-industrial interface. Having known Carl and Charlotte Anderson for 30 years, Allan Bromley related numerous examples of Carl's achievements in the field of laser technology. Others speaking on Carl Anderson's accomplishments and the importance of this fellowship included Nobel laureate, Nicolaas Bloembergen; Inge-Maria Ladenbauer-Bellis; Thomas Karras; Thomas McIlrath and Harry Lustig. In a brief biography of Carl Anderson written for the luncheon program by Thomas Karras, who was both a colleague and friend of Carl's, he states "Charlotte's desire to establish an APS fellowship in memory of Carl that emphasizes his area of work would certainly have pleased him. It encourages the work he enjoyed by people educated in the discipline he believed in."

D. Allan Bromley, Charlotte Anderson and Harry Lustig review the program to commemorate the occasion.

APS Matching Memberships Aid Physicists in Developing Countries

In many parts of Africa, Asia, Europe and Latin America access to information about physics and physicists is severely limited due to local economic conditions. Scientific meetings are far away and costly to attend, local university libraries are not well-stocked and telecommunication infrastructures are not widespread. A membership in the APS can help to bridge these gaps but, for most in this situation, a membership is simply beyond their means.

For example, at the current membership rate of $90 a year, a physicist at a university in Ukraine might have to pay a full month's salary - if he or she was actually paid during that month. Since 1983, the APS has offered an opportunity for these colleagues to participate in Society affairs and learn about other working physicists from around the world through the APS Matching Membership Program. Currently, over 250 physicists in 28 countries from Argentina to Uzbekistan participate in the Program.

Applications for Matching Membership are accepted at any time from physicists in eligible countries. Enrollment in the Program is based on a graduated dues structure or via the good will of an individual or institutional sponsor. Full APS membership benefits are included with some restrictions and membership in the Program is limited to six years to allow as many as possible to participate. In some cases, Matching Members continue their association with the APS and become full members when economic circumstances improve. Detailed information and applications are available from the Membership office (membership@aps.org).

The APS supports the matching membership program through member contributions to the APS Matching Membership Fund. Additional contributions to the Fund are needed and may be made by desigating it on the dues renewal invoice or by sending a check to The American Physical Society, One Physics Ellipse, College Park, MD 20740-3844 USA, Attn.: Accounting Department - Matching Membership Fund.

President Announces 1997 Medal of Science Winners

In May, President Clinton announced the nine 1997 winners of the National Medal of Science, recognizing exemplary work in such diverse fields as human genetics, mathematics, physical science, and cognition and learning. The winners include four long-standing APS members. Including this year's recipients, the Medal has been awarded to 353 distinguished scientists and engineers.

NSF Director Neal Lane, in announcing the names of the recipients of the nation's highest honor for groundbreaking scientific research, noted "It is important that the nation publicly repay its debt to these outstanding men and women, whose contributions to science have helped to advance human learning, fight disease and provide insight into the central questions of the nature of universe and humanity's place in it".

The National Medal of Science was established by Congress in 1959, and is administered by the NSF. The Medal of Science winners were announced simultaneously with those of the National Medal of Technology, administered by the U.S. Department of Commerce.

The four APS members receiving the Medal of Science this year are: Darleane C. Hoffman, director of the Glenn T. Seaborg Institute for Transactinium Science at the Lawrence Berkeley Laboratory, University of California at Berkeley, was recognized for her discovery of plutonium in nature and for her numerous contributions to the understanding of radioactive decay, notably of heavy nuclei.

Harold S. Johnston, professor emeritus of chemistry at the University of California, Berkeley, was cited for his understanding of the chemistry of nitrogen compounds and their role and reactions in the earth's stratosphere and in urban areas. His chemical and environmental research, have resulted in contributions to the understanding and conservation of the earth's atmosphere.

Marshall N. Rosenbluth, professor and research physicist, University of California, San Diego, was honored for his fundamental contributions to plasma physics, his leadership in the quest to develop controlled thermonuclear fusion, and his wide-ranging technical contributions to national security. He is noted for his theoretical studies of the behavior of plasmas and their instabilities.

Shing-Tung Yau, professor of mathematics at Harvard University, was recognized for his profound contributions to mathematics that have had a great impact on fields as diverse as topology, algebraic geometry, general relativity and string theory. His work has resulted in the solution of several long-standing and important problems in mathematics.

Inside the Beltway

(continued from page 3)

veterans hospitals, highways, water projects, housing and urban development, military personnel, and so on and so on. Who ultimately picks the fruit clean depends upon who can produce the greatest political muscle.

Scientists are learning how to compete, but, as Science Committee Chairman Sensenbrenner noted, "One press conference [on the Joint Statement] isn't going to change things very much." It's the follow through that counts, and that depends upon every researcher and every educator. Like it or not, scientists and politicians are finding themselves joined at the hip.

CORRECTION

The article on Cuban scientists who were denied U.S. visas in the May 1997 issue of *APS News* erroneously maintained that Dr. Carlo Trallero-Giner of the University of Havana was among those denied visas to attend scientific conferences in the U.S. This is incorrect. Dr. Trallero-Giner had not yet applied for a visa at the time of the article's publication.

Plasma Physics Brochure Available

The Division of Plasma Physics has published a lively 10 page brochure entitled *The Pervasive Plasma State* that describes the broad range of current areas of plasma science and technology research. This highly illustrated brochure is intended to give the educated nonspecialist an appreciation of the intellectual challenges in plasma research, as well as its many applications. Topics range from the role of plasmas in astrophysics to semiconductor processing. The text was written by James Glanz, who is currently a staff editor for *Science* magazine. The brochure was developed by the DPP's Interdivisional and Public Affairs Committee, chaired by Herbert Berk, University of Texas. The first printing of ten thousand copies has been widely distributed to government and agency personnel, scientists, colleges and schools. A second printing is underway. The brochure may be found on the DPP webpage which may be located through the APS home page [www.aps.org] under the Division button. Printed copies may be requested from Saralyn Stewart, DPP administrator, via email at: stewart@hagar.ph.utexas.edu.

On our planet, we inhabit a calm little oasis of ordinary solids, liquids and gases that is immersed in a perpetually blowing, roiling, flaring, erupting substance of a very different kind, called plasma.

OPINION

APS VIEWS

How Many Physicists are Enough?

by Barrett Ripin, APS Associate Executive Officer

Our colleges and universities are currently experiencing dramatic drops in the number of students enrolled in physics degree programs. While this appears to be a normal reaction to the well publicized difficulties young physicists have had gaining traditional physics employment, some fear that we may be experiencing an overreaction that may ultimately do a disservice to individuals, the academic infrastructure, and society.

According to surveys conducted by the AIP, physics bachelor degree production declined by more than 9% from 1994 to 1996. [See *APS News*, October 1996, pg. 5] Estimates, based on last year's junior physics major enrollments, are that the number of graduates this year will be smaller still, or about two-thirds of the peak production year, 1969. First-year physics graduate students, both of U.S. and non-U.S. origin, are also in steep decline, as can be seen in the figure below. The number of new PhDs awarded in the U.S. peaked in 1994 after a quarter century of steady rise. A further decline of new PhD production (greater than 25%) is projected over the next six years. Physicists are getting older, collectively as well as individually. The average age of full-time employed physicists is 46, up slightly from 44 in 1990.

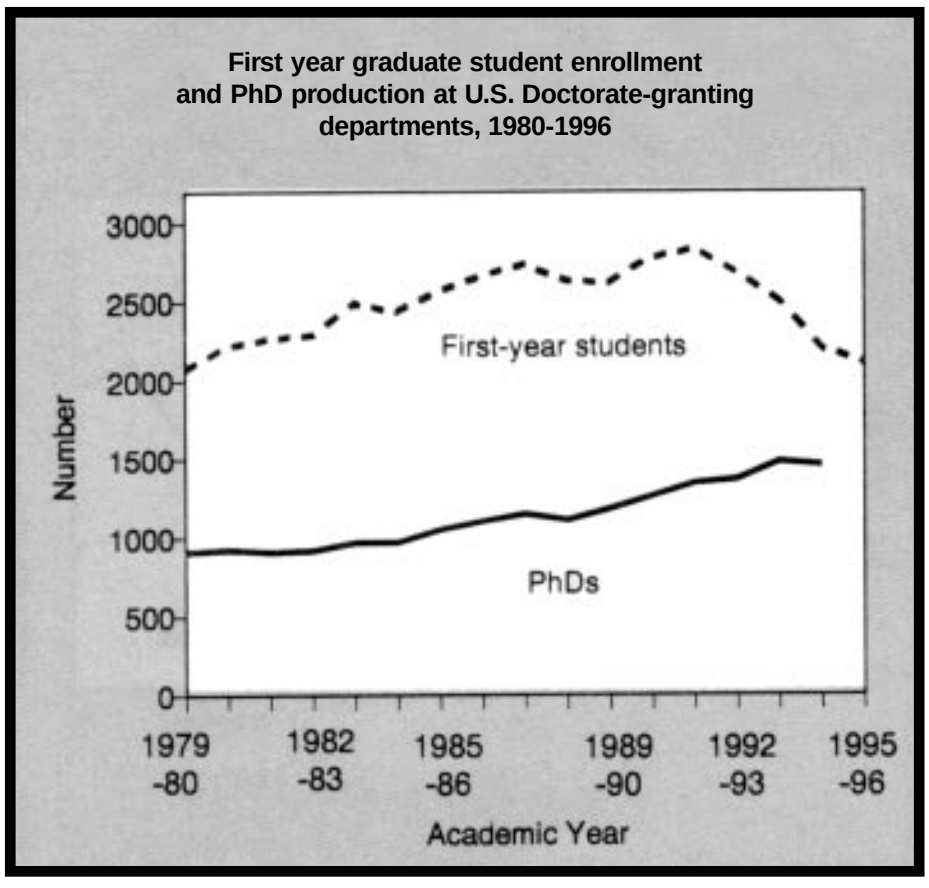
It doesn't take a rocket scientist (pardon the expression) to identify forces driving this. Prospective physics students are now well aware of lengthening times-to-PhD-degree and postdoctoral terms as well as the difficulties obtaining potentially permanent physics jobs in recent years. Competition from other exciting emerging areas, such as biological sciences, engineering, and information technology, etc., may also draw some talent away from physics.

Many think that these declines are a natural and necessary drop to a lower, more sustainable, level - a supply/demand thing. Others argue that we are vastly overreacting and are in danger of the pendulum swinging too far. They fear that overly publicizing past employment trends may cause unnecessary hysteria that will lead to a shortage of physicists, even in academia, in the near future. So, who is right?

There is no question that there has been a gross mismatch between career hopes of those entering physics programs and real world jobs. But, most physicists are not employed in academia, do not do basic research, and have a very diverse array of careers (applied or interdisciplinary research, technology and product development, engineering, management, government, law, finance, to name a few). This includes many of our best and brightest. Surveys show that physics degree holders at all levels typically express high satisfaction with their careers and that they become successful. This is true even when their jobs rarely call for their specific technical training. A recent Sigma Pi Sigma survey shows that BS physics recipients are in a particularly wide range of fields, perhaps due to their broad technical 'liberal-arts' training.

Should we counsel students to embark on a physics degree? Certainly those with a strong desire and capability to learn and do physics should be encouraged. At the same time, each needs to be made fully aware of employment/career trends and helped to develop a broad outlook on how they might ultimately use their physics training.

For more information see the APS Task Force on Career and Professional Development report (APS Home Page , www.aps.org, under the Career/Employment button). Comments and suggestions are welcomed.



[Courtesy of AIP Education and EmploymentStatistics Division, Report R-151.33]

LETTERS

Research Funding: An Increase, but for Whom?

While Michael Lubell, in his "Inside the Beltway" column (May 1997) praises the Congress for the across-the-board increase of 7% in research funding, it avoids altogether the critical question of how the research money is distributed. This unduly shifts the accent on the total funding and obfuscates the fundamental flaws of the peer review model in the allocation of the research funds.

It is getting progressively clear that the dominant model of funding allocation through the peer review "competition" between "proposals" adopted by NIH, NSF in the U.S., and the NSERC and MRC in Canada, has a coercive effect towards the sure-fire projects ("safe science") and all claims to the contrary notwithstanding, discourages real risk taking. As a result, many trendy grantsmanship empires are actually overfunded, while scores of other talented and capable researchers have no funds whatsoever.

To reflect the fundamental error-proneness of the peer review, the funding system needs to be radically redesigned towards the principle "Fund researchers, not proposals." In order to boost the efficiency of the research dollars we need to fund a lot more researchers (especially, junior) but on lower average levels. Such a reform, however, will threaten the power control of the grantsmanship elite and paper-shuffling bureaucracy and hence it is fiercely resisted by both of them.

Alexander A. Berezin
McMaster University

The cynical and destructive prose used by Michael Lubell in his "Paralytic Federalitis" article is of the exact type that leads countries straight into facism. Stale jokes and cynicism deprive the youth of hope. We get so much of that flippant, information deprived journalism from television and most of the press, that we do not need to have more from the APS. When an apparatus in our laboratories is malfunctioning, we sit down to discuss how to repair it, and we do not just sit there and laugh our heads off. If our political engine is sputtering, let us fix it or rebuild it, possibly starting from our own backyard.

Giacinto Scoles
Princeton University

Science and Religion Can Still Converse

The 1981 APS statement on creationism, which was recently reaffirmed by the APS Executive Board (*APS News*, May 1997) is essentially correct. It goes too far, however, in seeming to rule out any conversation between science and religion.

It is appropriate for the Society to take a public position on this matter. However, the last sentence of the statement is unhealthy overkill, neither necessary or accurate, and I hope that the Executive Board will give serious consideration to its omission: "Attempts to present [scientific inquiry and religious beliefs] in the same context can only lead to misunderstandings of both." Taken at face value, this means that science and religion simply have nothing to say to one another, in any context.

"Creation" is a religious, not a scientific, concept. But religious beliefs about creation involve the natural world, which science describes. Thus, religion and science have some subject matter in common, though they speak of it in different ways. To deny that religion and science have anything in common would mean that religion must be relegated to a purely interior spirituality or eliminated completely. Those are undoubtedly the private views of some APS members, but the Society as a whole should not endorse them.

George L. Murphy
Tallmadge, Ohio

The Board's statement, "…Scientific inquiry and religious beliefs are two distinct elements of the human experience. Attempts to present them in the same context can only lead to misunderstandings of both.", is seriously flawed. Both of these world views are foundationally philosophical and religious, not scientific - creationism starting with a belief in God (theism), and evolution starting with no God (the recognized religion of atheism). Neither creation nor evolution can ultimately be proven or disproven by the scientific method, since no scientist was around to observe the origin of life.

I cannot think of a better way to stimulate thinking and discussion in a classroom than to present two sides of a controversial issue! Statements like that of the APS Executive Board are signs that evolutionists are beginning to panic as the scientific evidence continues to mount against their theory. As the theory of evolution falls apart at the seams, the only logical alternative is creation.

John M. Cimbala
Pennsylvania State University

We Have Funding Choices

In your May issue on the Back Page, Senator Pete Domenici set up some convenient straw men to contend that the US faces an inescapable conflict between support for science and entitlement programs. He then attempted to recruit APS members in the effort to roll back entitlements. There is nothing inescapable about this choice. It stems from other more fundamental choices made by our political leaders for the nation.

As a minor example, discussing the availability of discretionary funds in the budget he states that, "Because defense requires almost half of the discretionary funds, we are left with about 17 percent to fund all the non defense programs, including the non defense science programs." "Required" is misleading.

OPINION

Blurring the Boundaries in Physics Education

by Stan Jones

Remember those boundary value problems from your electricity and magnetism course, the ones we also ran into in classical and quantum mechanics? I loved those problems. Really, I did. A well-defined boundary value problem has a unique answer, one you can find by standard techniques, and one whose validity you can easily check at the end.

There are many boundaries in the real world. Some are physical, some psychological, some bureaucratic, some sociological. Some are real, and some are imagined. Some we construct to make life simpler for ourselves, or to avoid the uncertainties beyond that border. There is a boundary to our "comfort zone," and until we cross that boundary, we do not grow. I want to talk about the boundaries I see in our system of physics education, and how some of these can truly get in the way of our goal of giving our students the very best we can.

Some of the physical boundaries that exist in physics education are the walls of our departments and buildings, or the confines of our company. Industrial scientists who want to have an impact on education are finding ways to reach beyond their institutions, by going out into the public schools, or by bringing the public into their outreach programs. Physicists at universities are finding they can learn from collaborations with other scientists and engineers, and that education faculty can teach us something about how students learn. They, too, are reaching out beyond the confines of the campus.

These physical boundaries are well-defined; it is clear what is inside our department or company, and where the outside world begins. The issue is how we define "our job." We can't make the mistake of allowing these boundaries to become barriers to our involvement in the larger world. There is a great need for better public understanding of science, and we serve not only the public, but ourselves as well if we venture beyond our "walls" to make our contribution.

At the undergraduate and graduate levels of physics education, I see boundary problems that are artificially set up; problems where the boundaries are not well-defined, and perhaps do not exist at all: the boundary between pure and applied research; between physics and other disciplines, such as chemistry; and between teaching and research. People have set up these boundaries in order to make physics and physics education a well-defined problem. They began disappearing some time ago in physics, but remnants remain, and for some educators they continue to get in the way.

In graduate training, we must decide what classroom experiences, and what research experiences, to give our students. What role should physics applications play? What is pure and what is applied physics is not always easy to identify. Many of the interesting research problems just happen to have real-world significance, such as materials, atmospheric physics, magnetic resonance, and so on. Many physicists have learned that there is no particular virtue in avoiding a problem just because it has applications. As funding sources have evolved, many scientists have recognized the wealth of interesting new physics discoveries waiting to be made in supposedly "applied" areas. In a sense, we have found that the need to define a problem as pure or applied is no longer significant. From an educational point of view, the fact that research has an application does not necessarily diminish its value as physics. Our graduate curricula must recognize and incorporate this reality.

In exploring the interesting properties of matter in its varied forms, physicists have found common interests with chemists, engineers, mathematicians, biologists, and more. To say that a problem is physics and not, for instance, chemistry, is often a distinction we cannot make. Techniques are also blurred. There are some ways of approaching a problem that are clearly physics, some that are clearly chemistry; but the importance of making this distinction has faded. Insisting that the distinction be made can interfere with our ability to recognize and address very fundamental and intriguing questions. And many problems require an integrated, multi-disciplinary approach if we want to truly understand them.

Physics is a discipline where change is rapid and exciting. As educators, we must always be open to this same rate of change. If what we do changes rapidly, what we teach, and how we teach, must also be flexible enough to change. We must be ready to provide our students with an introduction to the new interdisciplinary ways of thinking. We must also be ready to help them explore problems that may not be as clearly "physics."

The third boundary is that between teaching and research. One of the finest ways to learn is by doing, and whenever students can become part of a research project, everyone benefits. Research can be teaching, and teaching can be research. We should be learning from our students: how they think, how they understand or misunderstand the principles we discuss. In so doing, we ourselves increase our understanding, and as we learn how students learn, we should be changing how we teach in order to be more effective. The debate over the relative priority of teaching and research, which has lasted through the ages, is based on a false dichotomy; the two go hand in hand.

I would argue that whether or not boundaries exist, increasingly it is those who go beyond the boundaries who are making the changes in this world. Willingness to ignore boundaries, whether real or imagined, marks the creative person. Defense of the boundaries is often a decision which binds one to the past.

Stan Jones is a professor of physics at the University of Alabama, Tuscaloosa. An earlier version of this article appeared in the Spring 1997 issue of the Forum on Education newsletter.

Georgetown Senior Rallies Students for Support of Science Funding

Alarmed by the prospects for aspiring physicists, a senior student at Georgetown University launched a Congressional letter writing campaign in May through the Society of Physics Students (SPS) to enlist students in a grassroots effort to secure their own futures.

A combined physics and government major who plans to pursue graduate study in public policy at Rutgers University, Daniel Benson conceived of the campaign as his senior project, fueled by his growing concern over declining federal funding for science and what he perceived to be a corresponding "anti-science" atmosphere in Washington. As the scientific community began to speak out in defense of science, "I thought there needed to be an equal effort on the part of the science majors, the students," he said. Georgetown's physics department sponsored the effort.

After receiving approval from the American Institute of Physics to use their nationwide SPS mailing list, Benson sent letters to the presidents of all SPS chapters asking them to rally their members to write letters to their Congressional representatives in support of increased science funding, through such legislation as Senator Phil Gramm's proposed National Research Investment Act, for example, which proposes a 7% increase in science funding each year for ten years. "Don't let Congress balance the budget by sacrificing your future," his letter admonished. He is still waiting for word on the response nationwide from the various SPS chapters.

Similar letters and accompanying background materials were sent to all Georgetown physics majors, and Benson wrote an article on the subject for the student newspaper. While response overall was positive on campus, Benson admits that, given their tight schedules, "it's hard to get [students] to write letters. It was more successful than I was expecting, but not as successful as it could have been."

However, he did receive strong support from students enrolled in a new course on science and public policy, recently instituted by the physics department, and believes the campaign was especially useful in terms of educating students about how their government operates. "One of the main reasons for doing this was just to get the undergraduates to start thinking about their voice in Congress," he said. "It's been extremely successful in letting people know that there are decisions being made that affect their future, and they need to be alert and notify their representatives about what their wishes are."

Benson is following up the initial mailing with a similar mailing to science professors, but is concerned that recent positive developments on the federal funding front could hinder his efforts. "A lot of people are now reading that things are looking up and figure it's being done for them," he said. "But it's only the authorization that's underway now, we haven't actually gotten the appropriations bills out. So there still needs to be an effort. People need to understand this crucial difference."

Letters *continued*

"Gets" would be more accurate. The proportion of discretionary funding that goes to defense is a free will choice; no political equivalent of the second law of thermodynamics requires it. It deserves serious thoughtful debate.

More major choices are that in this, the richest nation on earth, we choose to have one of the lowest tax rates among industrialized nations and the most skewed distribution of wealth. As a result, the wealthy can wallow in ever increasing affluence and necessary investments in research, education and other areas important to the general welfare of the nation are not made. These are choices that we have freely made, they were not imposed upon us.

There are long term consequences to these choices that do have a bit of a second law about them. For one, if we choose to tightly restrict funds for fundamental research, our scientific community and its productivity will atrophy as we evolve from scientific leaders to followers to also rans. For another, if we choose to continue to skew the distribution of wealth and ignore public investment, we will have an increasingly apathetic and cynical citizenry that will further debilitate us as a nation and may eventually produce violent reactions.

We have choices. As a nation the choices that we make, more than our resources, will dictate our future. Senator Domenici adopted a conveniently myopic view.

David W. Blair
Princeton, New Jersey

Highlights from Washington, DC (continued from page 1)

a nucleus emits electrons or positrons along with neutrinos.

Black Hole Formation

Matthew Choptuik of the University of Texas, whose computer simulations of "naked singularities" (essentially the gravitational centers of black holes without their event horizons) obliged Stephen Hawking to pay off a famous bet, discussed critical phenomena in black hole formation at a Saturday morning session. Specifically, his detailed studies of various models of classical gravitational collapse revealed strong-field solutions which dominate the collapse dynamics at the threshold of the black hole formation, which exhibit such phenomena as universality and scaling. Other speakers at the session discussed such issues as whether black hole entropy arises from boundary states, horizon fluctuations, and quantum mass gap at the threshold of black hole formation.

Search for Life on Mars

At a Friday evening session, Jack Farmer of the NASA Ames Research Center reviewed the aims of present and future efforts to search for life on Mars. He believes that robotic field science will play a fundamental role in advancing current understanding of the planet's history. In particular, capable rovers are needed to survey a broad array of Martian rock types for *in situ* mineralogy and chemistry as a basis for interpreting remote sensing data obtained from orbit. "*In situ* mineralogical analysis will be crucial for selecting the best materials for sample return," he said, adding that rovers will need to be equipped with a suite of instruments capable of identifying acqueously-deposited sediments, as well as the capability to access rock interiors and cache small subsamples. There are still compelling reasons to mount human missions to Mars, however. While a deep subsurface hydrosphere is believed to be the most likely haven for living organisms, such exploration will require drilling to depths of tens to hundreds of kilometers. Robotic platforms are likely to provide very limited subsurface access to depths of only a few tens of meters; hence, deep subsurface drilling will most likely require a human presence.

Gamma Rays from a Free Electron Laser

Physicists at Duke University scatter ultraviolet photons from 500-MeV electrons inside a free electron laser facility to produce much higher energy (12 MeV) gamma-ray photons. By collimating the gamma flux, one can achieve a nearly mono-energetic beam. At a Saturday morning session, Eric Schreiberl reported that the emittance (the divergence) of the beam is so low that even after collimation the intensity of the gamma beam is 1000 times greater than that produced with conventional laser systems. A beam like this will be useful for cancer therapy and for high-precision gamma-ray transmission radiography. It can also be used to produce positrons and to perform sensitive studies of the atomic nucleus.

Developing a New Cryogenic Temperature Scale

In the past few years, more and more physicists have gotten closer and closer to absolute zero, with the proliferation of experiments in such fields as laser cooling, Bose-Einstein condensation, and atom lasers. The International Temperature Scale of 1990 (ITS-90) allows laboratories around the world to match their measurements to an internationally accepted scale. However, this temperature scale does not go below temperatures of 3 Kelvins, because there was not enough data in these low-temperature regions at the time ITS-90 was developed. On Saturday afternoon, researchers reported on the development of what some may consider a holy-grail for defining temperature in this region: the melting curve of helium-3, a liquid which solidifies at different temperatures depending on the amounts of pressure that are applied to it.

Low-Temperature Glow Discharge Plasmas

Low-temperature plasmas have gained prominence in recent years in rapidly developing high technology areas, such as the etching of microstructures which form the basis of computer chips and other devices; the deposition of thin films used as high-tech coatings; the clean-up of volatile organic compounds; and more generally, the controlled modification of surfaces. Most commonly used for processing purposes is low-temperature glow discharge plasmas, which are usually sustainable only below atmospheric pressure because of instabilities such as the glow-to-arc transition, which creates a high-current, spatially confined arc between the two electrodes of a plasma device, making them inefficient for technological applications.

However, at a Friday morning session, researchers at the Stevens Institute of Technology in Hoboken, New Jersey, reported on a new method for suppressing the glow-to-arc transition in dc and rf glow discharges, thus extending their operating range to atmospheric pressures. While there have been previous reports of stable glow discharges at atmospheric pressures, the Stevens method has several advantages over other approaches, including active versus passive stabilization, low energy consumption, simple engineering design, and easy scaling to larger plasma volumes. The new method will allow the efficient use of flow discharges for large-scale processing purposes without the need for costly vacuum equipment. It is already being used at Stevens to generate large volume atmospheric pressure plasma, and for the remediation of gaseous pollutants from waste streams. Other potential applications include novel lighting devices and discharge-enhanced combustion.

Chemical Sensor Design

On Monday morning, Steve Semanchik of NIST's Chemical Science and Technology Laboratory reported on recent major advances in gas sensing with the use of micromachined structures called "microhotplates," which he describes as "platforms for thin sensing films of oxide materials decorated with ultrathin islands of catalytic metals." In addition to enabling kinetic selectivity, arrays of multiple microhotplates with different active overlayers can be used to obtain the varied adsorption/ desorption/reaction characteristics needed for gas multicomponent analyses.

At the same session, A.J. Ricco of Sandia National Laboratories reported on efforts to detect volatile organic compounds using a six-device array of 97-MHz, ST-quartz-based SAW delay lines in combination with chemically sensitive interfaces, including self-assembled monolayers, plasma processed films, dendrimer-based films, and conventional polymers. His group has also applied chemical sensor array technology to investigate the surprising reactivity of Martian soil reported by Viking Lander experiments. Specifically, an instrument using an array of fiber optic micromirror-based chemical sensors was designed and built, using an array of chemically sensitive thin films, including metals, organometallics, and organic dyes to produce a pattern of reflectivity changes characteristic of the species interacting with these sensing layers.

General Interest Sessions.

Biological Effects of Low-Dose Radiation

On Monday morning, the Forum on Physics and Society (FPS) organized a session presenting diverse views on the biological effects of ionizing radiation at low doses. According to session chair John Cameron (University of Wisconsin-Madison), current national and international radiation protection policy is based on the assumption of a "linear no-threshold" (LNT) model relating a population's frequency of cancer and heritable ill-health to radiation dose. The LNT model specifically predicts that any increase in dose produces an increase in probability of cancer. Speakers included Dr. Arthur Upton (New York University), chair of the NAS/NRC committee that produced a 1990 report supporting the wide use of the LNT model; Ludwig Feinendegen (Brookhaven National Laboratory) and Myron Pollycove (University of California, San Francisco), who offered contradicting evidence to the LNT model; and Daniel Strom (Pacific Northwest National Laboratory), who addressed the use and abuse of models in radiation risk management.

Trends in Federal Support of Science Education

The FPS and FED co-sponsored a Friday morning session reviewing recent trends in federal support for K-12 and undergraduate math and science education. Current initiatives include opportunities for science teachers to participate in research internships or related programs at federal and university research laboratories. Agencies covered in the session included the NSF, NASA, the Department of Energy, the National Oceanic and Atmospheric Agency, and the Department of Defense research agencies. According to Richard Stephens, a science education consultant, cross-agency initiatives in math and science education present the potential for new K-12 and undergraduate science initiatives developing from the recently enacted National Oceanic Partnership legislation administered by the Office of Naval Research, which involves nine federal research agencies. At the same session, Tom Weimer, staff director of the Subcommittee on Basic Research for the House of Representatives' Committee on Science, reported that the subcommittee is planning a comprehensive review of K-12, undergraduate, graduate, and post-graduate federal science education programs, in light of the FY 98 agency authorization bills reviewed this spring.

National Science Education Standards

At a joint AAPT/FED session on Monday morning, Bruce Alberts, president of the National Academy of Sciences, urged that the wider community of scientists help to implement the comprehensive program of science teaching standards promulgated a year ago by the National Research Council. "For the first time in our history we have a coherent national vision of where we want to go in science and math education, but the changes called for in the [standards] will be difficult to implement and take more than a decade to build," he said. "Science must become the fourth R in every school year, starting in kindergarten, not the dry memorization of science terms, but an exciting and empowering experience in problem-solving that takes advantage of the curiosity in children and increases each student's understanding of the world." Other session speakers discussed the implications of the new standards, such as its likely effect on teaching at the K-12 level.

Forum Session Award Lectures

Physicists do more than research. As administrators and citizens they are often involved with governmental and social issues of national and international importance. At a special Saturday afternoon session, the FPS recognized the work of Martin Gardner, essayist and a longtime editor at Scientific American, with the APS Forum Award. Accepting on Gardner's behalf was James Randi, a notable debunker of pseudo-scientific claims. The APS Leo Szilard Award Lecture was presented by Thomas Neff of MIT, who reported on the dangers posed by the still-potent nuclear stockpiles of the US and Russia. The APS Nicholson Medal Lecture, on the subject of scientists and totalitarian societies, was given by Li-Zhi Fang, a former dissident in China and now a professor at the University of Arizona. Manuel Cardona from Max-Planck-Institut Für Festköperforschung gave the APS Wheatley Award lecture on physics in Latin America

1997 Spring Meeting Program Committee

Chair: Virginia Brown, National Science Foundation

Vice-Chair: Paul Grannis, SUNY-Stony Brook

AAPT Program Chair: Thomas L. O'Kuma, Lee College

APS Program Committee: John Ahearne, Sigma Xi (FPS); Beverly Berger, Oakland University (GTG); Bunny Clark, Ohio State University (DNP); L. Craig Davis, Ford Research Laboratory (FIAP); Gordon W.F. Drake, University of Windsor (DAMOP); Nathaniel Fisch, Princeton University (DPP); James Friar, Los Alamos National Laboratory (FBSM); Howard Georgi, Harvard University (DPF); Daniel Heinzen, University of Texas-Austin (FCTG); William Herrmannsfeldt, Stanford Linear Accelerator Center (DPB); Wendell T. Hill, III, University of Maryland (COM); Rush Holt, Princeton Plasma Physics Laboratory (FED); Paul Houston, Cornell University (DLS); Marvin Kalos, Cornell University (DCOMP); Richard Lingenfelter, University of California-San Diego (DAP); Laurie McNeil, University of North Carolina (CSWP); Roberto Merlin, University of Michigan (FIP); John Rigden, American Institute of Physics (FHP); Robert Soulen, Jr., Naval Research Laboratory (IMSTG); John Weiner, University of Maryland (DCP).

Canadian Association of Physicists: Eric C. Svensson, AECL/Chalk River Laboratories (CAP vice president); See L. Chin, Universite Laval (DAMOP); David A. Clarke, Saint Mary's University (DAP); Janis McKenna, University of British Columbia (DPF); Ann C. McMillan, Atmospheric Environment Service (CSWP, DCOMP, FIP, FPS); Louis J. Dube, Universite Laval (DAMOP); Rene Roy, Universite Laval (DNP); Roberto D. Connor, University of Manitoba (FHP).

Sociedad Mexicana de Fisica: Jose L. Moran-Lopez, UNAM (1994-96 SMF president); Silvia Torres, UNAM (DAP); Juan C. D'Olivo, UNAM (DPF); Carmen Cisneros, UNAM (1996-98 SMF President, DAMOP); Maria-Ester Brandan, UNAM (DNP); Miguel A. Perez, Centro de Investigation y Estudios Avanzado (FIP).

1998 General Election Preview

Members To Choose New Leadership for 1998

The membership of The American Physical Society will elect a Vice-President, a Chair-Elect of the Nominating Committee, and four General Councillors in the 1998 General Election. Ballots must be received by the 5 September deadline in order to be valid. A slate of candidates has been prepared by the Nominating Committee, and biographical summaries for each are provided below. Full biographical information and candidates' statements are printed in the ballot.

Vice President

James S. Langer
University of California, Santa Barbara

James S. Langer was born in Pittsburgh in 1934. He received his PhD in mathematical physics under the supervision of R.E. Peierls at the University of Birmingham, England in 1958. He joined the Physics Department at Carnegie Mellon University in 1958. In 1982, he became professor of physics and a member of the Institute for Theoretical Physics at the University of California, Santa Barbara, serving as its director from 1989 to 1995. The 1997 recipient of the APS Oliver E. Buckley Prize, Langer's research generally has been in the theory of nonequilibrium phenomena in condensed matter. His specific areas of interest have been quantum many-body theory of transport in solids, the kinetics of first-order phase transitions including nucleation and spinodal decomposition, dendritic pattern formation in crystal growth and, most recently, the dynamics of earthquakes and fracture.

Langer's most recent national committee service includes stints as chair of the APS Division of Condensed Matter Physics; chair of the APS Nominating Committee (1995); chair of the Physics Section of the AAAS (1992); and chair of the Panel on Research Opportunities and Needs, Materials Science and Engineering Survey, National Research Council (NRC) (1986-89).

Paul Martin
Harvard University

Martin was born in Brooklyn, New York in 1931, and received his AB and PhD in 1951 and 1954, respectively, from Harvard University. After a postdoctoral fellowship at the University of Birmingham and the Bohr Institut for Teoretisk Fysik in Copenhagen, he joined the Harvard faculty in 1957, where he has remained ever since, serving as a professor, Physics Department chair, Dean of the Division of Engineering and Applied Sciences, and Associate Dean of the Faculty of Arts and Sciences. He has been extensively involved in bringing high-speed electronic communication to Harvard students and faculty. Martin's research in theoretical physics includes work on quantum field theory, nuclear physics, and atomic physics, statistical and condensed matter physics, and fluid mechanics and non-linear dynamical systems.

Martin was the first chair of the Advisory Board for the Institute for Theoretical Physics at Santa Barbara. He served as an APS Councillor and Chair of the APS Nominating Committee. As Director of the Massachusetts Microelectronics Center and the Massachusetts Technology Collaborative he has worked with industry and state government in areas including electronics, communications, and medical instrumentation. He has also played a large role in directing the New England Consortium for Undergraduate Science Education (NECUSE) — a consortium, headquartered at Harvard, of four New England universities and twelve colleges — and in organizing the Northeast Center of the National Institute for Global Environmental Change (NIGEC).

Chair Elect of the Nominating Committee

Barbara Goss Levi
PhysicsToday

Levi received an MS and a PhD in particle physics from Stanford University in 1967 and 1971, respectively, and started working for *Physics Today* in 1969 as an associate editor. From 1970-76 she taught physics at Fairleigh Dickinson University in Madison, New Jersey, and from 1976-1980, she was a lecturer at Georgia Tech. In 1981, she became a member of the research staff at Princeton University's Center for Energy and Environmental Studies, returning to Physics Today full time in 1987, where she is a senior editor. Levi's career has focused primarily on problems of physics and society, including studies of nuclear proliferation and the future of nuclear power, energy conservation in homes and automobiles, and arms control. She has served as chair of the APS Forum on Physics and Society and Committee on Committees,as well as a member of the Committee on Education and the Committee on Committees, APS Executive Board and Forum on Education.

Daniel Kleppner
Massachusetts Institute ofTechnology

Kleppner received his Ph.D. from Harvard University in 1959, where he participated in the invention of the hydrogen maser with Norman F. Ramsey. He joined the faculty of M.I.T in 1966, where he is now the Lester Wolfe Professor of Physics and Associate Director of the Research Laboratory of Electronics. A past recipient of the Davisson-Germer Prize and the Lilienfeld Prize of the APS, his research interests are in experimental atomic physics, high precision measurements and quantum optics. Current research includes quantum chaos, studies of hydrogen at extremely low temperatures, and ultra precise spectroscopy. He is the co-author of two textbooks. Within the APS, Kleppner has served as chair of the Division of Atomic, Molecular and Optical Physics, as a Councillor-at-Large, and on several other committees including the Physics Planning Committee, which he joined in 1988 and chaired from 1992-96.

General Councillor

Cynthia McIntyre
George Mason University

McIntyre is a theoretical physicist and a Commonwealth Assistant Professor of physics at George Mason University. Her research focus is on the electronic and optical properties of semiconductor heterostructures. Most recently she has investigated electron-phonon scattering in structurally modified semiconductor heterostructures. She received her Ph.D. in physics from the Massachusetts Institute of Technology in 1990, and was awarded the Chancellor's Postdoctoral Fellowship to study at the University of California, San Diego, and the National Research Council's Research Associateship Award for postdoctoral study at the Naval Research Laboratory. She has served on the Research Associateship Programs Advisory Committee for the National Research Council, the APS Committee on the Status of Women In Physics, and the American Institute of Physics Advisory Committee on Physics In Two Year Colleges.

Douglas F. Finnemore
Iowa State University

Finnemore received his Ph.D. in physics from the University of Illinois at Urbana-Champaign. He became an Assistant Professor at Iowa State University in 1963, a Professor in 1968, and a Distinguished Professor in 1988, and currently chairs the Department of Physics and Astronomy. He was Program Director for Condensed Matter Physics in the Ames Laboratory/ISU from 1977-83 and was Associate Director of the Ames Laboratory/ISU from 1983-88. Finnemore's long time research interests are in superconductivity and magnetism. He has won the Department of Energy Materials Science Award for outstanding research three times, for superconducting materials research, for research in magnetostrictive

(continued on page 10)

Nomination Ballot—1998 Bylaw Committees

To be Completed Only by Members of The American Physical Society
(please complete both sides)

The Committee on Committees has the responsibility for nominating elected members of the Publications Oversight Committee and the Lilienfeld Prize Committee and for advising the President concerning suitable candidates for service on other Bylaw Committees appointed by the President. Information on the Committees and their present membership appears on the APS home page under Governance.

The Committee needs input from the membership. **Please provide the name and affiliation of nominees and attach information on career highlights and suitability of the nominee for the particular committee indicated. Nominees must be APS members. Self-nominations are strongly encouraged.**

The deadline for receipt of nominations is 8 August 1997.

For Membership on the Committee on Applications of Physics:

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For Membership on the Committee on Constitution & Bylaws:

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For Membership on the Committee on Education:

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For Membership on the Committee on Fellowship:

_____

For Membership on the Committee on International Freedom of Scientists:

_____

For Membership on the Committee on International Scientific Affairs:

_____

For Membership on the Investment Committee:

_____

For Membership on the Lilienfeld Prize Committee:

_____

Continued on Reverse

1997 General Election Preview (continued from page 9)

materials, and for studies of the motion of a single superconducting vortex in a thin film. From 1989-93, he served as councillor for the APS Division of Condensed Matter Physics.

Roberto D. Peccei
University of California, Los Angeles

Peccei is Dean of the Division of Physical Sciences of the College of Letters and Science at UCLA, a position he has held since November 1993. He is a particle theorist whose principal interests lie in the area of electroweak interactions and in the interface between particle physics and cosmology. Born in Italy, completed his secondary school in Argentina, and came to the U.S. in 1958 to pursue his university studies in physics. He obtained a Ph.D. from MIT in 1969. After a brief period of postdoctoral work at the University of Washington, he joined the faculty of Stanford University in 1971. In 1978 he returned to Europe as a staff member of the Max Planck Institute in Munich, Germany. He joined the Deutsches Elektron Synchrotron (DESY) laboratory in Hamburg, Germany, as the Head of the Theoretical Group in 1984 before returning to the U.S. in 1989, joining the faculty of the Department of Physics at UCLA. Within the APS, Peccei served for three years on the Division of Particles and Fields Executive Committee, chairing the unit in 1993.

Kevin T. Lesko
Lawrence Berkeley National Laboratory

Lesko received his Ph.D. in physics in 1983 from the University of Washington. As a postdoctoral fellow he worked in heavy-ion nuclear reactions and weak interaction physics at Argonne National Laboratory (1983-85). He moved to Lawrence Berkeley Laboratory in 1985 to pursue astrophysics and weak interaction physics. He became a staff scientist at LBNL in 1987, receiving the laboratory's Outstanding Performance Award in 1994. He is a group leader in the Sudbury Neutrino Observatory collaboration, and leads a group in neutrino astrophysics at LBL. His research interests include neutrino astrophysics, nuclear astrophysics, and weak interactions. He is currently involved with the solar neutrino problem and the Sudbury Neutrino Observatory. His extensive involvement with the APS Division of Nuclear Physics (DNP) includes serving on numerous meeting program committees, and as a member of the DNP Physics News Committee.

For Membership on the Committee on Meetings:

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For Membership on the Committee on Membership:

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For Membership on the Committee on Minorities

_____

For Membership on the Committee on the Status of Women in Physics:

_____

For Membership on the Publications Oversight Committee:

_____

For Membership on the Physics Planning Committee:

_____

Please provide brief biographical material on your candidates.

Nominator's Information

Name:_____

Address:_____

_____

Signature: _____

Please Address Your Envelope to:
The American Physical Society
ATTN: AMY HALSTED
One Physics Ellipse
College Park, MD 20740-3844
Fax: (301) 209-0865
Email: halsted@aps.org

The deadline for receipt of nominations is 8 August 1997.

Beverly K. Berger
Oakland University

Berger has been a faculty member at Oakland University since 1977. She received a Ph.D. in physics from the University of Maryland in 1972 and held postdoctoral positions at the University of Colorado (JILA) and Yale University. Berger's research is in the area of theoretical gravitational physics. Recent work includes Monte Carlo simulations for quantum cosmology, chaotic dynamics of Mixmaster universes, and the application of symplectic PDE solvers to the numerical study of cosmological singularities. She is a member of the APS Divisions of Astrophysics, Computational Physics, and Particles and Fields. During the past two years, she founded and served as the first chair of the APS Topical Group in Gravitation. She has also served on organizing committees for international conferences and on an NSF panel on future directions in gravitational physics.

Helen Quinn
Stanford Linear Accelerator Center

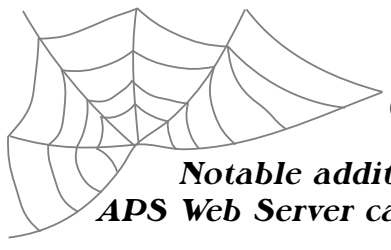
Quinn is a theoretical particle physicist at Stanford Linear Accelerator Center, where she also leads the laboratory's education and outreach efforts. She received her PhD from Stanford University in 1967 and held positions at Deutsches Electronen Synchrotron and Harvard University before returning to SLAC in 1977. Her research is focused on understanding the nature of the breaking of CP symmetry in weak interaction processes, as well as the mechanisms that ensure its maintenance in strong interaction processes. She is currently an active participant in the development of the experimental program for the SLAC B-factory, designed particularly to study CP violation in the decays of B mesons, where it is expected to manifest itself in a variety of decays and thus provide tests of Standard Model predictions and probes for beyond Standard Model effects. She has served in the APS Division of Particles and Fields Executive Committee and as a member of the Panel on Public Affairs, and is currently on the Executive Committee of the Forum on Education.

Elaine S. Oran
Naval Research Laboratory

Oran received her Ph.D. from Yale University in 1972 and promptly joined NRL as a research physicist in the Plasma Physics Division. She has been the Senior Scientist for Reactive Flow Physics since 1988, responsible for developing, supervising, advising on, and carrying out theoretical and numerical research in areas such as computational sciences and numerical analysis; high-performance computing and parallel architectures; chemically reactive flows; flame, deflagrations, and detonations; turbulence in reacting and nonreacting flows; astrophysical phenomena, particularly supernovae; rarefied gas flow, such as reentry flows and microdynamical flows; and shocks and shock interactions in gas and condensed phases. She coordinates a number of programs involving industry, government laboratories, and universities. Within the APS, she is a past chair and founding member of the Division of Computational Physics, past Vice-Chair of the Division of Fluid Dynamics, and has served on the Committee on the Status of Women in Physics.

Christopher Stubbs
University ofWashington

Stubbs is an experimentalist working on a variety of astrophysical problems. He is a principal investigator on the MACHO project, a search for galactic dark matter using gravitational microlensing. In addition, he is working with an international team to determine whether supernovae can be used to probe the evolution of the geometry of the Universe. He earned his Ph.D. in experimental gravitational physics with the Eot-Wash group at the University of Washington. In 1989 Stubbs was named the Center Fellow at the Center for Particle Astrophysics (CfPA) at the University of California, Berkeley, where he served as Associate Director for Education and Outreach. He joined the faculty of the University of California at Santa Barbara in 1991, returning to Seattle in 1994. He also holds adjunct appointments at the UCSB and at the Mt. Stromlo Observatory in Australia.



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
- APS Task Force Report on Careers and Professional Development on the Careers/Employment Page
- Text of speech by Dr. Mary Good, Undersecretary of Commerce
- Updated Centenary pages
- POPA: The Current Energy Situation & Background Papers

Units
- DCMP updated Operating Procedures and Meetings
- FHP: Birthday of the Electron
- New York State Section pages updated

Meetings
- Shock Compression, PC97, and Ohio Section Meeting Programs
- DFD: Meetings information updated
- APS Meeting Calendar updates

Announcements

COUNCIL RECOMMENDS BYLAWS REVISIONS

Based upon recommendations from the Committee on Constitution and Bylaws, the APS Council provisionally approved six Bylaws revisions at the 19 April meeting. Four are related to the structure of the Society's committees, one to the submission of papers to APS meetings, and one to the reporting of unit councillor election results. Members are invited to comment upon the revisions (address below). Taking member comments into account, the Council will take a second vote on these revisions in the fall and those it approves will be adopted into the Bylaws. The present APS Constitution & Bylaws are available at http://www.aps.org/exec/bylaws/apsbylaw96.html or from APS Headquarters. Revisions appear below with text proposed for deletion in ~~strikeout~~ and new text in *italics*.

1) **Reduce the size of the Committee on Education from 12 members to 9**. Although the bylaws presently state that the COE has 12 members, in fact it has been operating with nine members, as do almost all of the other outreach committees. The size was set at 12 while the committee was setting up the Forum on Education, which is now well established.

Suggested Revision: Committee on Education. - The membership of the Committee on Education shall consist of *nine* ~~twelve~~ members appointed by the President to staggered three-year terms…

2) **Reassign responsibilities formerly carried out by the disbanded Committee on Membership Publications (COMP).** When it was in existence, COMP was charged with oversight of APS News, which is now a responsibility of the Committee on Membership, and with that of the APS Bulletin, which is now assigned to the Committee on Meetings.

Suggested Revision: Committee on Membership. - …The Committee shall suggest to Council means for improving the relationship between the Society and its members, and for improvement in services the Society provides to its members *including APS publications members receive on payment of their membership dues,* and for other activities in the area of membership as delegated to it by the Council. Committee on Meetings. -… The Committee shall propose guidelines and rules for the organization and operation of all meetings of the Society and its units *and shall provide oversight for meetings-related publications, including the Bulletin of the American Physical Society.* The Committee shall recommend procedures for the Society sponsorship of other meetings.

3) **Permit Audit Committee members to serve the third year of their terms when they are no longer members of Council.** The Bylaws require that members of the Audit Committee be Councillors who are not otherwise involved in the Society's governance. Candidates are best selected from among sophomore councillors who are not serving on the Executive Board. That way, continuity in the Audit Committee is preserved because members can serve a full three year term without being disqualified from further service by their election to the Board. New Audit Committee members would begin their service in January of the third year of their Council terms, and continue through one year past the end of their service on Council. So that the Audit Committee Chair is a member of Council, the revision specifies that the Audit Committee member in his or her second year of service shall ordinarily chair the committee.

Suggested Revision: Audit Committee. - The membership of the Audit Committee shall consist of three members of the Council, who are not members of the Executive Board or are not otherwise directly involved in the business management of the Society, elected by Council to staggered three-year terms *which may extend one year beyond the term on Council.* ~~Council shall elect the Chairperson from among these three members.~~ *The member in his or her second year of service shall ordinarily chair the committee.*

4) **Make one of the two new members of the Publications Oversight Committee (POC) appointed, instead of elected.** Due to the importance of the Publications Oversight Committee, the bylaw has specified that Council elect its members. However, the election of members leaves much to chance and the POC has occasionally been left with significant gaps in representation among subfields and/or types of workplace. To balance the importance of Council's input with the need for technical balance within the POC, it is proposed that one of the new members be elected by Council, and the other appointed thereafter by the APS President.

Suggested Change: Publications Oversight Committee. - The membership of the Publications Oversight Committee shall consist of the Editor-in-Chief, the Executive Officer, the Treasurer, ~~and eight~~ *four* members elected by Council to staggered four-year terms, *and four members appointed by the president to staggered four year terms…*

5) **Change in the number of contributed papers at a meeting**. This revision allows a meeting attendee to present one technical paper (invited or contributed) at regular meeting session and one non-technical paper at a session organized by one of the Forums or APS Committees, with both papers appearing on the regular program.

Suggested Revision: ARTICLE XII - PAPERS AT MEETINGS Presentation. - The first author of a contributed paper submitted for a Meeting of the Society is expected to present the paper in either an oral or a poster session. An individual may normally present only one *technical* contributed paper during the regular program of a Meeting. *One additional contributed paper on a non-technical topic may also be presented during the regular program at a non-technical session where said session has been explictly approved as an exempt session by the appropriate program committee and/or program committee chair upon the advice of the Executive Officer of the APS.* If an individual wishes to present *any additional* ~~more than one~~ contributed paper*s* ~~at a Meeting~~, the individual must specify which paper*(s)* shall be presented in the regular program, *and the rest will be assigned to the supplementary program upon approval of the Executive Officer.* ~~A second contributed paper shall be assigned to the supplementary program. The inclusion of additional contributed papers in the program requires the approval of~~ The Executive Officer, ~~who~~ is empowered to schedule *these supplementary* ~~any such additional contributed~~ paper*s* as *either* ~~an~~ oral or ~~a~~ poster paper~~s~~ after making a reasonable effort to satisfy an expressed preference of the author(s). If poster presentation space is limited, the Executive Officer may require some or all additional *poster* ~~contributed~~ papers with the same first author to be presented in a space normally intended to accommodate one such paper.

6) **Change reporting date of Division and Forum councillor election results**. The Bylaws require Divisions and Forums to report the results of their elections for new Councillors by September 1, but due to their annual schedules some units are unable to comply with this provision. A more reasonable deadline for reporting councillor election results is January 1, so that new Councillors can start their terms on time and attend the spring Council meeting.

Suggested Revision: Each Division and Forum shall conduct its nominations and elections for the position of Councillor in conformance with the rules specified hereinafter and shall communicate the results of their elections to the Executive Officer before *1 January* ~~1 September~~ of the year ~~prior to that~~ in which they assume office.

Comments on the bylaw revisions should be sent to Amy Halsted, APS, One Physics Ellipse, College Park, MD 20740-3844; email: halsted@aps.org; comments must be received prior to the 23 November Council meeting.

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 July 1997 issue are provided below.**

Nobel Lectures in Physics and Chemistry
D.M. Lee, D.D. Osheroff and R.C. Richardson describe their discovery of the superfluid phases of liquid ^{3}He. R.F. Curl, H. Kroto, and R.E. Smalley describe their discovery of molecular C_{60}, buckyballs. These authors were awarded the Nobel Prize in Physics and in Chemistry, respectively, for their discoveries.

Random-matrix theory of quantum transport
C.W.J. Beenakker reviews for nonexpert readers the applications of random-matrix theory in diverse areas of physics. Particularly emphasized are recent developments in the theory of conductance in mesoscopic systems.

The ground-state phase diagram of the one-dimensional Kondo lattice model
H. Tsunetsugu et al. review the theory of strongly correlated electrons in a context where many results are known: the one-dimensional Kondo lattice.

Nonlinear dynamics and breakup of free-surface flows
J. Eggers reviews the formation of droplets on liquid surfaces. There has been recent progress in the theory with a discovery of scaling solutions near the singular point of droplet formation.

Long-scale evolution of thin liquid films
A. Oron et al. discuss the many kinds of fluid dynamics that arise in their film flow. The equations depend of course on the driving forces, and in many cases little is known about the solutions.

RMP Colloquium:

Independent particle motion and correlations in fermion systems
I. Sick et al. discuss the very successful independent-particle model in nuclei and its quantitative testing by electron-scattering measurements.

THE BACK PAGE

THE FOUR GUIDEPOSTS OF SCIENCE

By William J. Clinton, President of the United States
(Excerpted from his commencement address at Morgan State University on May 18, 1997.)

I ask you to imagine the new century, full of promise, molded by science, shaped by technology, powered by knowledge. These potent transforming forces can give us lives fuller and richer than we have ever known. They can be used for good or ill. If we are to make the most of this new century, we must work to master these forces with vision and wisdom and determination. The past half-century has seen mankind split the atom, splice genes, create the microchip, explore the heavens. We enter the next century propelled by new and stunning developments.

Just in the past year we saw the cloning of Dolly the sheep, the Hubble telescope bringing into focus dark corners of the cosmos never seen before, innovations in computer technology and communications, and now cures for our most dreaded diseases — diabetes, cystic fibrosis, repair for spinal cord injuries. The sweep of it is truly humbling. Why, just recently we saw a computer named Deep Blue defeat the world's reigning chess champion. I really think there ought to be a limit to this. No computer should be allowed to learn to play golf. But, seriously, my friends, in science, if the last 50 years were the age of physics, the next 50 years will be the age of biology.

We are now embarking on our most daring explorations, unraveling the mysteries of our inner world and charting new routes to the conquest of disease. We have not and we must not shrink from exploring the frontiers of science. But as we consider how to use the fruits of discovery, we must also never retreat from our commitment to human values, the good of society, our basic sense of right and wrong.

Science must continue to serve humanity, never the other way around. The stakes are very high. America's future — indeed, the world's future — will be more powerfully influenced by science and technology than ever before. Where once nations measured their strength by the size of their armies and arsenals, in the world of the future knowledge will matter most. Fully half the growth in economic productivity over the last half-century can be traced to research and technology.

But science is about more than material wealth or the acquisition of knowledge. Fundamentally, it is about our dreams. America is a nation always becoming, always defined by the great goals we set, the great dreams we dream. We are restless, questing people. We have always believed, with President Thomas Jefferson, that "Freedom is the first born daughter of science." With that belief and with willpower, resources and great national effort, we have always reached our far horizons and set out for new ones.

Let us resolve further to work with other nations to deal with great problems like global climate change, to break our reliance on energy use destructive of our environment, to make giant strides to free ourselves and future generations from the tyranny of disease and hunger and ignorance that today still enslaves too many millions around the world. And let us also pledge to redouble our vigilance to make sure that the knowledge of the 21st century serves our most enduring human values.

Science often moves faster than our ability to understand its implications, leaving a maze of moral and ethical questions in its wake. The Internet can be a new town square or a new Tower of Babel. The same computer that can put the Library of Congress at our fingertips can also be used by purveyors of hate to spread blueprints for bombs. The same knowledge that is developing new life-saving drugs can be used to create poisons of mass destruction. Science can enable us to feed billions more people in comfort, in safety, and in harmony with our earth; or it can spark a war with weapons of mass destruction rooted in primitive hatreds.

"Science often moves faster than our ability to understand its implications, leaving a maze of moral and ethical questions in its wake."

Science has no soul of its own. It is up to us to determine whether it will be used as a force for good or evil. We must do nothing to stifle our basic quest for knowledge. After all, it has propelled from field to factory to cyberspace. But how we use the fruits of science and how we apply it to human endeavors is not properly the domain of science alone or of scientists alone. The answers to these questions require the application of ethical and moral principles that have guided our great democracy toward a more perfect union for more than 200 years now. As such, they are the province of every American citizen.

We must decide together how to apply these principles to the dazzling new discoveries of science. Here are four guideposts. First, science and its benefits must be directed toward making life better for all Americans — never just a privileged few. Their opportunities and benefits should be available to all. Science must not create a new line of separation between the haves and the have-nots, those with and those without the tools and understanding to learn and use technology.

"But science is about more than material wealth or the acquisition of knowledge. Fundamentally, it is about our dreams."

Science must always respect the dignity of every American. We must never allow our citizens to be unwitting guinea pigs in scientific experiments that put them at risk without their consent and full knowledge. Whether it is withholding a syphilis treatment from the black men of Tuskegee or the Cold War experiments that subjected some of our citizens to dangerous doses of radiation, we must never go back to those awful days in modern disguise. We have now apologized for the mistakes of the past; we must not repeat them — never again.

Second, none of our discoveries should be used to label or discriminate against any group or individual. Increasing knowledge about the great diversity within the human species must not change the basic belief upon which our ethics, our government, our society are founded. All of us are created equal, entitled to equal treatment under the law.

With stunning speed, scientists are now moving to unlock the secrets of our genetic code. Genetic testing has the potential to identify hidden inherited tendencies toward disease and spur early treatment. But that information could also be used, for example, by insurance companies and others to discriminate against and stigmatize people.

We know that in the 1970s, some African Americans were denied health care coverage by insurers and jobs by employers because they were identified as sickle cell anemia carriers. We also know that one of the main reasons women refuse genetic testing for susceptibility to breast cancer is their fear that the insurance companies may either deny them coverage or raise their rates to unaffordable levels. No insurer should be able to use genetic data to underwrite or discriminate against any American seeking health insurance. This should not simply be a matter of principle, but a matter of law, period.

Third, technology should not be used to break down the wall of privacy and autonomy free citizens are guaranteed in a free society. The right to privacy is one of our most cherished freedoms. As society has grown more complex and people have become more interconnected in every way, we have had to work even harder to respect the privacy, the dignity, the autonomy of each individual.

Today, when marketers can follow every aspect of our lives, from the first phone call we make in the morning to the time our security system says we have left the house, to the video camera at the toll booth and the charge slip we have for lunch, we cannot afford to forget this most basic lesson. As the Internet reaches to touch every business and every household and we face the frightening prospect that private information — even medical records — could be made instantly available to the world, we must develop new protections for privacy in the face of new technological reality.

"...in science, if the last 50 years were the age of physics, the next 50 years will be the age of biology."

Fourth, we must always remember that science is not God. Our deepest truths remain outside the realm of science. We must temper our euphoria over the recent breakthrough in animal cloning with sobering attention to our most cherished concepts of humanity and faith. My own view is that each human life is unique, born of a miracle that reaches beyond laboratory science. I believe we should respect this profound gift. I believe we should resist the temptation to replicate ourselves. But this is a decision no President should make alone. No President is qualified to understand all of the implications.

These, then, are four guideposts, rooted in our traditional principles of ethics and morals, that must guide us if we are to master the powerful forces of change in the new century. One, science that produces a better life for all and not the few. Two, science that honors our tradition of equal treatment under the law. Three, science that respects the privacy and autonomy of the individual. Four, science that never confuses faith in technology with faith in God. If we hold fast to these principles, we can make this time of change a moment of dazzling opportunity for all Americans.

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