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CONTRIBUTE to September 11 Scholarship Fund
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Brookhaven's Marburger Confirmed; APS President Offers Assistance

The Senate has approved President George W. Bush's choice for presidential science advisor by voting on October 23 to confirm Dr. John H. Marburger III as Director of the Office of Science and Technology Policy. Marburger, a physicist who had served as Director of the Department of Energy's Brookhaven National Laboratory since 1998, said he felt "humility and immense pride" to be selected for the job and hailed the importance of science and technology to society.

"I approach this opportunity and profound responsibility with a mixture of humility and immense pride — humility in the wake of the distinguished American scientists who have gone before me, pride in this nation's unmatched scientific establishment," Marburger said in his statement to the US Senate. "Science and technology have long provided with us with increased security, better health, and greater economic opportunity, and will continue to do so for many generations to come."

Marburger, an APS Fellow, received his PhD in applied physics from Stanford University in 1967

John H. Marburger III

and in the early 1970s was a professor of physics and electrical engineering at the University of Southern California, serving as chair of the physics department as well as dean of the College of Letters, Arts and Sciences. While there, he developed a theory for various laser phenomena and co-founded USC's Center for Laser Studies. His teaching activities included "Frontiers of Electronics," a series of educational programs on CBS television.

In 1980 he became president of the State University of New York at Stony Brook, and during his tenure

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APS AMERICAN PHYSICAL SOCIETY
One Physics Ellipse • College Park, MD 20740-3844

October 24, 2001

Dr. John H. Marburger
Director, Office of Science & Technology Policy
Eisenhower Executive Office Bldg.
17th St. & Pennsylvania Ave., NW
Washington, DC 20502-0001

Dear Jack:

First of all, let me congratulate you on your confirmation as Director of OSTP and Science Adviser to the President. The nation is fortunate in having so distinguished a scientist and administrator in this very important role. This is especially true at the present time when we, and the rest of the world, are focusing on fighting terrorism, in response to the tragic events of September 11.

The successful pursuit of a war against terrorism will require the talents and expertise of individuals in many different areas, including science. Some of this expertise resides among the members of the American Physical Society.

The scientific community stands ready to join in the common international effort needed to assess and eventually eliminate the tremendous threat posed by terrorism throughout the world. As APS President, I invite you and other members of the administration to call on the APS and its membership for whatever assistance we can provide. We all recognize that this effort must have a very high priority.

Sincerely,

Three Scientists Share 2001 Nobel Prize in Physics for BEC Discovery

The 2001 Nobel Prize in Physics has been awarded to Eric Cornell of NIST/JILA, Wolfgang Ketterle of MIT, and Carl Wieman of Colorado and JILA, an institute run jointly by NIST and the University of Colorado. Cornell and Wieman are recognized for being the first to achieve a new state of matter: the ultra-cold gas known as a Bose-Einstein condensate (BEC) in neutral atoms, which could one day aid in the development of ultra-small machines. Ketterle soon thereafter produced a larger BEC and has made extensive study of BEC properties. The three men will share the $943,000 prize.

Their joint discovery of the Bose-Einstein condensate is "going to bring revolutionary applications in such fields as precision measurement and nanotechnology," according to the citation by the Royal Swedish Academy of Sciences. The

See NOBEL PRIZE *on page 4*

Two Young Physicists Honored with 2002 Apker Award

Two promising undergraduate physics majors have been awarded the 2002 Apker Award. Robert E. Wagner of Illinois State University was honored for his thesis entitled, "Intense Laser Physics Theory." And Kathryn Todd of the California Institute of Technology was honored for her thesis entitled, "Studies of Two-Dimensional Electron Systems."

The Apker Award is given annually by the APS for physics research done by an undergraduate. The award was first given in 1978, and in recent years has been divided into two categories, depending on whether the institution has a PhD granting program

Kathryn Todd

or not. The winners, who will receive $5,000, were selected by a committee from among the seven finalists (see *APS News*, November 2001).

Wagner quickly distinguished himself at Illinois State as a gifted physics student, joining the laboratory of the Intense Laser Physics Theory Unit immediately after graduating from high school, learning a new computer language in less than a week. He then developed from scratch a computer simulation program to simulate the relativistic dynamics of atoms in strong laser and magnetic fields, resulting in his first peer-reviewed publication. His codes are still

Robert Wagner

See APKER *on page 5*

DNP, Japanese Nuclear Physicists Have First Joint Meeting in Hawaii

Nuclear physicists from the US and Japan convened in Maui, Hawaii, for the annual fall meeting of the APS Division of Nuclear Physics (DNP), held October 17-20. The historic event marks the first joint meeting between the DNP and the nuclear physicists of the Japanese Physical Society (JPS), organized in the hopes that it would serve as a meeting ground to engender cooperation and the exchange of ideas among nuclear scientists from the US and Japan, as well as from other Pacific Rim countries.

"There are many common

See HAWAII *on page 3*

Photo courtesy of Tom Clark

(from left to right) Shoji Nagamiya (KEK and JAERI) Organizing Committee and Plenary Speaker; Joel M. Moss (LANL) Organizing Committee and DNP Chair; James Symons (LBNL) NSAC Chair and Plenary Speaker; George H. Trilling (LBNL) APS President; Virginia R. Brown (MIT/Univ of MD) Organizing Committee Chair; Judy R. Franz, APS Executive Officer; Hiroshi Toki (Director RCNP/Osaka University) Organizing Committee. Not shown: Plenary Speakers Larry McLerran (BNL) and Kenichi Imai (Kyoto University).

2002 March Meeting Returns to Indianapolis

The 2002 APS March Meeting returns to Indianapolis, Indiana, which last hosted the APS in April 1996. Typically the largest meeting of the Society, with annual attendance averaging about 5,000, the conference will feature cutting edge research in

See MARCH MEETING *on page 6*

Highlights

Members in the Media

"I've become interested in the impact of climate change on the world, and the future of energy needs for the developing world, but right now I'm focusing on how we can take effective precautions against terrorism without harming our civil liberties."
—Burton Richter, Stanford, San Francisco Chronicle, October 8, 2001

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"California in particular is very good in leadership — exploring the unknown, going out into the jungle, having the courage to know that you'll fail most of the time. Compare that with my native country. Sweden is good in management, but Swedish society does not accept failures the way we do."
—Sig Hagstrom, Stanford, on why California produces so many Nobel Prize winners, San Francisco Chronicle, October 8, 2001

✶✶✶

"There are literally millions of ways a terrorist could attack next."
—Rob Duncan, University of New Mexico, on the difficulty of defending against terrorism, Albuquerque Journal, October 7, 2001

✶✶✶

"We're looking at things so small, it's like being able to see my office window from 4 million miles away in space."
—Wilson Ho, UC Irvine, on techniques for manipulating individual atoms, Orange County Register, October 7, 2001

✶✶✶

"The chips could one day be used to pluck individual atoms from a BEC. You have a magnetic trap that's much, much simpler than any other experiment and that is much more versatile."
—Joerg Schmiedmayer, University of Heidelberg, on new techniques to trap atoms, New Scientist, October 6, 2001

✶✶✶

"We are now in the middle of a revolution in astrophysics. That revolution actually started here."
—Baha Balantekin, University of Wisconsin, on the Homestake Mine in South Dakota, AP, October 5, 2001

✶✶✶

"Teleportation is a really unfortunate term. It implies moving people from point A to point B."
—Christopher Monroe, University of Michigan, on the meaning of quantum teleportation, Christian Science Monitor, October 4, 2001

✶✶✶

"This requires only a modest-size blower at the normal air intake to the building that makes sure that any leakage of air in the building is out rather than in. "
—Richard Garwin, Council on Foreign Relations, on ways to protect a building from bioterrorism, NY Times, October 23, 2001

✶✶✶

"The main puzzle about solar neutrinos is that their measured number has always been lower than expected. Though the main explanation is now that neutrinos have mass — which was not originally predicted —details about how they are produced in the sun still need to be investigated."
—Carl A. Gagliardi, Texas A&M University, UPI, October 22, 2001

✶✶✶

"Being an ordinary scientist and an ordinary Christian seems perfectly natural to me. For others, however, it appears strange, even astonishing, that someone could be serious about science and about faith."
—William Phillips, NIST, The Washington Times, October 22, 2001

✶✶✶

"One of the great achievements of science has been, if not to make it impossible for intelligent people to be religious, then at least to make it possible for them not to be religious. We should not retreat from this accomplishment."
—Steven Weinberg, University of Texas, Dallas Morning News, October 23, 2001

Physicist Moves from FBI to CIA

In August, physicist (and lifetime APS member) Donald Kerr, an assistant FBI director in charge of the bureau's crime laboratory, was named as the CIA' s next deputy director for science and technology. Kerr directed Los Alamos National Laboratory (LANL) and spent 12 years in private industry before assuming control of the FBI lab in 1997. Kerr received his PhD in plasma physics from Cornell and worked at LANL from 1966 to 1976. In 1976 he became deputy manager of the Department of Energy's operations in Nevada, and three years later was named head of LANL. In 1985 Kerr left LANL to become president of EG&G, Inc., a manufacturing and engineering firm in Wellesley, MA. He then joined Science Corporation, a San Diego based consulting contractor, and in 1996 he spent a year as executive vice president of Information Systems Laboratories in San Diego. Joining the FBI in October 1997 "was not something I'd ever expected to do," Kerr admits. "But it was such an interesting opportunity." Of his varied career spanning research, industry, and corporate and government management he says, "I've been fortunate to have an unusual set of [career] opportunities."

This Month in Physics History

December 27, 1956: Fall of Parity Conservation

Symmetries have long played a crucial role in physics. Since 1925, physicists had assumed that our world is indistinguishable from its mirror image — a notion known as parity conservation — and prevailing scientific theory reflected that assumption. Until a series of pivotal experiments at the National Bureau of Standards in 1956 (now the National Institute of Standards and Technology), parity conservation enjoyed exalted status among the most fundamental laws of physics, including conservation of energy, momentum and electric charge. But as with relativity, Nature once again demonstrated that it is not always obliged to follow the rules of "common sense".

Parity conservation implies that Nature is symmetrical and makes no distinction between right- and left-handed rotations, or between opposite sides of a subatomic particle. For example, two similar radioactive particles spinning in opposite directions about a vertical axis should emit their decay products with the same intensity upwards and downwards. Yet although there were many experiments that established parity conservation in strong interactions, the assumption had never been experimentally verified for weak interactions. Indeed, when the weak force was first postulated to explain disintegration of elementary particles, it seemed inconceivable that parity would not hold there as well.

All that changed in the 1950s, when high-energy physicists began observing phenomena that could not be explained by existing theories, most notably the decays of K mesons emitted in the collision of a high-energy proton with an atomic nucleus. The K meson appeared in two distinct versions, decaying into either two or three pi mesons, (which necessarily had opposite parity), although in all other characteristics they seemed identical. In June of 1956, theoretical physicists Chen Ning Yang and Tsung Dao Lee submitted a short paper to the *Physical Review* raising the question of whether parity is conserved in weak interactions, and suggesting several experiments to decide the issue.

Lee and Yang's paper did not immediately spark more than passing curiosity among physicists when it appeared in October 1956. Freeman Dyson later admitted that while he thought the paper was interesting, "I had not the imagination to say, 'By golly, if this is true, it opens up a whole new branch of physics!' And I think other physicists, with very few exceptions, at that time were as unimaginative as I." Richard Feynman pronounced the notion of parity violation "unlikely, but possible, and a very exciting possibility," but later made a $50 bet with a friend that parity would not be violated.

One of the simplest proposed experiments involved measuring the directional intensity of beta radiation from cobalt-60 nuclei oriented with a strong magnetic field so that their spins aligned in the same direction. Parity conservation demands that the emitted beta rays be equally distributed between the two poles. If more beta particles emerged from one pole than the other, it would be possible to distinguish the mirror image nuclei from their counterparts, which would be tantamount to parity violation.

Between Christmas of 1956 and New Year's, NBS scientists set about performing beta decay experiments. The team was led by Columbia Professor C. S. Wu. Professor Wu had been born in China in 1912, had received her PhD from the University of California in 1940, and had worked on the Manhattan Project during World War II. In 1975 she would serve as the first woman president of the APS.

When the results were in, the NBS team arrived at a startling conclusion: the emission of beta particles is greater in the direction opposite to that of the nuclear spin. Thus, since the beta emission distribution is not identical to the mirror image of the spinning cobalt-60 nucleus, parity was unequivocally shown not to be conserved. Leon Lederman, who at the time worked with Columbia University's cyclotron, performed an independent test of parity with that equipment, involving the decay of pi and mu mesons, and also obtained distinct evidence for parity violation.

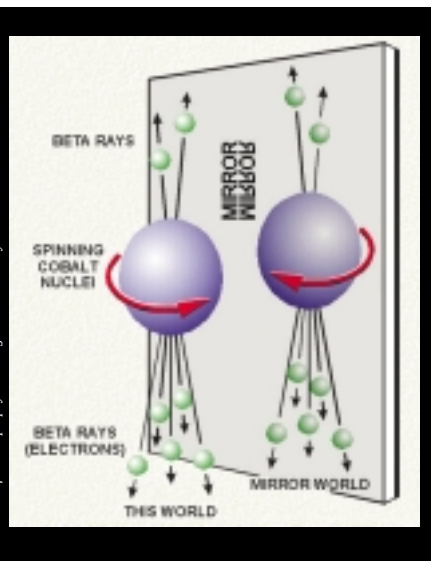
In short, Nature is a semi-ambidextrous southpaw. And Feynman lost his bet. The result shattered a fundamental concept of nuclear physics that had been universally accepted for 30 years, thus clearing the way for a reconsideration of physical theories and leading to new, far-reaching discoveries — most notably a better understanding of the characteristics of elementary particles, and a more unified theory of the fundamental forces.

Further Reading:

S. Weinberg, *Reviews of Modern Physics*, 52, 515 (1980); A. Salam, p. 525; S.L. Glashow, p. 539.

See also:

- http://physics.nist.gov/GenInt/Parity/cover.html
- http://ccreweb.org/documents/parity/parity.html



Photos from http://physics.nist.gov/GenInt/Parity/cover.html

The ellipsoid on the left represents a large number of cobalt nuclei, all with their spins in the same direction, all emitting beta rays. On the right this process is seen in a mirror. The direction of spin is reversed, while the direction in which most beta rays are emitted remains unchanged. The mirror world is thus distinguishable from the real world. The parity-transformed world is not identical with the real world; parity is not conserved.

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APS Online Journal Access Helps Russian Scientists

By Richard M. Todaro

The American Physical Society's program to provide Russian academic and research institutions free and reduced-cost access to its online journals has resulted in nearly 73,000 current articles being downloaded since its inception in March 2000, prompting APS Treasurer Thomas McIlrath to declare it a success.

"The goal of the program is to keep the literature available to students and research scientists throughout the world, in particular in this case, in Russia," said McIlrath, who also is publisher of the APS research journals. "I think we are moving well in Russia. Everybody seems to have common goals and reasonable expectations."

Known informally as the Electronic Journal Program, it was set up in early 2000 following the termination in 1999 of the Science Journals Donation Program by the Russian office of billionaire philanthropist George Soros's Open Society Institute Network.

The Soros program was established in the early 1990s in the chaos following the break-up to the Soviet Union in order to provide various institutions across the former USSR access to hard science journals, including APS ones.

According to the former head of the program, Soros himself decided in 2000 to stop supporting mailing journals in hard copy form in favor of establishing a much more quickly available electronic system.

"Mr. Soros wanted to change to an online position. He felt that by the time the journals arrived, although it was better than nothing, it was very far behind when the scientists actually needed them," said Melissa Hagemann, former program officer for the Science Journals Donation Program, and now with the Information Program at the Open Society Institute's New York office.

With the end of Open Society Institute support, in February of 2000 the APS Executive Board established the Electronic Journal Program, providing electronic access to APS journals – current and archived back to the beginning – to 158 participating Russian institutions through the Russian Foundation for Basic Research (RFBR), a government-funded organization that funds a wide variety of scientific research across Russia.

According to statistics provided by program manager Claire O'Neill Sinks, as of July 1, 2001 there had been 72,858 current articles downloaded by 133 of the 158 registered academic and research institutions in Russia. Archived articles accounted for another 1599 downloads from April through June.

Although the program provided free access to any participating Russian institution in its first year, McIlrath said the plan was to institute a 10-year phase-in of the regular cost for access to APS journals starting in 2001.

McIlrath said negotiations with the RFBR for a multi-year contract with the cost phase-in are "going well but slowly. We are trying to negotiate a single-site license paid by the RFBR that will provide all the journals to all the institutions back to the beginning of each journal."

The Electronic Journal Program provides access to the past three years of the *Physical Review*, *Physical Review Letters*, and *Reviews of Modern Physics*. It also provides access to the newly completed, comprehensive Physical Review Online Archive (PROLA), an electronic database containing all of these journals from three years ago (currently 1998) back to their beginnings – which for *Physical Review* was in 1893.

Martin Blume, Editor-in-Chief of the APS, has estimated that PROLA replaces 220 feet of library shelf space – almost four-fifths the length of a football field.

SPOTLIGHT on the Profession of Physics

Physics Education: Education of a Physicist

By Arthur F. Hebard

All of us who refer to ourselves as physicists have at one time or another been influenced by the physics education system. If asked why physics education is an important subject, most of us would agree unhesitatingly with the answer that it provides us with access to a vast body of knowledge which has been collected and tested over the ages and which has enabled the triumph of science over superstition and ignorance. Physics education is also important because it teaches methods of inquiry and analysis that expand upon this body of knowledge to drive the development of advanced technology in our modern society.

Although these answers might make us feel good, they do not address the most compelling requirements for a good physics education system; namely enhancing the scientific literacy of the general public and providing a well-trained technical workforce. These requirements have been embraced in a recent National Academy of Sciences (NAS) study[1] which concludes that physics education must change to adapt to a new landscape in which physics itself is becoming more interdisciplinary and society is becoming increasingly dependent on technology.

The problems are acute in many areas. For example, in K-12 only about 1/3 of the physics teachers have physics degrees and less than 30% of high school seniors are enrolled in physics courses. These students score lower on physics tests than comparable students from other countries. The decreasing numbers of undergraduates majoring in sciences is also worrying. Dropout rates by declared physics majors are high, and student interest in physics careers is waning.

At the PhD level, a recent American Institute of Physics (AIP) report[2] reveals that PhD production has been declining since 1994. The number of Americans entering physics graduate programs is the lowest in more than 30 years, although much of the slack has been taken up by an influx of students from foreign countries. Workforce needs in the US will be severely compromised if the economy stagnates and many of these foreign PhD recipients find it more attractive to return to their countries of origin to pursue their careers.

NAS studies and AIP reports cogently state the problems confronting physics education, but to most individuals, myself included, these problems are not real until experienced firsthand. Active personal involvement is required, and to be effective, such involvement must be on a broad front, taking up the energies of more than just a few of us. If, for example, a large number of APS members commit to volunteerism and individual action, significant progress can be made. Whether you are an academic teaching Mechanics 101 or an industrial physicist modifying the composition of a widget to reduce manufacturing costs, you understand and appreciate physics and can therefore be effective in addressing critical problems confronting physics education.

There are three ways to become involved: (1) by acting in one's professional capacity to improve opportunities for learning in the workplace, (2) by volunteering in educational and related activities through existing organizations such as the APS, and (3) by spontaneous individual acts.

Workplace advocacy and implementation of changes in physics education can have equal impact in academic, industrial, or government lab settings. I have mentored summer students with equal effectiveness at Bell Laboratories and at the University of Florida. In these programs, hypotheses are tested, problems are solved, research is completed, papers are written, and the successful students go home feeling good about science. Internships for students and sabbatical leave for faculty help lubricate the connection between industry and academia. Invitations to alumni to come onto campus and speak to students about their careers can also be very effective.

Alicia Chang/APS

Arthur F. Hebard

Meaningful curriculum reform should be guided by the principle that physics education is not just for the purpose of producing professional physicists. Graduates with PhDs are often too specialized and have trouble adapting to nonacademic careers. Attitude changes are needed. No longer should the conferral of a master's degree be viewed as a consolation prize but rather as a valued and marketable degree that qualifies the recipient for a wide variety of lucrative and satisfying jobs. A number of schools are already providing alternative offerings including professional masters degree programs, career-skills courses, dual track undergraduate majors, and combined physics-business or physics-engineering majors.

Small-scale changes can be easily accomplished. For example three of us on the faculty at UF spontaneously decided last year that a course on "Communication in the Scientific Arena" was needed for our graduate students. The intention of the course was to hone oral presentation skills without compromising technical content. Our hope is that no student from the University of Florida will give a contributed talk at an APS meeting or be interviewed for a job without having taken this course.

Volunteering is also an effective way to make an impact on physics education. For some this might mean tutoring the underprivileged or spending a few hours a week helping to teach science in a local high school. For others like myself, it is volunteering through one's professional society. The APS has a very effective education and outreach program that is supportive of the mission

See SPOTLIGHT *on page 6*

Hawaii, *from page 1*

threads in the research interests pursued by the nuclear physics communities of Japan and the US," said Virginia Brown of MIT and the University of Maryland, who chaired the organizing committee. "These exist at the level of big projects as well as the individual investigator. Our goal was to bring the two societies together at both levels in a truly joint meeting emphasizing topics of common interest."

Attendance was strong despite some cancellations caused by an FBI generic warning of the potential for increased terrorist activity, according to DNP Chair Joel Moss (Los Alamos National Laboratory). Highlights included a special session on the status of women and minorities in physics, featuring talks by APS Executive Officer Judy Franz and Professor Masako Bando of Aichi University. And in a whimsical nod to the unique culture of the region, the traditional Friday evening banquet was replaced with a special Hawaiian luau.

The scientific program was spearheaded by a plenary session which focused on present and future relativistic ion beam facilities. Larry McLerran of Brookhaven National Laboratory gave a summary of what scientists have learned and expect to discover about matter at high energy density from the heavy ion program at RHIC, including insights into quark gluon-plasmas and color-glass condensates. And Shoji Nagamiya described the status of the joint JAERI/KEK high intensity proton accelerator project, a 189 billion yen project that recently began its six year construction phase.

There were also an unusually large number of mini symposia, featuring one invited talk followed by numerous contributed papers on the same topic. "These symposia lend themselves to alternating JPS and APS invited and contributed speakers. A lot of work went into picking topics of mutual interest and intertwining speakers," said Brown.

One such symposium focused on atoms containing such exotic particles as muons, pions, kaons or antiprotons which, while not a new subject, remains active and product thanks to several new collaborative facilities, according to R.S. Hayano (University of Tokyo), who kicked off the session. For example, a new low energy antiproton facility at CERN called "AD" ["antiproton decelerator"] is already beginning to produce new results since it started delivering 5 MeV pulsed antiprotons last year. The ATHENE and TRAP collaborations are making steady progress towards cold antiproton synthesis, and the ASACUSA collaboration recently succeeded in decelerating antiprotons down to about 10 KeV by using a radio frequency quadrupole decelerator.

Neutrinos are of great interest in both nuclear physic and astrophysics, according to Gail McLaughlin (North Carolina State University), who described how both ordinary stars and supernovae release neutrinos which undergo flavor transformation. Her Thursday morning talk focused on the role of neutrino scattering and flavor transformation in supernova nucleosynthesis, as well as possible observable consequences of such transformations on the neutrino signature of the next galactic supernova. The same session also featured the latest results gleaned from the Sudbury Neutrino Observatory, an imaging Cerenkov detector that observes neutrinos from the sun in hopes of providing evidence for flavor transformation of electron neutrinos without reference to solar model flux calculations.

While not a nuclear physicist himself, APS President George Trilling (Lawrence Berkeley National Laboratory) was on hand to represent the Society and declared the meeting "a great success." His enthusiasm was echoed by Moss, who reported that one Japanese member of the organizing committee suggested that "we do this every year." "The area of nuclear physics is particularly suitable for a joint meeting because of the many subtopics in that field where there are US/Japan collaborative efforts using facilities in both countries," says Trilling. "I hope that in the future it may be possible to organize additional efforts in both Japan and the US, including [research] collaborations."

LETTERS

A Bad Presentation is a Bad Presentation

Although I'm far too young to be a curmudgeon, I found myself in full agreement with Al Bartlett's comments on the use of "presentation technology" (October 2001, *APS News*). I would only add that a bad presentation is a bad presentation, whether done with an overhead projector or a glitzy PowerPoint presentation. A watch-word for all presenters: view your own slides—whether on transparencies or 35mm or computer projector—from the back row of the room you'll actually be using. If you can't read it effectively, neither can your audience.

George Spagna
Ashland, Virginia

Accuracy is Important

In the October 2001 issue of *APS News*, I noticed that the graphs on page 1 showing the rises in salaries for physicists did not begin at $0. In my opinion, our visual aids should illustrate the same data with the same level of accuracy as our numbers would do. However, while I am happy that my salary has continued to climb over the years, by beginning at $20,000 instead of $0, the graphs make the increase "appear" to be larger (percentage-wise) than the numbers indicate. In this case it may not be a large "error" in perception, but as scientists we should aim to be accurate in all of our communication.

Richard L. Bowman
Bridgewater, Virginia

Mein Units

As I started reading Charles McCutchen's Viewpoint article in the October 2001 issue of *APS News*, I fell into my usual 2pm power nap, a habit since post-lunch lectures in grad school. When I woke up and continued his article, I was thrilled and delighted by a level of vitriol and teeth gnashing that I'd not seen in print in many years. I was therefore a bit disappointed to find some technical errors in an article whose fury and opprobrium were otherwise perfect.

The ultracentrifugers' Svedberg is 10^{-13} seconds, not 10^{-13} cm. The subsequent parenthetic remark, "(one Fermi/sec per g)", presumably intended to shed further light on the Svedberg, works out to ~$(10^{-15}\ m/\text{sec})/(10m/\text{sec}^2)=10^{-16}$ sec, off by a factor of about 1000 from the Svedberg.

I very much enjoyed reading an article that could have been entitled Mein Units. However, it's a bit ironic that significant errors in both dimensions and numbers crept into a piece that unabashedly extolled units that had not, in the author's opinion, passed muster with the "units dictators".

Jeffrey Marque
San Mateo, California

MEETING BRIEFS

New England Section Fall Meeting

The APS New England Section held its annual fall meeting November 2-3 at Keene State College in Keene, NH, jointly with its corresponding geographical section of the American Association of Physics Teachers (AAPT). The conference's theme was the confluence of chemistry and physics, featuring talks on such diverse topics as condensed matter, surface science, thin films, and nanotechnology. Invited speakers gave lectures on trapping and storing light in atoms, novel applications of X-ray crystallographic techniques, electrical transport in carbon nanotubes, imaging phase transitions, and fullerenes in the polymeric state. The evening's banquet speaker was Indiana University's George Ewing, who spoke on the physics and chemistry of ice. There were also lectures on cross-disciplinary education, including a presentation by APS Director of Education and Outreach Fredrick Stein on the fledgling PhysTEC program (see *APS News*, November 2001).

Four Corners Section Fall Meeting

The APS Four Corners Section also held its annual fall meeting the first weekend in November at New Mexico State University in Las Cruces, NM. While technically a general meeting, four focused sessions were organized for papers in condensed matter physics, physics education, earth and space science, and nuclear and particle physics. There was an afternoon special demonstration session. And the evening featured a lecture by 1997 Nobel prizewinner Steven Chu on his development of methods to cool and trap atoms with laser light, as well as a presentation on the physics of dance by Kenneth Laws of Dickinson College (see *APS News*, November 1999), illustrated with the help of a professional ballet dancer.

Southeastern Section Fall Meeting

The APS Southeastern Section held its annual fall meeting November 4-6 at the University of Virginia in Charlottesville, VA. The program featured a broad range of topics, including recent advances in particle physics, quantum optics, condensed matter, chaos, quantum information and physics education. In keeping with the section's longstanding tradition, Sunday evening also featured a program of physics demonstrations.

World's Oldest Airport May Be Terrorists' Victim

By Richard M. Todaro

The headquarters of the American Physical Society in College Park, Maryland is also home to the College Park Airport, a small facility with the unique distinction of being "the oldest, continuously operating airport in the world."

But the terrorist attacks of September 11, 2001 prompted severe restrictions on private general aviation in at least 30 cities around the country, including a ban on all such aviation within a 25 nautical mile radius of Washington, DC and New York City.

While the restrictions are being gradually relaxed, and even though the radius of the ban about Washington's Reagan National Airport and New York's JFK Airport has been shrunk to 18 nautical miles, the College Park Airport falls well inside this range.

When the "temporary flight restricted area" about Washington and New York will be lifted is not clear. College Park Airport manager Lee Schiek said that high-ranking FAA officials told him reopening is likely to be a "multi-month" process.

Alicia Chang/APS

College Park Airport, known as "the oldest, continuously operating airport in the world" is grounded until further notice.

"Founded" as an airstrip in 1909 by none other than Wilbur Wright himself – who was here to demonstrate the usefulness of his flying machine to the US Government – the College Park Airport turned 92 years old on October 26.

Unlike private, for-profit airports inside the restricted areas, the College Park Airport is run by the Maryland Park and Planning Commission, a quasi-governmental state agency that oversees parks, recreation and related zoning issues in Prince George's and Montgomery Counties. As such, the airport's survival through this difficult time is a good bet.

"We have resources available that will allow us to buffer the problem we are having right now," Schiek said. "Our private sector maintenance has moved off-site."

But will the airport now lose its status as the "oldest, continuously operating airport in the world" now that it isn't operating?

Schiek said that with the help of the county police department, this won't happen.

"A helicopter belonging to the Prince George's County Police touches down on the tarmac every day in order for us to maintain our status as the 'world's oldest, continuously operating airport,' " he said. Guinness Book of World Records, take note.

zero gravity
The Lighter Side of Science

2001 Ig Nobel Prizes

The 2001 Ig Nobel Prizes, presented for achievements that "cannot or should not be reproduced," were awarded at Harvard's historic Sanders Theatre on October 4 before 1,200 spectators, in a ceremony filled with labcoats, opera singers, paper airplanes, nuptial paraphernalia, and Joseph Stalin masks.

The evening concluded with the wedding on stage of two scientists, Lisa Danielson and Will Stefanov, who are both geologists based at Arizona State University. The wedding ceremony was performed in sixty seconds and was preceded by the premiere of a new mini-opera ("The Wedding Complex") performed by professional opera singers and five Nobel Laureates. The event was produced by the science humor magazine *Annals of Improbable Research* (AIR), and co-sponsored by the Harvard Computer Society, the Harvard- Radcliffe Science Fiction Association and the Harvard-Radcliffe Society of Physics Students.

Here are the new winners:

MEDICINE: Peter Barss of McGill University, for his impactful medical report "Injuries Due to Falling Coconuts."

PHYSICS: David Schmidt of the University of Massachusetts for his partial solution to the question of why shower curtains billow inwards.

BIOLOGY: Buck Weimer of Pueblo, Colorado for inventing UnderEase, airtight underwear with a replaceable charcoal filter that removes bad-smelling gases before they escape.

ECONOMICS: Joel Slemrod, of the University of Michigan Business School, and Wojciech Kopczuk, of University of British Columbia, for their conclusion that people would find a way to postpone their deaths if that would qualify them for a lower rate on the inheritance tax.

LITERATURE: John Richards of Boston, England, founder of The Apostrophe Protection Society, for his efforts to protect, promote, and defend the differences between plural and possessive.

PSYCHOLOGY: Lawrence W. Sherman of Miami University, Ohio, for his influential research report "An Ecological Study of Glee in Small Groups of Preschool Children."

ASTROPHYSICS: Dr. Jack and Rexella Van Impe of Jack Van Impe Ministries, Rochester Hills, Michigan, for their discovery that black holes fulfill all the technical requirements to be the location of Hell.

PEACE: Viliumas Malinauskus of Grutas, Lithuania, for creating the amusement park known as "Stalin World."

TECHNOLOGY: Awarded jointly to John Keogh of Hawthorn, Victoria, Australia, for patenting the wheel in the year 2001, and to the Australian Patent Office for granting him Innovation Patent #2001100012.

PUBLIC HEALTH: Chittaranjan Andrade and B. S. Srihari of the National Institute of Mental Health and Neurosciences, Bangalore, India, for their probing medical discovery that nose picking is a common activity among adolescents.

For more information, see http://www.improbable.com.

Nobel Prize, *from page 1*

research will help scientists use motionless atoms to measure the fundamental properties of matter. "Revolutionary applications of [Bose-Einstein condensates] in lithography, nanotechnology and holography appear to be just around the corner," the citation said.

The BEC phenomenon, foreseen by Satyendra Bose and Albert Einstein in the 1920s, can come about when atoms are chilled to very low temperatures. Quantum theory holds that the wavelike nature of atoms allows them to spread out and even overlap. Indeed at a high enough density and a low enough temperature (billionths of degrees above absolute zero) the atoms can, like the photons in a laser, enter into a common quantum state with a common energy. In other words, the atoms are all coordinated (coherent) with each other and constitute a single "super atom." BEC was possible experimentally when, in a magnetoptic trap, a combination of laser cooling (a web of laser beams hitting the atoms from many directions) and evaporative cooling (a web of magnetic fields encourage the warmer atoms to depart, leaving the cooler atoms to coalesce in the trap) brought about by unprecedentedly low temperatures.

BEC is still largely restricted to fundamental research in physics labs, but numerous potential applications beckon, such as the use of BEC beams ("atom lasers") for doing high-resolution lithography for microchips, interferometry (navigation, gravity wave detectors, etc.), high-precision clocks, and "atomtronics" (atoms sent around a microchip or down hollow fibers).

The Nobel prizes are presented on December 10 each year, the anniversary of Alfred Nobel's death in 1896. To mark this year's centennial, all living Nobel laureates have been invited to the ceremonies and related seminars, with about 150 expected in Stockholm and 30 in Oslo, including former South African President Nelson Mandela, and former Soviet leader Mikhail Gorbachev.

—Philip F. Schewe and Benjamin P. Stein of AIP's Public Information Division contributed to this article.

Focus on Committees

Two Complementary Committees Tackle Public Affairs

By Richard M. Todaro

"The Panel on Public Affairs studies what physics can do for the country while the Physics Policy Committee advocates what the country should be doing to support physics."

This oft-repeated sentence is used to describe the different but complementary goals of two key APS committees that address issues relating to public affairs.

The Panel on Public Affairs, created in 1974 and known by its acronym POPA, advises the President and the Council on various public policy issues that have a particular interest to physicists. Consisting of 19 members elected by Council and other ex officio members, POPA engages in a series of activities that William Frazer of the University of California, the current chair, said "can be put together under the idea of the APS trying to be of service to the broader society on matters within its technical competence."

"For example, we recently assisted APS President George Trilling in preparing a response to requests from a representative of the US Secretary of Energy for advice on the proposed Yucca Mountain nuclear waste disposal site in Nevada," Frazer said.

A second type of POPA activity is initiating both large-scale studies and smaller scale reports. Large-scale studies can take several months to several years and go through a formal procedure involving the APS Council. Frazer said a prime current example are the technical issues raised by the proposed National Missile Defense System.

"There is currently a study on aspects of missile defense which will be completed early next year," he said. This study has been the subject of a number of reports in *APS News* (January, March, October 2001 issues).

Other APS studies, going back to the mid-seventies, have included light-water reactor safety, nuclear fuel cycles and waste management, and solar photovoltaic energy conversion, among others. These studies are available under Public Affairs on the main APS web site.

Like the major studies, the more modest POPA reports can also deal with a range of issues from energy and the environment to national security and help APS members become familiar with such issues.

"There are less formal reports called POPA reports where some of our members get together and do less extensive study," Frazer said. "We usually prepare these for education of and discussion by APS members."

Current POPA reports (as listed on the APS web site) include Patriot missile performance during the Gulf War, possible dangers posed by power lines and ordinary electrical appliances, and the relation of science and technology to economic growth.

A third type of POPA activity is to advise the APS leadership on official Statements of the American Physical Society. Frazer said such statements are formulated by POPA before consideration by the full APS Council.

William Frazer

Robert Richardson

APS Statements have ranged on topics from teaching Creationism in public schools to the rise of anti-Semitism in the former Soviet Union in the early 1990s to a statement on the technical feasibility and deployment of the National Missile Defense System. These statements are also available on the APS website (http://www.aps.org/statements/).

The Physics Policy Committee (PPC) was initially called the Physics Planning Committee when it was established informally within POPA in early 1989 following the recommendation of a POPA task force on long-range planning. After being elevated to the status of a formal committee operating under APS bylaws in 1991, the name was changed in 1997 to the current Physics Policy Committee. There are 15 regular members, including the chair of POPA.

From the beginning, PPC served to advise the APS on governmental matters that might affect the physics or even larger scientific community. PPC statements are sent to the APS Council via POPA.

"Our principal function is to serve as an advisory committee for the APS leadership on issues related to the interaction between physicists and the national government," said Robert C. Richardson of Cornell, current chair of the PPC. "The PPC consists of a group of experienced people the APS can call upon for advice."

"We spend a lot of time monitoring funding support from the federal agencies in support of science. We try to help the APS form strategic alliances with other professional societies," Richardson said. "We do a little bit of lobbying. We have conversations with the staff support of the principal science committees in the Senate and House, and we talk to the heads of agencies."

Richardson described APS lobbying as a "gentle kind" designed to provide "appropriate guidance." Often this means following budgets through the approval process.

"We try to think of how to encourage the supporters of the science budget who are in Congress," he said.

Richardson noted that PPC got involved with the role of science in the leadership of the Department of Energy.

"We sponsored a group of people – it wasn't an official APS committee – to analyze the way the Department of Energy is authorized and gave congressional testimony on the role science plays in the leadership of the Department of Energy," he said.

But Richardson said that PPC tries to avoid simply making the "weak" argument that physicists just want more money from the government. Rather, he said the committee attempts to link what the physics community is able to do for the country with proper funding priorities to achieve such goals.

"If you say, 'hey, we need more money,' that is a very weak argument. What we need to say is, 'look, the government is relying on the contributions the physics community can make in these areas' and if there is an important opportunity the government is going to miss, we will make every effort to draw attention to that," Richardson said.

Editorial Cartoon

"Physicists Strive to Build a Black Hole"

...NY Times News Item

"Agreed. The first things we toss into our black hole will be our high school yearbooks."

Nanotechnology Featured at Senior Physicists Group Meeting

Alicia Chang/APS

At the October event for the APS Mid-Atlantic Senior Physicists Group, speaker Jonathon Selinger (far right) of the Naval Research Laboratory, presented a talk on nanotechnology while group members (from left to right) Dick Strombotne, Walt Faust and Jim Cline look on. This is one of a series of monthly events being held at APS headquarters in College Park, Maryland.

Apker, *from page 1*

used by the group to explore theoretically novel mechanisms to generate new light sources exploiting resonance last-atom interactions.

Using his computer skills, Wagner has undertaken numerous research projects, including the exploration of a hydrogen atom in a laser field. He later added a strong, static magnetic field to the system, and found that the probability density function for the electron — which is initially the ground state of hydrogen — evolves over time to form a ring-shaped structure later dubbed a cycloatom. His most recent project concerns classical and quantum modeling of an electron-electron collision, with the objective of gaining a better understanding of the classical approximation in a two-electron system, which he hopes to apply to the study of a two-electron cycloatom.

Although just beginning his senior year, Wagner has presented more talks, published more papers and won more awards than any previous physics major, according to departmental chair Richard Martin. He has given 11 conference presentations and contributed to nine peer-reviewed publications, including a *Physical Review Letters* article on his development of a new Internet-based visualization software package that can generate 3D computer animated movies, which was featured in *Physical Review Focus* as well as *Science News*.

He has twice been selected to give invited talks at the APS Division of Atomic Molecular and Optical Physics' undergraduate research symposium, and presented a paper on high harmonic generation in ionization of magnetically dressed atoms at the APS Centennial Meeting in 1999. Wagner describes the past three years of research as "a very exciting and rewarding part of my undergraduate education" adding that he plans to pursue a career in physics. "I am looking forward to the new challenges offered by a physics graduate school."

Todd's thesis consisted of two main experimental research projects, both involving the physics of two-dimensional systems in semiconductor heterostructures. In the first, she studied the mobility of a 2D electron gas confined to an interface between gallium arsenide and an alloy. In such systems, the electrons are typically donated by silicon atoms deposited in a thin sheet some distance away from the interface on the alloy side. Todd added a narrow quantum well between the dopant sheet and the material interface in order to add a second layer of 2D electrons which could screen potential fluctuations of the donors. She then employed theoretical modeling to produce predictions of the electron densities in the quantum well and heterointerfaces as a function of various physical parameters.

In her second project, Todd examined the tunneling current that flows perpendicularly between two parallel 2D electron systems in a symmetrically doped double quantum well system. When a large magnetic field is perpendicularly applied to the 2D planes, tunneling at low interlayer voltages is heavily suppressed. Todd sought to examine this suppression and determine the exact shape of the nonlinear current voltage (I-V) characteristic at very low voltage. She succeeded in manufacturing tunnel junctions and measured the tunnel current down to values 100 times smaller than the research group had done in the past, concluding that the suppression effect deep in the gap was less rapid than it appears at higher energy. She is still pursuing the project, hoping to obtain a quantitative result for I-V deep in the gap.

James Eisenstein, her thesis advisor at CalTech, says he has watched Todd "mature from an inquisitive young undergraduate into an accomplished laboratory scientist," noting that in order to arrive at these scientific conclusions, she performed all aspects of the experiments and analyses herself, "at the level expected of an experienced graduate student." These included optical lithography, wet etching, thin film depositions, and low temperature, low noise electrical measurements. Todd is currently attending graduate school at Stanford University to pursue a PhD in physics.

INSIDE THE BELTWAY:
A Washington Analysis

Getting it Right

By Michael S. Lubell, APS Director of Public Affairs

Finding a way to inject science into the psyche of policy makers and elected officials is always a daunting task. You might think that the September 11 attack and the anthrax assaults would make it easier. But you'd be wrong. No question, fighting terrorism requires crack intelligence operatives. And it depends on international cooperation to control the flow of laundered cash. But to succeed it must draw on the best that science and technology have to offer.

Intercepting clandestine communications, recognizing suspect behavior patterns, detecting biological and chemical agents, decontaminating infected sites – all of these are high-tech activities. Yet if you look at the new Office of Homeland Security, you don't find a whiff of science at the loftiest levels.

True, Jack Marburger, who was recently installed as the President's Science Advisor, has attended cabinet meetings on terrorism and can be expected to play a role. True, one of the dozen or so panels on counter-terrorism policy and planning will focus on science and technology.

For now, however, the six key players on the homeland security team, according to *CQ Weekly*, count one retired Navy admiral, two lobbyists, one legal counsel to the Bush campaign, one marketing specialist and one communications executive.

But fighting terrorism requires more than PR and political hype. More than three years ago, then-Secretary of Defense William Cohen appointed a 14 member bipartisan commission, headed by two former senators, Gary Hart, a Colorado Democrat, and Warren Rudman, a New Hampshire Republican. Their task was to examine and redefine America's national security policies in the post Cold War era.

It was a posse of heavyweights that included ex-House Speaker Newt Gingrich, former Motorola Board Chairman John Galvin, former Lockheed-Martin CEO Norm Augustine and James Schlesinger, whose priors comprised stints as Secretaries of Energy and Defense.

Last March, the Hart-Rudman Commission, formally known as the US Commission on National Security/21st Century released its Phase III Report, calling for the creation of an Agency for National Homeland Security with Cabinet status.

In what must be one of the most prescient analyses of recent times, it said, "The combination of unconventional weapons proliferation with the persistence of international terrorism will end the relative invulnerability of the US homeland to catastrophic attack. A direct attack against American citizens *on American soil* is likely over the next quarter century." They certainly got that right.

In response, last spring, President Bush expressed his appreciation for the work that the former administration had inspired and promptly asked Vice President Cheney to reexamine the issue, this time with a plan to have the Federal Emergency Management Agency take the lead.

September 11 changed all that, and now former Pennsylvania Governor Tom Ridge is installed as the Terrorism Czar, with full Cabinet privileges. But the White House has failed to act on three other key Commission recommendations, the ones dealing with science and technology.

The Phase III Report noted, "In this Commission's view, the inadequacies of our systems of research and education pose a greater threat to US national security over the next quarter century than any potential conventional war we can imagine."

To address the threat, the Commission made three policy recommendations: "doubling the federal research and development budget by 2010 and instituting a more competitive climate for the allotment of those funds," elevating "the role of the President's Science Advisor to oversee these and other critical tasks," and passing "a new National Security Science and Technology Education Act."

Judging by White House actions and rhetoric, these recommendations are receiving scant attention. The Office of Science and Technology Policy has been down-sized from four to two associate directors. The Office of Management and Budget has signaled that science budgets for Fiscal Year 2003 will be slashed unless programs focus strictly on fighting terrorism. And the President insisted that DOE's bottom line be held even if Congress restored funding for energy technology programs. The result was no increase in the Department's FY 2002 budget.

Largely through the work of science advocacy groups and the good judgment of science champions James Walsh (R-NY) and Alan Mollohan (D-WV) in the House and Barbara Mikulski (D-MD) and Kit Bond (R-MO) in the Senate, NSF and NASA fared relatively well in the November budget conferences, with NSF rising 7.6 percent and NASA space science jumping 8.5 percent. In the coming months the White House and the science community need to get it right. Scientists must accept their responsibility and help the nation in a time of need. That was one of Vannevar Bush's main arguments to President Roosevelt when he advocated strong federal support for research. And the White House must foster the future strength and vitality of A merican science by providing the necessary resources for long-term research.

No other prescription can defeat the disease of terrorism and safeguard our homeland in the 21st century.

SPIN-UP Seeks Undergraduate Programs to Host Site Visits

The National Task Force on Undergraduate Physics has been awarded a $133,000 grant by the Exxon-Mobil Foundation to support its Strategic Programs for Innovations in Undergraduate Physics (SPIN-UP) initiative.

Thanks to this grant, SPIN-UP's focus in the coming year will be on completion of site visits to about 20 departments with thriving undergraduate physics programs, and of the survey of all physics departments. A case study report compiling the findings of the site visits will be distributed to all physics departments in the country. Departments interested in being part of the site visit program should contact the task force at taskforce@aapt.org, or spinup@gw.bsu.edu

The task force is charged with planning, developing, and coordinating activities aimed at "revitalizing" undergraduate physics programs across the country, and providing advice to the professional organizations and the physics community at large about undergraduate physics.

The national task force was formed a year and a half ago by the APS, the American Institute of Physics, and the American Association of Physics Teachers, drawing its 10 members from physics departments around the country. While the number of undergraduate physics majors as a whole is declining steadily each year, the task force noticed that certain departments were actually thriving and growing. They came up with several hypotheses as to why this might be so, but found no data to support their conclusions. So they approached Exxon-Mobil for funds to conduct a series of site visits and a survey of all undergraduate physics departments to gather the missing hard data.

Further information about the task force is available online at http://www.aapt.org/programs/nftup.

Models for Reform

When it comes to revitalizing physics departments, one size doesn't necessarily fit all, according to Robert C. Hilborn, a professor of physics at Amherst College and chair of the task force. "There are many ways to apply the principles of successful programs to the local situation," he says.

When the physics department at the University of Illinois, Urbana-Champaign, began revamping its curriculum in 1996, it faced a challenge common to many large state universities: huge classes for introductory physics (about 2500 students each semester) placed a heavy burden on the faculty member assigned to teach them, and burnout was a common problem. So the department chose to implement what it describes as a "team teaching" environment, according to faculty member Gary Gladding, in which the burden is evenly distributed among several faculty members. The result: "No heroes, no burnout, because both the pain and gain are shared."

The Colorado School of Mines is a much smaller school, with a technology-focused mission, and hence most of its students are already predisposed to science and engineering pursuits. Despite its small size, CSM is among the top 20 colleges and universities nationwide in terms of producing physics majors. James McNeil, a professor in the physics department, attributes this to the fact that every student is required to take Physics I and II, which are taught by the best teachers, because this is viewed as a prime recruiting opportunity to draw students into the physics department. The college administration values teaching, tends to hire student-centered faculty, and encourages and rewards teaching innovations.

March Meeting, *from page 1*

condensed matter, materials physics, high polymer and chemical physics, biological physics, and laser science, to name just a few of the many APS units who participate each year. The outstanding scientific program will consist of more than 90 invited sessions and 550 contributed sessions, at which approximately 5,000 papers will be presented.

In addition, the meeting traditionally features a two day short course on the Saturday and Sunday preceding the start of the conference, organized by the APS Division of Polymer Physics, and focused this year on the topic of glasses and the glass transition. Also on Sunday, the Committee on the Status of Women in Physics will offer a half-day workshop on "Survival Skills for Successful Women Physicists" in which a panel of highly successful women physicists will share their perspectives on scientific careers, raising research funds, balancing career and family, and more.

Sunday will also feature eight half day tutorials on a variety of specialized

topics: superconducting materials, spintronics, high resolution optical microscopy in materials systems, nonlinear dynamics in cellular biophysics, single electron tunneling, how Beowulf clusters can enhance computing needs, applied magnetism and information storage technology, and business fundamentals for physicists interested in entrepreneurship.

Rounding out the activities is a series of special events, such as the annual awards program, alumni reunions, and a special "students lunch with the experts" on Wednesday afternoon, March 20. Attendees will also be able to visit the larger and enhanced exhibit show, with displays by vendors showcasing their latest products, instruments and equipment, as well as computer software and scientific publications.

Spotlight, *from page 3*

"to expand and diffuse the knowledge of physics". These marching orders are highly suited to the physics education cause and progress is greatly facilitated by the enabling structure and resources provided by the APS.

APS outreach extends across the broad areas of education, public affairs, governmental relations, public information, international affairs, women and minorities in physics, and careers and professional development. Visit the APS web site and familiarize yourself with the opportunities. Call a present or past committee member and ask questions. You will discover that it is easy to find like-minded spirits, and by acting together your individual efforts will be magnified and made more effective. My own commitment has been to the Committee on Careers and Professional Development (CCPD), a committee that through its Careers and Professional Development Liaisons (CPDLs), identifies and aids faculty career counselors at more than 200 physics departments. This is done for the most part by (1) disseminating current information on career and employment trends, (2) organizing workshops at regional and national APS meetings to exchange information on model programs, and (3) maintaining and updating a dedicated CPDL website[3] to encourage dialogue between physics departments regarding career development programs for students.

At the individual level physics education can be addressed in a multitude of ways. Exude enthusiasm for physics, excite the students, engage everybody who will listen, and inform the citizenry! For example, on the highways and at the gas pumps, I have found myself explaining the Doppler effect and red shifts because of an orange-colored sticker on my rear bumper that reads, "If this sign is blue, you are going too fast". Explain your research using bulletin boards, seminars, and web pages and by all means avoid giving the impression that your work is so important that you shouldn't have to explain it. Finally, be active on the small-action front: participate in science fairs, visit a classroom, do a demo, write your congressman, or send a thoughtful letter to your local newspaper.

There is no one solution to improving physics education. Physics education is a multifaceted issue that occurs on many scales. The active involvement of physicists who understand and appreciate physics is however definitely required. There are many professional and personal rewards for becoming involved. Clearly, the health of physics is at stake, and that should be motivation enough. For me, the opportunity to interact daily with young people energizes and is fulfilling. I know I have less gray hair because of it.

Arthur Hebard is a professor of physics at the University of Florida and previously was a research scientist at Bell Laboratories in Murray Hill, N.J. for 23 years. He is currently chair of the APS Committee on Careers and Professional Development.

References:

[1] *Physics in a New Era: An Overview*, The National Academy of Sciences, 2001 (http://books.nap.edu/books/0309073421/html/index.html)

[2] *2000 Physics Academic Workforce Report*, American Institute of Physics (AIP) Pub. Number R-392.4, March 2001 (http://www.aip.org/statistics/)

[3] CPDL web page at http://www.aps.org/jobs/cpdl/

ANNOUNCEMENTS

FELLOWSHIP PROGRAMS

APS/AIP CONGRESSIONAL SCIENCE FELLOWSHIP

The American Physical Society and the American Institute of Physics are accepting applications for their 2002-2003 Congressional Science Fellowship programs. Fellows serve one year on the staff of a Member of Congress or congressional committee, learning the legislative process while lending scientific expertise to public policy issues. Application deadline is January 15, 2002. For more information, visit: http://www.aip.org/pubinfo or http://www.aps.org/public_affairs/fellow/index.shtml

Nominations Requested for Nicholas Metropolis Award for Outstanding Doctoral Thesis Work in Computational Physics

The purpose of the award is to recognize doctoral thesis research of outstanding quality and achievement in computational physics and to encourage effective written and oral presentation of research results.

The award consists of $1,500 and a certificate to be presented at the Division of Computational Physics annual meeting and an allowance of up to $500 for travel to the meeting. The award is supported by the Journal of Computational Physics.

Nominations will be accepted for any student in any country for work performed as part of the requirements for the PhD Nominees must pass their thesis defense not more than 18 months before the nomination deadline. Individuals can be nominated only once; unsuccessful candidates will be carried over for one year. The procedure for nominations can be found at http://www.aps.org/praw/metropol.

Deadline for submission of nominations for the 2002 Prize is January 14, 2002

APS Council and Committee Position Nominations

VICE-PRESIDENT; GENERAL COUNCILLOR (2); NOMINATING COMMITTEE; Vice-Chairperson-Elect • Members; PANEL ON PUBLIC AFFAIRS; Vice-Chairperson-Elect • Members

Please send your nominations to: American Physical Society; One Physics Ellipse; College Park, MD 20740-3844; Attn: Ken Cole; (301) 209-3288; fax: (301) 209-0865; email: cole@aps.org. A nomination form is available at **http://www.aps.org/exec/nomform.html**.

DEADLINE: JANUARY 31, 2002

APS Mass Media Fellowship Program

Applications are now being accepted for the 2002 summer APS Mass Media Fellowships. In affiliation with the popular AAAS program, the APS is sponsoring two ten-week fellowships for physics students to work full-time over the summer as reporters, researchers, and production assistants in mass media organizations nationwide. Information on application requirements can be found at **http://www.aps.org/public_affairs/Media.html**.

DEADLINE: JANUARY 18, 2002

Prize & Award Nominations *http://www.aps.org/praw/*

Otto LaPorte Award — *DEADLINE: 01/18/02*

Endowed by the friends of Otto Laporte and the Division of Fluid Dynamics. Purpose: To recognize outstanding research accomplishments pertaining to the physics of fluids.

Fluid Dynamics Prize — *DEADLINE: 01/18/02*

Supported by friends of the Division of Fluid Dynamics and the AIP journal Physics of Fluids. Purpose: To recognize and encourage outstanding achievement in fluid dynamics research.

Nicholas Metropolis Award for Outstanding Doctoral Thesis Work in Computational Physics — *DEADLINE: 01/31/02*

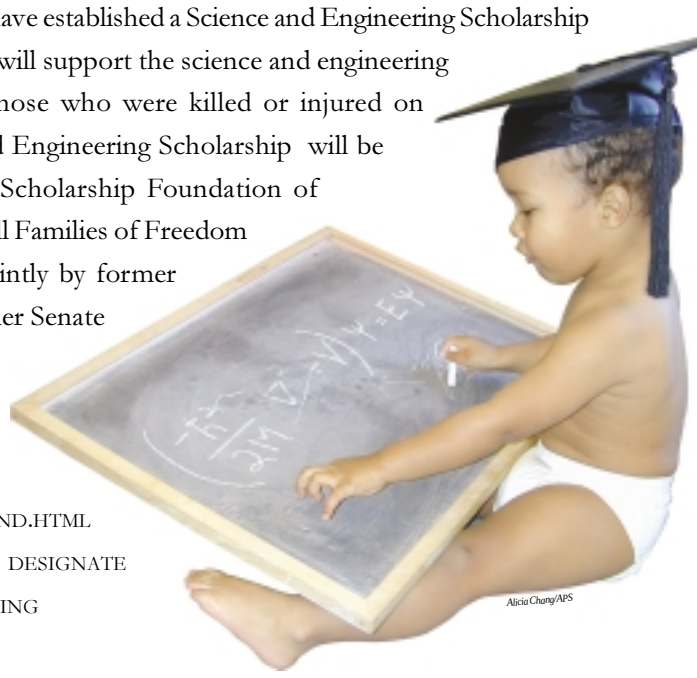
Establishment and Support: The award is supported by the Journal of Computational Physics, a publication of Academic Press. Purpose: To recognize doctoral thesis research of outstanding quality and achievement in computational physics.

SEPTEMBER 11TH

The Science and Engineering Community Can Make a Difference.

DONATE TODAY TO THE SCIENCE AND ENGINEERING SCHOLARSHIP FUND

In response to the tragedy of September 11, dozens of organizations representing more than a million scientists and engineers have established a Science and Engineering Scholarship Fund.* Donations to the Fund will support the science and engineering education of dependents of those who were killed or injured on September 11. The Science and Engineering Scholarship will be administered by the Citizens' Scholarship Foundation of America®. It is part of an overall Families of Freedom Scholarship Fund™ chaired jointly by former President Bill Clinton and former Senate Majority Leader Bob Dole.


Alicia Chang/AP

TO MAKE A TAX-DEDUCTIBLE DONATION VISIT US ON THE WEB AT WWW.APS.ORG/SCIENCEFUND.HTML OR CALL 1-800-335-1102 AND DESIGNATE FFSF - SCIENCE AND ENGINEERING SCHOLARSHIP FUND.

Sponsors include: Acoustical Society of America, American Association for the Advancement of Science, American Association of Engineering Societies, American Astronomical Society, American Chemical Society, American Crystallographic Association, American Geological Institute, American Institute of Biological Sciences, American Institute of Chemical Engineers, American Institute of Mining, Metallurgical and Petroleum Engineers, American Institute of Physics, American Mathematical Society, American Meteorological Society, American Physical Society, American Psychological Society, American Society for Cell Biology, American Society of Civil Engineers, American Society for Information Science and Technology, American Society of Mechanical Engineers, American Society of Parasitologists, American Society of Plant Biologists, Association for Women in Science, Computing Research Association, Council of Scientific Society Presidents, Ecological Society of America, Estuarine Research Federation, Federation of American Societies for Experimental Biology, The Institute of Navigation, The Institute of Electrical and Electronics Engineers, Inc. - USA, The International Society for Optical Engineers, Materials Research Society, Optical Society of America, Research!America, The Science Coalition, Society for Integrative and Comparative Biology, Society of Toxicology

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Fusion Energy Science Fellowship Program

Sponsored by Office of Fusion Energy Sciences, US Department of Energy

BENEFITS INCLUDE: Full Payment of tuition and fees; Monthly stipend of $1,500; Summer research assignments at an approved FES Fellowship fusion facility; Appointment tenure up to three years; Limited travel funding to present papers at national or international conferences

APPLICANTS MUST: Be a US Citizen or Permanent Resident Alien; Be a BS recipient, undergraduate senior, or have not completed more than one full-time semester/quarter of graduate studies at the application deadline; Be planning full-time, uninterrupted study toward a PhD degree at an FES Fellowship Participating University

APPLICATION DEADLINE: January 28, 2002

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Marburger, *from page 1*

federally sponsored scientific research at the institution grew to exceed that of any other public university in the northeastern US. The University Hospital was opened and biological sciences became one of the university's major strengths. Marburger also oversaw the establishment of the Long Island Technology Incubator, and the acquisition of the Long Island house of artists Jackson Pollock and Lee Krasner. He returned to the faculty in 1994 to teach and conduct research in optical science.

Three years later, he became president of Brookhaven Science Associates, a partnership founded by Stony Brook and Battelle, a nonprofit applied science and technology organization. BSA was awarded the contract to manage and operate Brookhaven National Laboratory for the Department of Energy, and Marburger was appointed Director. During his tenure, Marburger has overseen an era of exciting scientific advances at BNL, including the launching of the Relativistic Heavy Ion Collider (RHIC), the world's largest particle accelerator for nuclear physics research, which produced its first experimental results earlier this year when Brookhaven scientists detected what may be the first truly significant deviation from the Standard Model of particle physics.

In addition, under Marburger's leadership the laboratory has expanded its Center for Imaging and Neuroscience, advancing its groundbreaking studies of how various diseases, aging and addictive drugs affect the brain. He has also expanded BNL's emphasis on technology transfer and collaboration with industrial partners, and has played a significant role in advancing environmental restoration at the lab.

Reaction to President Bush's choice of a science advisor has been positive from both Congress and the scientific community. During the confirmation hearings before the Senate Committee on Commerce, Science, and Transportation, Rep. Sherwood Boehlert (R-NY), who chairs the House Science Committee, professed himself "pleased" at the choice of Marburger for presidential science advisor, praising the physicist's managerial skills and natural leadership ability. "With his experiences with Brookhaven National Laboratories and SUNY Stony Brook, he is going to make an invaluable addition to the team and help us make the case for federal R & D science programs in the future," Boehlert said.

Rep. Felix Grucci (R-NY), who represents the Brookhaven district, said that Marburger had "restored the [local] community's trust" in BNL and "reaffirmed their faith" in the nation's science program, adding that Marburger "will be a tremendous asset to President Bush and our nation."

THE BACK PAGE

Support for Research, Education Must Remain as Priorities

By Rep. Sherwood Boehlert

I'm sure that everyone, like me, is still reeling, emotionally and intellectually, from the attacks on the World Trade Center and the Pentagon. In some ways, the passage of time has only made what happened seem more unreal and bewildering. But I think it's safe to say that in the coming months, our nation will turn to its colleges and universities for leadership, for ideas, for information, for education and training, and, if worst comes to worst, for soldiers.

Universities and colleges are inherently implicated in our response to September 11th. For while we say that the world changed on September 11th, it's really our knowledge of the world, our sense of the world, not the world itself, that changed on that fateful day. After all, terrorists were at work before the 11th, the Taliban was in power before the 11th, our security vulnerabilities existed before the 11th; it's our awareness of these that is different now. It is the ways in which we put that new awareness and knowledge to use that will change the actual world in the aftermath of the attacks.

I don't believe that these attacks signal a need for any fundamental change in the structure or nature of our academic institutions. I'm thinking here, particularly, of the openness of our colleges and universities — openness to both ideas and people. I've already seen some articles in *The New York Times* and *The Chronicle of Higher Education* raising the specter of new restrictions on student visas, although I haven't heard much talk of this yet in the Congress.

Obviously, the US has to screen all visa applicants more thoroughly and needs to keep better track of those who enter our country, and, in particular, to crack down on those with expired visas. But we must not imperil the openness of our universities. Foreign students who remain here are absolutely critical elements of our science and technology workforce, and those who return home often increase the goodwill toward the US in their home countries. Some people may view limiting visas as "erring on the side of caution," but it's just as easy to argue that "caution" argues for openness, given how much we rely on students who come here from overseas.

Indeed, I believe we need to look critically at every proposal to curtail the general openness and freedom of American society in the wake of September 11. As a member of the House Intelligence Committee, I know that changes are needed, but those changes need to be targeted and limited.

What about changes in the R&D agenda? Do we need to redirect government or academic R&D in the wake of the attacks? Along with the scientific community, the House Science Committee has just begun to analyze that question. I know that the National Academy of Sciences and numerous other entities in Washington and around the country are also looking at how the scientific community should respond to the attacks, and we should be careful about rushing to conclusions. There are a few areas that need additional focus, although the general thrust of R&D need not change.

> *"I don't believe that these attacks signal a need for any fundamental change in the structure or nature of our academic institutions."*

First among these appears to be computer security. While the terrorists involved in the September 11th events did not engage in cyber attacks — indeed they made full use of the intact Internet in carrying out everyday activities, like airline ticket purchases, on which their plot depended — our general vulnerability to terrorism should make us look again at our ability to protect the computer systems on which we all increasingly rely. We have a long way to go to make our systems secure. One reason for that is that computer security research, particularly on security for civilian systems, is an inadequately funded backwater in academia, government and industry. The computer science resources that attract the best computer scientists and engineers are simply elsewhere.

That situation has been exacerbated by battles between security agencies, on the one hand — particularly the secretive National Security Agency — and civilian R&D agencies, over who should be funding what kinds of research. The Science Committee will hold a hearing to explore these issues more fully. Our conclusions will be reflected in the Information Technology bill we were already drafting, which will authorize and improve coordination of computer science programs across the federal R&D agencies.

The federal government must also put additional resources into improving the technical capabilities of our law enforcement agencies. We need research that will enable us to gather better intelligence to foil terrorist plots and other crimes before they are implemented. Some of this work is already going on at the National Institute of Justice (NIJ) lab, which was doing a great deal of work with the Secret Service and FBI offices that were located in the World Trade Center complex. They head a federal, state, local government partnership called the New York Electronic Crimes Task Force. Their building was among those that collapsed, but thankfully, everyone in the Task Force got out safely. Within days of the tragedy, our NIJ center in Rome and other New York assets were forthcoming to get the Task Force up and running.

There are probably some narrower areas of research that need more attention, as well. For example, the Science Committee is working on a bill to authorize the Environmental Protection Agency (EPA) to fund research to assess and improve the security of drinking water systems. This is an idea that came to us from the water utilities, and the sewage authorities are interested in similar research on their facilities. Other research projects may emerge as we scrutinize what happened in New York and Washington. We plan to hold a hearing to examine what research is needed to better protect our physical infrastructure — buildings, power plants, the electric grid, etc.

In addition, the focus of some of our nation's research may shift. Existing research on identification techniques — especially biometrics: the use of iris patterns or heartbeat patterns or other aspects of the human body to ensure that people are not using false identities — must get a higher priority. Research in the social sciences and the humanities, including research on the causes of terrorism and the reaction to it, will certainly be more relevant than ever. Research that would help us prevent or respond to chemical, biological or nuclear attacks by terrorists will have renewed significance.

The September 11th attacks were not exactly high tech. The terrorists turned the instruments of everyday American life against us. We need careful analysis to piece together how the terrorists accomplished that, and to prevent its recurrence. But that is not the stuff of a wholly new federal

Rep. Sherwood Boehlert

or academic R&D agenda. The bulk of our R&D and education programs have not been directly affected by recent events. The good news is that federal R&D spending was doing pretty well in the Congressional appropriations process before September 11th, and that is unlikely to change.

Here's the picture for the National Science Foundation (NSF), for example. The fiscal 2001 spending level was about $4.4 billion, and the President recommended essentially level funding for 2002. But the House came in and provided more than $4.8 billion, and the Senate almost $4.7 billion. Now that the White House and Congressional leaders have tentatively agreed to raise overall federal spending for 2002, I expect NSF to end up with a sizable spending increase for the new fiscal year.

Of course, none of the R&D we conduct on security or anything else will matter, in the long-run, unless it helps train students in new fields. None of our R&D goals will be met unless we do a better job of preparing teachers and producing more capable students in science and math. Recent events have done nothing to deter the President and the Congress from carrying out their commitment to improve American education, particularly pre-college education in all fields. President Bush has made education one of his signature issues. Ongoing negotiations are continuing to settle on increased funding levels for education programs and to enact a major rewrite of the Elementary and Secondary Education Act.

Progress is also being made on H.R. 1858, a bill targeted specifically at improving pre-college science and math education. That bill would create new NSF programs to encourage institutions of higher education and businesses to devote more of their energy and resources to improving pre-college science and math education. The bill would also create new federal scholarships to encourage top science, math and engineering majors to become science and math teachers. It passed the House without opposition, and is garnering bipartisan support in the Senate.

The events of September 11th have forced us to alter our agenda in ways large and small. But fundamentally, our nation's R&D and education needs remain pretty much what they were before the attacks, and, for now, at least, the resources available to meet those needs remain about the same, as well. What we need to do now is to draw on, and to shore up, the strengths of our major institutions, not just to prevent future attacks, but to ensure that our nation remains a beacon of freedom and openness and opportunity and innovation and prosperity. Those traits may make our nation a more appealing target for terrorists, but they're also what makes it worth defending.

Rep. Sherwood Boehlert (R-NY) is chair of the House Science Committee. The above article was adapted from a speech presented to SUNY's Council of Presidents, October 1, 2001.

APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Responses may be sent to: letters@aps.org.