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Members Respond to President's letter
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Curtis Callan Elected next APS vice-President

APS members have elected Curtis Callan, professor and former chair of the physics department at Princeton University, as the Society's next vice president. Callan will assume the office in January 2008. At the same time, Cherry Murray of Lawrence Livermore National Laboratory will become president-elect, and Arthur Bienenstock of Stanford University will serve as APS president for 2008, succeeding 2007 APS President Leo Kadanoff of the University of Chicago. Callan will be President-elect in 2009, and will serve as APS President in 2010.




Pictured here are the members of the APS Presidential line who will assume office on January 1, 2008. From left: Arthur Bienenstock, President; Cherry Murray, President-elect; Curtis Callan, vice-President; and Leo Kadanoff, past-President.

In other election results, Angela Olinto, a professor of astronomy and astrophysics at the University of Chicago, was selected as the new vice-chair of the APS Nominating Committee, which has the responsibility of selecting a slate of candidates each year to run for APS office. Katherine Freese, a professor of physics at the University of Michigan, and Marcela Carena, a senior scientist at Fermilab, were elected as general councilors. Sabyasachi (Shobo) Bhattacharya, Director of the Tata Institute of Fundamental Research (TIFR), Mumbai, India, was elected as international councilor.

Callan, a theoretical particle physicist, received his PhD from Princeton in 1964. In 1967, after postdoctoral work at Princeton, he took an assistant professorship in physics at Harvard University. In 1969, he moved back to Princeton as a long-term member of the Institute for Advanced Study and rejoined Princeton University in 1972. He is currently the J. S. McDonnell Distinguished University Professor of Physics. Callan is a long-time member, and was chair from 1990 to 1995, of JASON, a group that advises the US government on national security implications of science and technology. He has served as chair of the Nominating Committee of the APS. Callan was elected to membership in the National Academy of Sciences in 1987. He received the 2000 Sakurai Medal for Particle Theory of the APS and the 2004 Dirac Medal of the Interna-

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US Olympiad Team Brings Back Medals and Memories From Iran

By Katherine McAlpine

The five-member US traveling team competed against 322 of the brightest physics students from 72 other countries at the 38th International Physics Olympiad (IPhO). Each member of the team was decorated as they brought two gold and three silver medals back home to the US (see accompanying photo).

They were welcomed to Iran Friday, July 13th, attending opening ceremonies Saturday morning. The Olympiad closed with a banquet on Saturday, July 21st. In between, aside from the competition, their time was filled with touring historic sites in Isfahan and the surrounding area, introduction to new cuisines, swimming in salty waters, and camaraderie among students of many countries and customs.

"The IPhO exam itself only took up 10 hours over two days," said student Kenan Diab, recent graduate of Hawken School in Ohio. "The most interesting stuff that happened at IPhO wasn't directly exam-related."

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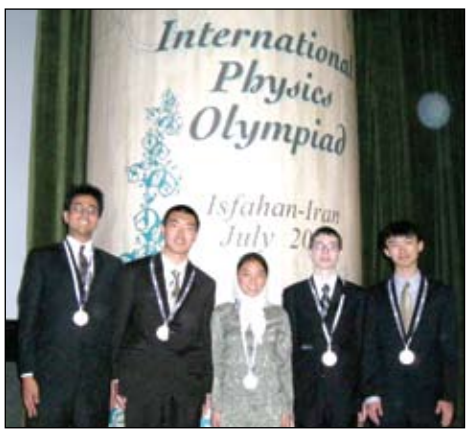

Decorated US Physics Team. From left, Kenan Diab (silver), Haofei Wei (gold), Jenny Kwan (silver), Jason LaRue (gold), Rui Hu (silver).

Three APS Members Receive National Medal of Science

Three APS members are among the recipients of the 2005 and 2006 National Medal of Science, and one APS member was among the recipients of the 2006 National Medal of Technology. The awards honor the nation's top scientists and innovators.

President Bush presented the medals in a ceremony at the White House on July 27.

APS members Daniel Kleppner of MIT and Lubert Stryer of Stanford University received the 2006 National Medal of Science.

Kleppner was cited for "his pioneering scientific studies of the interaction of atoms and light including Rydberg atoms, cavity quantum electrodynamics, quantum chaos; for developing techniques that opened the way to Bose-Einstein Condensation in a gas; and for lucid explanations of physics to non-specialists and exemplary service to the scientific community."

Stryer was cited "for his elucidation of the biochemical basis of signal amplification in vision and pioneering the development of high density micro-arrays for genetic analysis. His influential biochemistry textbook has influenced and inspired millions of

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Physics Bachelors Degrees Show 40% Gain in Six Years

The number of physics degrees awarded at all levels in the US increased in 2005. The information comes from the recently released Enrollments and Degrees Report, 2005, from the AIP statistical research center, which surveys physics departments annually.

The number of physics bachelor's degrees has been increasing steadily for the past 6 years, reaching 5113 in 2005. This represents a 40% increase over the recent low in 1999. Astronomy bachelor's degrees have risen sharply in the past few years, with 343 awarded in 2005.

The recent gain "substantially outpaces gains seen in degree production for related majors during the same time period," the report says, but physics remains a relatively unpopular major, with just 3.6 out of every 1000 bachelor's degrees in all fields in 2005, and about 2% of the bachelor's degrees in natural sciences, math, and engineering, according to the report.

The study mentions several possible reasons for the upward trends, including increases in the college age population, the proportion of high school graduates going to college, and the number of high school students taking physics. In addition, the report suggests that some efforts by the physics community may also be responsible for some of the increase in physics majors, though the

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New Research Raises Old Questions About Electromagnetic Fields

Recently published research suggests that electric fields can influence the growth of brain tumors. This might suggest that low-energy electromagnetic fields, such as those near power lines, also have some health effect. When APS News asked several APS members with expertise in this area to comment, they expressed the view that this study should not change our thinking about the safety of power lines.

Beginning in 1979, various groups have claimed, based on statistical analysis, that those living near power lines have an increased risk of cancer. Later the claims were extended to include other devices that generate low-level electromagnetic fields, such as cell phones and electric blankets.

The scientific community generally refuted these claims, citing flaws in the analysis and an absence of any credible physical mechanism. In 1995, the APS Council passed a statement that said, in part, "The scientific literature and the reports of reviews by other panels show no consistent, significant link between cancer and power line fields."

A National Academies panel also studied the possible connection between power lines and public health, and issued a report in 1996 that concluded that "the current body of evidence does not show that exposure to these fields presents a human-health hazard."

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APS Selects Bowen as New Congressional Fellow

A high energy physicist from Ann Arbor, Michigan, is the new APS Congressional Fellow for 2007-2008. Matthew Bowen, who completed his graduate study at the University of Washington in 2006, will spend the next year broadening his congressional experience through direct involvement with the legislative and political process.

The APS Congressional Fellowship program is intended to provide a public service by making individuals with scientific knowledge and skills available to members of Congress. In turn, the program enables the scientists selected to gain experience in the political process.

Unlike many PhD physicists, Bowen hadn't really thought about becoming a scientist until his undergraduate studies at Brown University. Initially, he planned on majoring in religious studies with the intent of becoming a comparative mythologist, having been inspired in high school by reading the writings of Joseph Campbell (author of The Hero with a Thousand Faces, among other seminal works). However, his religious studies professors "just didn't excite me the way I'd hoped they would," he says.

A mechanics class and a stint in the lab with a high-energy experimental physics group at Brown tipped the scales in favor of a physics major, which Bowen completed in 2000. His thesis focused on top quark pair production at Fermilab's D0 experiment, specifically applying commercial server applications towards the analysis of large data sets. Not only did Bowen's work demonstrate improvement in the

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Members in the Media

"Pre-blog, this sort of rumor would have circulated among perhaps a few dozen physicists. Now with blogs even string theorists who can't spell Higgs became immediately aware of inside information about D Zero data."

***Joe Lykken**, Fermilab, on rumors that the Higgs had been detected at Fermilab,* The New York Times*, July 24, 2007*

"Baseball actually isn't doing too bad a job compared to other leagues. Probably the worst is the National Football League with only 16 games in a season."

***Eli Ben-Naim**, Los Alamos National Lab, on his statistical study that found that the best baseball team does not always finish first in the league,* USA Today*, July 30, 2007*

"If you talk to many scientists, their first exposure to science may be watching a cartoon or seeing a far-out science-fiction movie. I know there are many scientists who enjoy The Simpsons."

***Paul Halpern**, University of the Sciences in Philadelphia, who has written a book on science and The Simpsons,* USA Today*, August 13, 2007*

"I think there are a lot of women in physics—and there really aren't that many women in physics—who sort of don't really know how they should dress. You want to just blend in. On the other hand, you're never going to blend in. The great thing about getting older is you don't have to care."

***Lisa Randall**, Harvard,* Vogue*, August 2007*

"If anything gives way anywhere in the structure the structure can't hold itself up."

***Erik Hendrickson**, University of Wisconsin, Eau Claire, on the Minnesota bridge collapse,* WEAU News*, August 2, 2007*

"You're older, with crazy white hair. You're a physicist."

***Brian Jones**, Colorado State University, on fitting the "Einstein stereotype,"* News and Record*, (Greensboro, NC) July 31, 2007*

"It used to be if you wanted to make a mechanical change in your golf swing, it could take months to do that. But if you can hear what's going on, you can change the sound space almost instantly."

***Robert Grober**, Yale University, on developing a tool that uses sounds to help people improve their golf swing,* The New York Times*, August 6, 2007*

"How can you not work to solve a problem when you have a solution in your back pocket, and you see somebody is under abysmally harsh conditions, suffering agony?"

***Ashok Gadgil**, Lawrence Berkeley National Laboratory, on a wood-fired stove he developed for refugees in Darfur that is much more efficient than the wood fires they usually cook over,* Reuters*, August 7, 2007*

"It's a real New York fuel. It uses what we have here."

***Stephen Paul**, Princeton Plasma Physics Laboratory, on his process for turning trash into fuel,* New York Sun*, August 14, 2007*

"It may be wise at first to do a less expensive project that still does very good physics."

***Abraham Seiden**, UC Santa Cruz, on the proposed "Project X" at Fermilab,* Chicago Tribune*, August 20, 2007*

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APS Web Writer Wins Award

Don Monroe, a freelance science journalist and an APS Fellow, is the first to win the Acoustical Society of America's (ASA) new award for science writing in electronic media. His award-winning article, "Why the Inner Ear is Snail-Shaped," was published in APS's online magazine *Physical Review Focus* in 2006 (http://focus.aps.org/story/v17/st8).

The article explains how the curled shape of the inner ear contributes to better hearing.

Monroe graduated from MIT with a PhD in physics in 1985 and worked as a scientist in semiconductor computer chip research. He attended New York University's Science and Environmental Reporting Program and then began his second career in science journalism.

"His combination of 20 years' experience as a physicist and a degree in science journalism are a really rare and valuable contribution," said David Ehrenstein, the editor of *Physical Review Focus*.

Monroe will receive a $1000 prize and an award certificate, which will be presented at the 2007 ASA Fall Meeting, to be held in New Orleans in November.

This Month in Physics History

October, 1957: Soviets launch first artificial satellite into Earth orbit

Fifty years ago, on October 4, 1957, the Soviet Union launched Sputnik, the first man-made satellite, shocking the American public and beginning the Space Age.

People had been dreaming of space travel for some time before the launch of Sputnik. In 1903 Russian rocket scientist Konstantin Tsiolkovsky showed mathematically that an artificial satellite was feasible, though the US paid little attention to his work. Rocketry developed over the next several decades, and the idea of spaceflight captured the public's imagination.

Courtesy of NASA

Sergei Korolev

In 1952, the International Council of Scientific Unions decided to establish the International Geophysical Year. The IGY was scheduled for 18 months from July 1957 to December 1958, chosen because solar activity would be at a high point during that time period. The "year" would be a sort of extravaganza of geophysical science, with many scientific studies planned.

As part of the IGY, ICSU called for Earth orbiting satellites to carry out scientific experiments during the year. In July 1955, the White House announced plans for the first satellite and called for proposals. In September, the Naval Research Lab's Vanguard satellite was chosen. The Soviet Union also announced plans to launch an IGY satellite.

The Russian satellite effort was led by Sergei Korolev, though his name was kept secret until after his death in 1966. Korolev was born in 1907, and trained at university to become an aerospace engineer. In the 1930s he worked on developing long range missiles. In 1938, he was arrested on trumped-up charges and sent to prison; he spent the next few years in several forced labor camps, including one of the most dreaded in the gulag. During WWII he and other engineers were sent to prison design camps, where imprisoned engineers designed rockets for military use. After the war Korolev was released from prison and continued work on long range ballistic missiles.

In 1953, Korolev began work on the R7, the first intercontinental ballistic missile, which he successfully tested in August 1957. The powerful rocket was capable of launching satellites weighing more than a ton into orbit. The planned scientific payload (which later became Sputnik III) was not yet ready, but Korolev, hearing plans for Vanguard, was determined to beat the Americans into space, so he decided to proceed with the launch of a smaller satellite with no scientific instruments. The Soviets originally hoped to schedule the launch for September 17, the 100th anniversary of the birth of Tsiolkovsky; they were able to put their first satellite into orbit a just few weeks later.

Launched on October 4, 1957, Sputnik I was a shiny aluminum alloy sphere about the size of a beach ball. It weighed 184 pounds, much heavier than America's planned Vanguard satellite. Sputnik, whose name comes from the Russian for "traveling companion," orbited Earth once every 96 minutes, flying in an elliptical path that reached 141.7 miles from Earth at its closest approach, and 588 miles away at its farthest point. Amateur radio operators could easily pick up the signals it constantly sent out at 20 and 40 MHz. It continued circling the globe until January 1958.

The small beeping ball was enough to terrify the American public, which was taken by surprise by the satellite's launch. US scientists tracked its course, and its signals were broadcast on radio and television. The satellite could even be seen from Earth with binoculars as it flew overhead. The public was afraid that since the Soviets could launch a satellite into space, then they could also launch missiles with nuclear warheads that could reach the US. Some people even believed that the satellite was spying on us, or that its meaningless beeps were actually some sort of code. President Eisenhower tried to calm the country, but his words were seen as a sign of unconcern, which angered the public even more.

Responding to the public panic that the Russians had beaten us into space, the Defense Department approved another satellite, Explorer, in addition to the Vanguard mission. About two months after the first Sputnik launch, the US, in a hurry to prove our own capabilities, attempted to launch Vanguard, but it exploded on the launch pad.

Finally, on January 31, 1958, the US made it into space with the successful launch of satellite Explorer I. Explorer I made one of the most important scientific discoveries of the international geophysical year, the Van Allen radiation belts, and the discovery was soon confirmed by Explorer-III, launched on March 26, 1958. On March 17, 1958, the Vanguard I satellite was launched. It weighed only about 3 pounds, and was about the size of a grapefruit.

Less than a month after the first Sputnik launch, the Soviet Union launched a second Sputnik satellite, this time carrying the first living passenger in space, a dog named Laika. This was followed by the May 15, 1958 launch of Sputnik III, which carried a variety of scientific instruments. The Russians went on to send the first human into orbit, on April 12, 1961.

There are now thousands of man-made satellites orbiting Earth. Following Sputnik, fears that the US was losing the space race led to a drive to improve American scientific and engineering capabilities. The US government poured more funding into science, science education was emphasized in schools, and more people went into science and engineering careers. This October, we commemorate the 50th anniversary of Sputnik, and fifty years of scientific and technological innovation in the Space Age.

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tional Center for Theoretical Physics.

Callan's early work focused on using general properties of quantum field theory to understand the new phenomena of particle physics. Later he turned to the study of nonperturbative gauge theory phenomena. Callan's research then turned toward string theory. In recent years, he has been exploring how physical principles may constrain biological phenomena.

Callan said he was "honored to receive the votes of the American Physical Society members."

In considering his priorities as he joins the presidential line, "my overriding goal is to make sure that APS does the right thing to ensure the vitality of our science," he said. "I will do my best to serve the interests of the physics profession as issues present themselves. Everybody can have some view of what he would like to accomplish; what you can actually accomplish depends on the opportunities that present themselves."

In his candidate's statement, Callan said he had been drawn to physics as a student by the "fascinating scientific mysteries the field addressed," and he believes that APS can play an important role in keeping the frontier of physics open. He suggested that one way to push the frontier is to "define physics as the unceasing quest to expand the scope of precise mathematical understanding to the widest possible range of natural phenomena. The nascent attempt to subject the phenomena of life to physics-style explanation is a promising example of an expansion of physics beyond its historic bounds," he said in his statement. He also stressed the connection between physics and societal issues. The APS is the natural vehicle for articulating the position of the physics profession and for making that position known to the public."

Olinto received her PhD in Physics from MIT in 1987. She is now a professor at the University of Chicago. Her recent work has focused on the nature of the dark matter in the universe and the origin of the highest energy cosmic particles. She has served on many advisory committees for the NRC, DOE, NSF, and NASA. In 2006, she received the Chaire d'Excellence Award of the French Agence Nationale de Recherche.

"One of the top challenges of our leadership should be to increase the funding for basic research with a well planned long term vision. As part of facing this challenge, the effective communication of the fundamental value of the scientific endeavor and, in particular, of the physical sciences, to policy makers and the public at large should be a priority," Olinto said in her candidate's statement.

A theoretical cosmologist, Freese received her PhD in Physics in 1984 from the University of Chicago. She is now a professor of physics at the University of Michigan. Her interests span particle physics, astrophysics, general relativity, and climate science. Freese has served on many advisory panels and committees, including the Astronomy and Astrophysics Advisory Committee (AAAC) mandated by Congress; and the Dark Matter Scientific Advisory Group. In 1997 she was Senior Program Officer at the Board of Atmospheric Sciences and Climate at the National Research Council.

In her candidate's statement, she emphasized the need for APS to inform and engage the public, encourage young people to pursue physics, and advocate for science funding. "Science is the "seed corn" for many developments in society which must be sustained. It is our job to make sure that members of Congress as well as the public at large realize the big returns for society that result from every dollar spent on science," she wrote.

Carena, a theoretical particle physicist, received her PhD in physics from the University of Hamburg in 1989. She has been a staff scientist at Fermilab since 1997. Her research explores the possible connections between Higgs physics, supersymmetry, unification, flavor physics, and dark matter. Carena is a member of the APS Committee on International Scientific Affairs. She is a former member of the APS Division of Particles and Fields Executive Committee and the current chair of the DPF Nominating Committee. She also serves on the Particle Physics Project Prioritization Panel (P5) of the U.S. DOE/NSF High Energy Physics Advisory Panel. She originated a visitor program that brings Latin American students to pursue research at Fermilab, and has given public outreach lectures in the Fermilab area.

Carena sees an important role for APS in bringing together the different subfields. "As physics becomes broader and more complex, it is important to maintain the strength of our core disciplines. The field must meet this goal by fostering the interconnections, both intellectual and technical, that increasingly tie together different subfields," she said in her candidate's statement. She also supports APS education and outreach and partnerships with related organizations such as AAPT.

Bhattacharya is an experimental condensed matter physicist. He received his PhD in physics in 1978 from Northwestern University. He spent his post-doctoral years at the University of Rhode Island, and at the University of Chicago. Subsequently, he worked at Exxon Corporate Research, New Jersey and at the NEC Research Institute, Princeton. In 2002 he left NEC to join the Tata Institute of Fundamental Research (TIFR). His current research interests include scanning probe studies of domain wall dynamics in systems such as ferroelectrics, ferromagnets and multiferroics as well as optical tweezer-based studies of complex fluids. He serves several committees, including the Commission on Structure and Dynamics of Condensed Matter of the International Union of Pure and Applied Physics (IUPAP), the editorial board of Reports on Progress in Physics of the Institute of Physics, UK, the Scientific Advisory Committee to the Cabinet, Government of India and the Basic Sciences Steering Committee of the Planning Commission, Government of India.

"I believe that the active involvement of practicing physicists is essential for framing informed policies and putting in place mechanisms for substantive global engagement," he said in his candidate's statement. He plans to build on his experience in both academia and industry in America and internationally to "help strengthen the ability of the APS to forge mutually beneficial partnerships with its peer groups around the world."

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time needed to perform such analyses, it proved to be an excellent foundation for his graduate work on the electroweak production of single top quarks at hadron colliders.

Through his years of study, "I learned how to take a complex system, break it down, propose solutions, analyze those solutions, and communicate the final results as clearly and honestly as possible," he says. "Performing original research also taught me to expect unanticipated developments and to quickly adapt to new realities."

Since completing his PhD, he has continued doing research with the Michigan Center for Theoretical Physics (MCTP), exploring the notion that perhaps the existence of dark matter in the universe might change how the Higgs boson is discovered. "The idea was that the particles making up dark matter might have their own Higgs boson, and this might mix with the Standard Model Higgs," he explains. "This scenario implies that Higgs bosons with exceptionally large masses are theoretically viable. Time will tell what the LHC experiments actually find, but perhaps it will include a superheavy Higgs."

For all his love of physics research, Bowen is equally committed to making a difference in the world at large through his involvement with science policy. His interest was sparked when he heard Nobel Laureate Steven Chu give a colloquium on the global energy challenges we face. Impressed, in 2006, Bowen spent three months as a Science and Technology Graduate Fellow at the National Academies in Washington, DC, preparing background research and policy analysis for committee reports on a wide range of topics. The experience proved so enjoyable, he decided to apply for a Congressional Fellowship.

Following an intensive orientation process organized by the American Association for the Advancement of Science, Bowen will choose where to spend his fellowship year: either working in a Congressional office, or with one of the many associated committees. His policy interests include US energy policy, climate change, and the future of US particle physics, particularly laying the foundation for possibly hosting the International Linear Collider.

Bowen would like to work in those areas during his fellowship year. However, "Since coming to Washington [through his National Academies fellowship] I have been exposed to a wide range of science and technology issues I would be excited to work on," he says. Beyond the coming year, his plans have yet to take shape. He may return to physics research, but he doesn't rule out the possibility of pursuing subsequent positions in science policy. "I guess we'll see how the year goes," he says.

INSIDE THE BELTWAY: WASHINGTON ANALYSIS AND OPINION

A Pox on Both Their Houses

by Michael S. Lubell, APS Director of Public Affairs

You would think that a President with approval ratings in the low thirties and an inner circle of advisors who have headed for the Texas hills would be contrite and in the mood for compromise. You would think that a President with a war that has taken almost 4,000 American lives, severely injured several tens of thousands more, killed hundreds of thousands of Iraqis and dislocated millions more, a war that nearly seventy percent of American voters want ended, a war that is running up a tab of $3 billion per week, you would think that such a President might lose a bit of his swagger. But you would be wrong.

Most Presidents, as they enter the last fifteen months of their Constitutionally-limited term, focus on creating an enduring legacy. But if President Bush is focusing on legacy, he's fooled me and everyone else in Washington.

Whether it's supreme self-confidence, a skin that is thicker than rawhide or just plain obstinacy, the President seems bent on toughing out his waning days in office without giving an inch on policy, budgetary priorities or ideology. About the only place President Bush seems to have gotten religion is putting a lid on spending of the domestic sort.

And how have the Democrats responded? You might think that a party that has regained control of Congress after more than a decade in the political boondocks would show some spunk. But, judging by the polls, American voters think the Democrats spunkless. Now that Attorney General Alberto Gonzales is gone, about the only Washington institution that gets lower ratings than the White House is Congress, which barely cracks 20 percent approval in the latest surveys.

Main Street seems to have had it with both ends of Pennsylvania Avenue. President Bush isn't running again, but all 435 House seats and one third of the Senate seats will be up for grabs in 2008. And if voters break with precedent and assign blame to their own members of Congress, more than a few incumbents could be in trouble.

For science, there's a certain irony in the public's bashing of Washington at this very juncture. It comes at a time when both political parties and both branches of government have finally recognized that math, science and engineering are the foundations of American prosperity and security and of global sustainability.

It would be more than a great pity if governmental paralysis and public outrage about the institutions of government conspire to derail the federal science education and research initiatives and the dollars they require. It would be a tragedy if the policies and authorizations in the America COMPETES Act–which the President signed into law on August 9 after it had passed the Senate by unanimous consent and had garnered 367 House votes–were still-born in their implementation.

But as the first session of the 110th Congress winds down, the Senate is struggling to find the necessary 60 votes it needs to pass any of its pending bills; Democrats in both chambers remain divided on Iraq and energy policy; and House and Senate conferees are haggling over spending priorities.

The President's threatened veto of any spending bill that exceeds his budgetary request has only served to poison the atmosphere further. The White House argues that federal deficits have spiraled out of control and that Congress must trim $21 billion in spending on domestic discretionary programs to avoid the vetoes.

Democrats disdainfully say that the President's concern over deficits has a hollow ring, since Republicans controlled the White House and Congress for most of the last six years during which spending ballooned. And they note that President Bush has asked Congress for almost $200 billion in supplemental war spending for Iraq and Afghanistan this year, ten times the amount he is asking Congress to trim from other federal programs.

Add to this a looming economic recession, the implosion of several hefty hedge funds, a frightening growth in mortgage foreclosures, a potentially crippling credit crunch and partisan bickering over tax restructuring and you have the makings of an astounding political storm.

Should Congress and the White House fail to resolve their differences over spending and should the federal government be forced to shut down, each side is betting that the other side will receive the majority of the public's scorn.

In fact, both sides could both be wrong. The public has little tolerance left for Beltway blame, bumbling and bombast and could simply decide to vote for a new beginning in 2008. Michael Bloomberg, are you listening?

Letters

Respect for the Other is Too Often Missing

The July *APS News* provided me with much food for thought on two very different issues. The Back Page has a very impressive article: The "Violence of Our Knowledge: On Higher Education and Peace Making" by Parker J. Palmer. The following paragraph in this article gives the key to many problems:

"So what can we do about the violence of our knowledge? We don't need to import a new culture to the academy. We need to reclaim the best of the culture in which we have always been rooted. For example, scholars at best always have respect for otherness, whether it comes to subatomic particles or people. If we could reclaim that simple epistemological principle that knowing requires respect, we could get a good start on reducing violence in the academy."

But in earlier articles in the same *APS News* we find the absence of respect for the other, creating unsolvable problems.

A small group of Palestinian and Israeli academics learned respect for the other in a public lecture in December 1982 by four Palestinian professors at a Weizmann Institute auditorium. Their simple message is the key to Mideast peace : "We don't want to drive you into the sea; we don't want you to drive us into the desert. We need a two-state solution with peace and mutual respect". But "respect for the other" was not forthcoming from Israelis, who first dismissed them as naive young academics and ignored them as they rose to top positions as Ministers in their government and Presidents of top universities. Instead we find the flamboyant empty talk described in the article "Nobel Laureates Tackle Middle East Problems".

The "respect for the other" that we have tried to introduce is simply missing. Without it there is not much hope for progress.

A completely different example in "This Month in Physics History" states that "BCS theory was quickly accepted as correct".

This reveals other aspects for the absence of respect for the other that has hurt the physics community.

BCS was not accepted so quickly. I spent a sabbatical year in 1958-59 at the University of Illinois at Urbana and saw BCS criticized as nonsense by people at the top of the establishment because it was not gauge invariant. That year Bardeen invited a young physicist, Phil Anderson, to give a colloquium in which he not only showed how to restore gauge invariance to BCS, he also introduced a new mechanism which is claimed to be the same as the Higgs mechanism later presented in particle physics. The absence of "respect for the other" in the way this physics was treated by the condensed matter and particle physics communities may have played an important role in the failure of the SSC accelerator to obtain congressional funding.

Harry J. Lipkin
Rehovot, Israel

Biblical Creation Has Lots of Wiggle Room

In the July *APS News* you state "the biblical creation story...claims that Earth is only 6,000 years old and was created by God in six 24 hour days." In fact, the Bible makes no claim as to the age of Earth. The Hebrew word "yom" translated "day" often means a long period of time, just as the English word does when I write "the day of the dinosaur." Many Biblical scholars and Christians believe the "days" of creation are long periods of time and the biblical story of creation is perfectly compatible with the big bang and the 14 billion year old universe. In addition, Hebrew genealogies often have many gaps in them, so the Bible makes no claims as to the time scale when humans first appeared on Earth. I would expect much better fact checking from *APS News*, rather than perpetuating false ideas.

Mike Strauss
Norman, OK

Undergraduate Research Key to Gender Equity

We applaud the efforts of the Gender Equity Conference organizers and participants to strengthen the women in physics enterprise at universities and national laboratories, as reported in the June *APS News*.

We agree with Barbara Whitten that the greatest leak from the pipeline is at the undergraduate level. Yet one major ingredient appears to be missing in the discussions and report. No mention was made at all of using undergraduate research, as an addictive tool to attract and retain female students in physics. We have a small, yet rather thriving Women in Science and Engineering program at San Jose State University, only partly supported by outside funding from NSF and NIH. There have been no dropouts and no leakage has occurred in our WiSE@SJSU pipeline.

It has been reported that merely 20% of the research university faculty are active in undergraduate research; for state universities, that percentage is about 50%. Apparently, typical research professors are only interested in their postdocs, PhD students, and/or (best) graduate students. It would be much better for undergraduate students, female and male alike, that many more faculty participate in undergraduate research, and, if needed, come down from their ivory towers.

The headline suggested that there is no silver bullet, but there are lots of ways to help gender equity in physics. Our work indicates undergraduate research could be the golden nugget to retain and attract female students in physics. Start research at the undergraduate level, and get them captivated to overcome the frustrations and biases in the physics enterprise. Then, the rest will follow.

Carolus Boekema
San Jose, CA

zero gravity

The Lighter Side of Science

Warnings Accompanying Your Inflatable Universe

By Justin Kahn

Congratulations on your receipt of an Inflatable Universe. While we can't tell you where it came from, we can tell you with a certain amount of confidence that it will be around for some time.

WARNINGS FOR THE INFLATABLE UNIVERSE:

Inflatable Universe is a fun and educational tool for you and your children. Please be aware that the following precautions should be observed.

Allow adequate space for setting up the Inflatable Universe. Please be aware that the universe will continue to expand, even after you have finished inflating. Also, be aware that if you do not inflate the universe at all, it will inflate itself. Know that while the Inflatable Universe is not to scale, it eventually will be to scale at a ratio of one to one.

Included with your Inflatable Universe is a set of clocks. They are not synchronized. Do Not Try To Synchronize Them.

Your Inflatable Universe, even as you read this, is moving towards a state of total decay. Our lawyers assure us that this is a law, and nothing can be done about it.

Actual Star Dust is highly flammable. Do not sprinkle it on your loved ones. If you get Star Dust in your eyes, you must take immediate action. Forcibly hold your eyelids open while flushing out with water. You must rotate your eyeball so that the whole surface is exposed to the water stream. You will look ridiculous.

Regarding the Miniature Box. Your set contains a scaled-down version of the box which the universe comes in. For the sake of authenticity we must include it. However, you should not place this box in your universe. Think about what happens: in a sense, the box which once contained the universe is actually now contained by the universe. This creates an actual paradox that threatens the whole of our reality. DO NOT RUIN EXISTENCE FOR THE REST OF US. Thanks.

The mysteries of the universe are many. Be careful with these. If you ignore them you may find yourself missing out on the deepest emotional and philosophical experiences known to humanity. On the other hand if you spend too much time thinking about these mysteries you could end up going nuts.

Do not get too close to the black holes. You will not survive.

Be patient with civilizations as they evolve.

Batteries are not included.

Justin Kahn is an adjunct instructor in philosophy at Notre Dame of Ohio. A slightly longer version of the above piece appeared in issue 16 of the Café Irreal.

Doubling Plan Sounds Fuzzy

The APS Executive Board's advocacy of doubling the number of physics majors, particularly with a view to addressing the shortage of high-school physics teachers (*APS News*, August/September 2007) is laudable but woefully short on practical advice beyond a fuzzy-sounding suggestion to make degree plans more user-friendly. Indeed, I have to wonder how many Board members come into daily contact with undergraduate students and programs; the problem may not be the typical structure of a physics major as such. In many smaller institutions–such as my own–administratively-mandated minimum course-enrollment requirements constrain the teaching of upper-level courses to alternating years, making it tough enough for a student to complete the program in 4 years even if they get on track at the outset. I have seen many students consider careers in secondary teaching only to become turned off by the bureaucracy and twaddle of their Education programs. These programs often seem to end up attracting analytically weak students, leading to a self-propagating situation where many students enter college with weak high-school preparation. Our administrators need to hear authoritative outside-source messages explaining that physics is a vertically-integrated discipline and needs to be supported as such for an institution to be credible, while we in the trenches need effective strategies to help us work with state and local education administrations. These might be better places to start.

Cameron Reed
Alma MI

Doubling Need Manufactured by Self-serving Bureaucrats

What, may I ask, apart from insuring the continued employment of physics faculty, is the intended purpose of doubling the number of physics bachelors? [*APS News*, August/September 2007] Who, apart from self-interested physics bureaucrats, has identified a need? It can't be to satisfy a demand in the marketplace–where are the "physicists wanted" ads? And why "doubling"? The APS Board can't possibly have any quantitative basis for that number. Why not "fourpled"? Or halved, for that matter? We have been seeing self-serving declarations from both the APS and the AAPT (not to mention the IEEE) apparatchiks, for decades–with no indication that anyone has paid any attention, and with no obvious detriment to the American economy. More physics bachelors–men, women, minorities–or martians–would be a result of a surge of interest in physics, not a source of such interest, and will do nothing to improve the teaching of high school physics.

Robert A. Myers
New York, NY

Physics Must be Relevant to the Real World

I have been getting increasingly disillusioned by some of the editorial content of *APS News* and *Physics Today*.

Every year the candidates in the APS election talk about the need for increased funding to keep America competitive, but these talented scientists who write and speak so precisely in their work use vague, undefined concepts that cannot easily be quantified in their campaigns. I am probably one of the more vocal supporters of basic research outside of a basic research organization, but these "motherhood and apple pie" statements make me skeptical about whether the APS has any interest in exploring the continuum between physics as a scientific discipline and physics as a means both to solve real problems and to provide discipline to how problems are discussed and framed.

The apprenticeship program we call graduate school has helped me immeasurably in tackling a wide range of problems. There are hard problems to solve in areas from agriculture to telecommunications and from research to manufacturing. And while we should test and reformulate our models, we must keep our beloved science from becoming little more than Hermann Hesse's *Glass Bead Game*.

Steve Rosenblum
Ithaca, New York

Viewpoint...

On the Responsibilities of APS

By Leo Kadanoff

Editor's Note: *In early August, APS President Leo Kadanoff wrote to all APS members expressing some thoughts on the responsibilities of APS in a number of areas. For those who missed this message, or who would like to see it again, we reproduce it below.*

As a tax exempt organization, APS has a legal responsibility to serve the public welfare. We fulfill this obligation in five main ways: journals, meetings, informing the government, informing the public, and in helping education. The senior leadership of APS is in reasonable agreement on the first four; we have some disagreement about the last. I go in the order named.

1. Journals: We publish the *Physical Review* family of journals, including *Reviews of Modern Physics* and *Physical Review Letters*. Our per-word prices are very low; our impact upon professionals is very high. In addition, we maintain all the back issues and make them available online.

2. Meetings: We conduct a diverse set of professional meetings. Our largest meeting has reached 7,000 registrants.

3. Informing the government: Our Washington office informs public officials about APS positions on a variety of public issues, including and especially funding for science. The office acts under the guidance of Council and committees of experts.

4. Informing the public: APS provides information for various different "publics"–our members, industrial scientists, chairs of physics departments, teachers, young students, ...The last two activities have been materially increased in response to the National Academy of Sciences report "Rising above the Gathering Storm". This report asks for increased governmental spending upon research and education aimed at the physical sciences and mathematics.

The goals of this report have been incorporated in the policies and planning of both parties, congress, and the executive branch.

5. Education: The *Gathering Storm* report's emphasis upon education reflects a broadly felt worry that our educational system is not up to US needs for a knowledgeable workforce and citizenry.

APS has long contributed to improving education. We have outreach activities aimed at schoolchildren, including successful websites and contests. Our meetings include workshops for teachers. Together with the American Institute of Physics and the American Association of Physics Teachers (AAPT), we oversee and aid two programs, PhysTEC and PTEC, aimed at improving and promoting the education of future teachers of physics and physical science. APS's flagship program, PhysTEC, is supported by the National Science Foundation, private donors, and ourselves. We oversee teacher training at ten universities and colleges, each based upon a cooperation between its physics department and its school of education. In each case, an experienced teacher helps bring in the real world.

We have reached a crossroad in planning future educational programs for APS's PhysTEC, our flagship program, is set to diminish by 60% as NSF support runs out next year. On the plus side, we have hired a new full-time person to work on education. Working jointly with AAPT, we have in planning an important new program aimed at doubling the number of physics majors, while guiding these new majors toward teaching and a wide variety of other occupational goals. However, for the next year, only 5% of the present education spending has been allocated for new education programs.

There is considerable discussion within APS leadership about whether education should be a core APS activity. One side of the discussion points out that APS has traditionally focused upon research while AAPT has teaching as its central concern. Further, US education is a huge problem and APS can hardly make a dent in any part of it.

On the other side, some of us argue that this is the time to make use of promised increased governmental investment in both science and education. In this view, it is APS's responsibility to respond by bringing into being new and expanded programs aimed at improving science education. This ongoing discussion is likely to focus upon the practical question of whether we shall support educational programs with our own resources or rely upon (and wait for) funding from government and private donors.

In parallel, physics departments all across the US are likely to have discussions about their own educational missions. These discussions might focus upon increased numbers of physics majors, new teaching goals, new teaching methods, as well as broader and more flexible curricula. They may also be aimed at reaching out to students interested in teaching careers and perhaps students whose main aims are knowledge and good citizenship.

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"This experiment is a giant step forward in sensitivity. Whenever you get big step forwards in technology, that's when you can make a discovery."

Robert Svoboda*, University of California, Davis, on a planned experiment to detect dark matter in the proposed deep underground lab,* Sacramento Bee*, August 13, 2007*

"Math, with its inner consistency and beauty, is very much like music. There's an inner harmony, just something very beautiful."

Leonard Parker*, University of Wisconsin, Milwaukee,* Milwaukee Journal Sentinel*, August 18, 2007*

Comments on Leo Kadanoff's Letter to the APS Membership

Editor's Note*: At the end of his message, Leo Kadanoff asked for responses, and many were received. Below, Michael Marder, Professor of Physics at the University of Texas, Austin, and Chair of the APS Committee on Education, presents some analysis of, and quotations from, those responses.*

Overall Statistics

There were 188 responses by email. 143 or 76% were supportive of APS playing a strong role in education. 28 or 15% were opposed to an increased role, and 17 or 9% did not take a position on whether APS should increase its activities in education.

Against Expanding Educational Role

From those who opposed the expansion of APS education activities, there was a fairly consistent line of argument. Most emphasized that the AAPT should work in this area, not the APS. As Peter Wolynes put it,

"I think the differentiation in function between APS and AAPT is a good one. Let's do what we each do well."

Some additional common points were that education funding is a black hole, and that it drags physicists along with educational fads that they are ill-equipped to address. One respondent commented that when he was in high school many years ago there was a shift in physics education from what was then "standard" physics [more mechanics subjects, homework problem focus] to a Physical Science Study Committee [PSSC] curriculum [more focus on modern physics subjects like wave mechanics, and more discovery activities]. He thought the change was for the worse and that the high school instructor couldn't teach the new material.

Another argument was that there are already too many unemployed physicists. A respondent wondered why we need to train more people for jobs that do not exist, and asked who would benefit from this, other than the people who are in the business of training people for jobs that do not exist.

In favor of Expanding Educational Role

The most common statement from those who favored sustaining or increasing the role of APS in education was that all efforts should be made in cooperation with AAPT, and to complement their strengths. Many spoke of the authority the APS commands in research universities and at the federal level. Ken Krane commented,

"When I did a survey a few years ago, I discovered that of the 5000 or so physics professorial faculty at research-1 universities, fewer than 500 were members of the AAPT. Some of our leading research universities have no AAPT members among their professorial faculty. And 2/3 of those who were members received their PhD degrees prior to 1971. The AAPT simply cannot speak to the education concerns of the universities that produce all of our graduate students and half of our baccalaureates."

Eugen Merzbacher noted that

"The tension within APS between those who would like to see the Society's resources confined to the support of physics research and those who regard physics education at all levels a significant part of our mission has always been with us. In the 1930s it led to the founding of the AAPT."

There also were calls for increased cooperation on education matters with organizations such as the Materials Research Society, and the American Mathematical Society. They carry some weight because the messages came from the current presidents of the Materials Research Society and the American Mathematical Society.

Many respondents talked of the responsibility of physicists to combat ignorance about science in the general population, often mentioning creationism and intelligent design. Joseph Abeles wrote

"APS should place an emphasis on seeking to elevate what I may term the lowest-common-denominator physics competence in our society. The rest will eventually follow. The ability of the citizenry to comprehend and to respect the potential for advances in physics and technology is fundamentally based on demystification of basic physical principles. "

Many respondents spoke of the importance of engaging with educational issues in order to retain influence in Washington. Stamatis Vokos put it this way:

"If APS removes engagement with education as part of its mission, then the Society will return to a state of being a (relatively) small special interest group of research scientists that bemoans the state of science education K-20 but is unable to have any credible impact in the scientific preparation of our population and is impotent in any substantive involvement with policy makers on this issue."

The importance of improving high school physics teaching was mentioned many times. Michael Walock mentioned the importance of a particular teacher for him:

"As an American graduate student in physics, I fall into a relatively small group. The vast majority of my colleagues are from outside the United States.... When I was a high school student, I fully intended to go into engineering (aeronautical to be precise).This was my goal, until I took a physics class in my junior year. Even with the passing of almost 14 years, I still remember my teacher, Tom Lagina. Mr. Lagina's knowledge and enthusiasm for the subject was infectious. As a result of that class, I changed my career goals: I wanted (and still do) to be a physicist."

Suggestions of how to improve high school teaching ranged from preparing more and better teachers, to providing workshops for teachers, and developing recommendations for curricula:

"You could try to see if the APS/AAPT could formulate a clear set of curriculum guidelines for high school physics teachers. Give a direction. I doubt that you will succeed."–Gerald Gabrielse

Many respondents mentioned the importance of improving science instruction at elementary and middle school levels as well:

"Partly our students are being intellectually smothered by the standardized testing, which starts in elementary school. I have seen this in my daughter's class here in Amherst MA, and in Santa Barbara CA—two places which are known for their excellent schools! They are being taught a jumble of factoids on test-prep worksheets." –Jennie Traschen

It was stated several times that research and teaching are inseparable, and that it is a pity that professional advancement at the major universities depends so much on research to the exclusion of teaching.

Twelve of the responses overall came from women, and all supported increasing the role of APS in education. Amy Bug remarked

"I have many women colleagues who could not cover all three vertices [of] the "teaching, research, family" triangle... and changed the nature of their research to "research on teaching" in order to actually make their lives work. Men more typically feel they are able to modify that triangle in other ways.... My point is that the gender imbalance exists; no one is smart enough to know how to change it; and it is not going to change any time soon. If APS backs off on education as a core value, it backs off on a woman-biased core value."

A good fraction of those who support increased APS involvement with education are already actively involved. Many of them wrote to point out particular programs they feel are strong, or to ask for assistance in working with middle or high school students, particularly in economically disadvantaged parts of the country.

There was also much emphasis on the importance of increasing communication with the public at every level. Suggestions ranged from contacting local and national news organizations about important developments in physics to speaking before school boards and maintaining a steady flow of information about physics to Congress. There were several protests that APS journals are not freely available. And Don Correll advised:

"Give every high school physics teacher free on-line access to Physics Today. *Consider a middle school level summary of physics news highlights provided as a very visible link available from the APS home page."*

There were several strong statements of support for a continuation of the PhysTEC project, some saying APS should devote its own funds, and also some fond remembrances of PSSC physics from cases where it was taught well.

Finally, some remarks from Don Langenberg (former APS President and former Chancellor of the University of Maryland

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Focus on APS Topical Groups

This month's group:
Shock Compression of Condensed Matter

Editor's Note: *This article is the first in an occasional series that will highlight the activities of APS's ten topical groups, units that may be small in numbers but that are often the locus of cutting-edge research.*

Shock compression of condensed matter, the study of the response of materials to rapid compression through the use of explosive, laser, magnetic, and gas gun drivers, is a dynamic field, and the APS topical group on shock compression of condensed matter (GSCCM) is helping its members keep up with the latest developments. GSCCM was founded in 1984 to promote the development and exchange of information regarding the dynamic high-pressure properties of materials, shock physics, and detonation physics research.

Shock compression physicists study the behavior of materials undergoing rapid compression, most often in the form of a shock wave propagating through the material. Impact creates a state where there is high pressure and often high temperature behind the propagating wave. Shock physicists then use velocimetry, spectroscopy, and diffraction techniques to analyze the response of the material, looking for phase transformations, chemical reactions (in the case of explosives), and the dynamic strength of the material.

These techniques are useful for understanding and developing armor for military use and for developing new defense mechanisms against attackers. They also contribute fundamental knowledge that can be used in the aerospace and automotive industries for many applications.

Because of the military applications of the field, many shock physicists work for national labs and/or are part of the defense community, said David Funk, current chair of the GSCCM.

In addition to the applications, shock physics has fundamental interest, said Funk. Scientists use shock techniques to understand a wide variety of materials' properties. For instance, shock techniques are useful in the study of Earth and other planetary materials, because they can be used to generate extreme high temperature and pressure conditions such as those that might be found in giant planetary interiors.

Recently, increases in computing power have made it possible to simulate materials at the atomic level. Simulations can be done with up to several billion atoms. Previously, shock scientists had only been able to study materials at a composite level, but now they can use simulations to begin to connect what is happening at the atomic level with how it gives rise to the bulk properties of the material. This has opened up new opportunities, said Funk. "There's still a lot of discovery science."

With 367 members in 2007, GSCCM is one of the smaller topical groups. GSCCM helps its members stay connected and up to date on their field through biennial topical conferences on shock compression. This year's meeting, which took place June 24-29 in Hawaii, attracted about 430 attendees.

The meeting included special sessions on shock waves in medical devices, isentropic compression of materials, and a town hall meeting on future directions in dynamic high pressure research. Other topics included inelastic deformation, first-principles and molecular dynamics calculations, explosives and reactive materials, geophysics and planetary physics, optical spectroscopy and multiscale and continuum modeling.

A number of recent developments were reported at the meeting. For instance, graduate student Cindy Bolme of MIT and Los Alamos described a new technique that uses femtosecond laser-driven shock waves that produce a wide range of pressures to determine the complete shock equation of state, not over the weeks or months usually needed, but on a single laser shot lasting just 300 picoseconds. Marcus Knudson of Sandia National Lab described using the Sandia Z-machine to study the shock melting properties of diamond. William Nellis of Harvard explained how several common and ordinarily soft materials, when compressed to pressures over one million atmospheres, become far stiffer than diamonds.

The topical group also presented the biennial Shock Compression Science Award, which this year was given to Dennis Grady of Applied Research Associates (Sandia National Laboratories retiree).

The topical group has recently launched a quarterly newsletter that contains information on upcoming conferences, news of award winners, job announcements, obituaries, and other items of interest to the topical group. The newsletter should help to keep the community involved, said Funk.

The topical group has also been working to hold dedicated sessions at the APS March Meeting. In recent years GSCCM attendance at the March Meeting has been about 45-50 people; the topical group would like to increase that to about 80. At this year's March Meeting, the interests of GSCCM were represented at a focus session on Earth and planetary materials. GSCCM vice-Chair Marcus Knudson is leading the effort to plan sessions that will help to ensure strong GSCCM participation at the 2008 March Meeting in New Orleans.

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System) that are representative of the strength of feeling in many of the messages.

"When we talk about STEM education we're not just talking about high school and early college students. You and I are both aware that post-baccalaureate education in physics is an example of Darwinism in its purest form. It has one and only one purpose, the propagation of the physics faculty's own specialized subspecies, research physicists. We're here solely to make more just like ourselves. Recently, though, there has arisen the radical idea that there is a role in the workforce for individuals educated to the master's level in physics (or other sciences) and also equipped with skills useful in non-research careers, like operating large genomic data bases, running high-tech start-up companies, leading venture capital operations in new fields, etc. These are called Professional Science Master's degrees, and might be thought of as the scientific equivalent of the MBA or the MPH. There are now over a hundred such programs across the country in about fifty universities, and their number is growing. I've joined the PSM crusade.

"I am of course aware that many of our colleagues see teaching and learning as the province of lesser beings. I can't count the times I have heard "But obviously you don't understand. This is a research university, not an educational institution!" I would argue that teaching and learning are worthy subjects of scholarly research in themselves. Happily, some of our colleagues have embraced that idea. There are perhaps fifteen or twenty significant physics education research programs across the country, and I have been told by scientists in other disciplines that physics is leading the way in this. Some quite respectable physicists are leading such programs, including several Nobel Laureates. So there's hope. (I've found the following quotation from Albert Einstein inspiring: "I never teach my students; I only attempt to provide the conditions in which they can learn.)

"All that leads me to recommend in the strongest possible terms that APS enhance its emphasis on education and make it one of the Society's primary functions! It should do so in partnership with AAPT, which has the very positive feature of engaging both college and pre-college teachers. APS should be–and be seen to be–the organization representing the whole sector of science called physics in all of its aspects. It should not be a narrowly-purposed organization of researchers in physics. I empathize with the argument that education is a huge issue in which APS cannot expect to play a dominant role. True. But it can play an important leadership role, as some of its members already are. That argument has never stopped physicists from weighing in on national security, energy policy, environmental policy, climate change, and many other huge national issues. If we crawl into our shell and say we'll focus entirely on our noble (and Nobel) searches for the Higgs boson and the nature of dark energy, eschewing any involvement with the pressing problems of our nation in education, I don't see any reason why our nation should continue to support us as generously as it has."

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students."

APS member Ralph A. Alpher, who passed away in August, was one of eight recipients of the 2005 National Medal of Science. Alpher was cited "for his unprecedented work in the areas of nucleosynthesis, for the prediction that universe expansion leaves behind background radiation, and for providing the model for the Big Bang theory."

In addition, APS member Herwig W. Kogelnik of Bell Labs was among the five recipients of the 2006 National Medal of Technology. He was cited "for his pioneering contributions and leadership in the development of the technology of lasers, optoelectronics, integrated optics, and lightwave communication systems that have been instrumental in driving the growth of fiber optic transmission systems for our nation's communications infrastructure."

The National Science Foundation administers the National Medal of Science, which was established by Congress for the White House in 1959. The National Medal of Technology was established in 1980.

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Diab counts the six-story Ali Qapu palace of Imam Square among his favorite sites, particularly the music room at the top which "had hundreds of holes carved into the walls in the shape of musical instruments. The room was not large, but the collective effect of all these orifices gave the room some pretty stunning acoustics."

"The highlight of the whole competition would be meeting representatives of all of the different countries and cultures around the world. I had a great time talking and having fun with everyone there," said Rui Hu, a senior from Charter School of Wilmington in Delaware. "Everyone there spoke a little bit of English, so communication wasn't difficult. I can also speak fluent Chinese, so I was able to communicate very well with the Malaysian and the Chinese [teams]."

The international aspect was a favorite of coaches Bob Shurtz and Paul Stanley as well. Shurtz, of Hawken School, noted, "We definitely have ongoing friendships with a number of coaches that we have seen now for several years."

All of the students enjoyed the camping excursion in the silk gardens. "It was much more relaxing," said Jenny Kwan, a graduate from San Marcos High School in California. "Lots of booths were set up so that we could see Iranian music, pottery, and calligraphy in action and gain our own hands-on experience."

The team was aware that Islamic law was in force in Iran, but felt it was not overwhelming. "In Iran, all the women wore scarves and there was no pork," recounted Haofei Wei, a recent graduate from Oklahoma School of Science and Math. "Also, there was a strict separation between the living quarters of the male and female contestants, although the rules about male-female contact were not extended to between team members and contestants in general."

Kwan, the only woman in the group, was untroubled by the headscarf, or hajib, and by the rules of conduct. "Although I had extra clothing restrictions and I could not shake hands with Iranian men, I felt that people treated me in the same manner, if not with more politeness than usual."

Since the students took both the theory and experimental tests in the privacy of tall cubicles set up in a large gymnasium, she was allowed to remove the scarf during the competition. While the theory test was easy compared to years past, Kwan and Wei found that the question about a model of a car's airbag system, involving springs and capacitors, was tough.

The experiment required the students to find the band gap in a thin film of semi-conducting material. "We were given the necessary theoretical information, and the task mainly consisted of data collection and analysis. All of us were provided with our own equipment, and it was more than enough to complete the task with the necessary precision," said Wei.

However, data collection required the use of a photo-resistor that took three or four minutes to stabilize. Only being able to record one data point every five minutes meant that assembling the necessary set of forty to fifty data points was incredibly time-consuming.

According to Diab, speed during the experiment marked the difference between earning a silver and gold medal among US team members. But they all found the experiment interesting.

Beyond the physics competition, each student reported coming away from the experience with an appreciation for the beauty and history of Iran as well as the hospitality of its people. As Diab describes it, "Deserts don't usually have a reputation for being pretty, but there were breath-taking ranges of stone hills, and the endless dunes of sand in the more rural parts of the country were starkly beautiful."

Said Wei, "I was surprised at how friendly everyone was to Americans, given the impression created by our media that Iranians in general were hostile to America."

ANNOUNCEMENTS

APS CONGRESSIONAL SCIENCE FELLOWSHIP 2008-2009

THE AMERICAN PHYSICAL SOCIETY is currently accepting applications for the Congressional Science Fellowship Program. Fellows serve one year on the staff of a senator, representative or congressional committee. They are afforded an opportunity to learn the legislative process and explore science policy issues from the lawmakers' perspective. In turn, Fellows have the opportunity to lend scientific and technical expertise to public policy issues.

QUALIFICATIONS include a PhD or equivalent in physics or a closely related field, a strong interest in science and technology policy and, ideally, some experience in applying scientific knowledge toward the solution of societal problems. Fellows are required to be U.S. citizens and members of the APS.

TERM OF APPOINTMENT is one year, beginning in September of 2008 with participation in a two week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

A STIPEND is offered in addition to an allowance for relocation, in-service travel, and health insurance premiums.

APPLICATION should consist of a letter of intent of no more than two pages, a two-page resume, with one additional page for publications, and three letters of reference. Please see the APS website (http://www.aps.org/policy/fellowships/congressional.cfm) for detailed information on materials required for applying and other information on the program.

ALL APPLICATION MATERIALS MUST BE SUBMITTED ONLINE BY JANUARY 15, 2008.

American Institute of Physics

State Department Science Fellowship

Experience a unique year in Washington, DC. Contribute to US foreign policy while learning how the policy making process operates.

This Fellowship is open to all qualified members of APS and other AIP Member Societies, of all ages and career levels. By sponsoring at least one Fellow a year in the State Department, this program benefits the government, the science community, and the individual Fellows.

Qualifications include:

- U.S. citizenship
- AIP Member Society membership
- PhD or equivalent in physics-related field

Applicants should possess interest or experience in scientific or technical aspects of foreign policy.

Application deadline: November 1, 2007

For more information, please see: http://www.aip.org/gov/sdf. html.

APS Division of Plasma Physics Job Fair

Looking for a job? Looking for the ideal candidate? Let the APS/DPP Job Fair do the work for you!

Don't miss this opportunity!

November 12-14, 2007
Rosen Centre Hotel
Orlando, FL

Register today at: http://www.aps.org/careers/employment/jobfairs.cfm

For more information contact Alix Brice at 301-209-3187 or at jobfairs@aps.org

US Government Student Fellowships and Scholarships

The National Science Foundation's Graduate Research Fellowship Program 2007-2008

This fellowship program provides students with three years of financial support including a $30,000 annual stipend and $10,500 cost-of-education allowance. U.S. citizens, nationals, or permanent residents at or near the beginning of research-based graduate studies in Chemistry, Computer and Information Science and Engineering, Engineering, Geosciences, Life Sciences, Mathematical Sciences, Physics and Astronomy, Psychology, and Social Sciences are eligible to apply. **For additional information and deadlines, please go to** https://www.fastlane.nsf.gov/grfp/

The National Defense Science and Engineering Graduate Fellowship Program (NDSEG)

Sponsored by the Department of Defense, this fellowship program is intended for U.S. citizens at or near the beginning of their graduate studies in science and/or engineering programs. The fellowships are for three year tenures and provide an annual stipend of over $30,000. Full tuition and fees and a health insurance allowance are included as part of the program. **For additional information, please go to** http://www.asee.org/ndseg

SMART Defense Scholarship for Service Program

This Department of Defense Program is open to undergraduate and graduate students studying in the Science, Mathematics and Engineering fields and provides an annual salary, full tuition, and other normal educational expenses including health insurance and a book allowance. Applicants must be U.S. citizens or nationals, and at least 18 years of age. There is an employment obligation to Department of Defense with this education program. **For additional information, please go to** http://www.asee.org/smart

Distinguished Traveling Lecturer Program in Laser Science

The Division of Laser Sciences (DLS) of the American Physical Society announces its lecture program in Laser Science, and invites applications from schools to host a lecturer in 2008. Lecturers will visit selected academic institutions for two days, during which time they will give a public lecture open to the entire academic community and meet informally with students and faculty.

The DLS will cover the travel expenses and honorarium of the lecturer. The host institution will be responsible only for the local expenses of the lecturer and for advertising the public lecture. Awards to host institutions will be made by the selection committee after consulting with the lecturers. Priority will be given to those institutions that do not have extensive resources for similar programs.

Applications should be sent to the DTL committee Chair Rainer Grobe (grobe@ilstu.edu) and to the DLS Secretary-Treasurer John Fourkas (fourkas@umd.edu). The deadline for application for visits in Spring 2008 is November 30 2007.

Detailed information about the program and the application procedure is available on the DLS-DTL home page: http://physics.sdsu.edu/~anderson/DTL/

Lecturers for the Spring and Fall 2008: Laurie Butler, University of Chicago, Hui Cao, Northwestern University, Eric Cornell, University of Colorado, Jim Kafka, Spectra Physics, Fleming Krim, University of Wisconsin, Christopher Monroe, University of Maryland, Luis A. Orozco, University of Maryland, Carlos Stroud, University of Rochester, Ron Walsworth, Harvard University, Linda Young, Argonne National Lab.

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The APS council reaffirmed its 1995 statement in 2005, stating that, "Since that time, there have been several large in vivo studies of animal populations subjected for their life span to high magnetic fields and epidemiological studies, done with larger populations and with direct, rather than surrogate, measurements of the magnetic field exposure. These studies have produced no results that change the earlier assessment by APS."

Now, Yoram Palti of the Technion-Israel Institute of Technology, and colleagues have found that low intensity, alternating electric fields can disrupt cell division. The research is reported in PNAS (E. D. Kirson et al., *Proc. Natl. Acad. Sci.* USA 104, 10152 (2007); also see Search and Discovery, August 2007 *Physics Today*). The researchers found that electric fields applied to tumor cells in vitro and in mice and rats could slow the cells' division and even kill dividing tumor cells. They then developed a treatment for an aggressive type of brain cancer, in which electrodes stuck to patients' heads apply 200 kHz electric fields. A small clinical trial with 10 patients found that the treatment seems to slow the progression of tumors and lengthen the survival time of patients in the study.

Palti, said there is no connection between his studies and electric power lines or home appliances. The treatment uses alternating electric fields in the 100-200 kHz range, a much higher frequency than the 60 Hz power lines in the U.S. "If we move the frequency down, below 100kHz, or above 300kHz, we don't get an effect," Palti says. In addition, external electric fields would not penetrate the body. "The reason why we are using electrodes, is that there is a very bad impedance matching between the air and the tissue, so a very small fraction of the field penetrates the tissue. We are applying it directly to the tissue, so we get effectively much stronger field," Palti said.

Another study by Damir Janigro, Luca Cucullo and colleagues at the Cleveland Clinic found that 50Hz low intensity alternating current can slow cell division in some cases. (Cucullo et al. *Glia*, 51, 65 (2005))The studies were done using several types of tumor cells in vitro. Janigro said, "We found that cell division was very much inhibited, in a very reversible way."

Other experts didn't think these studies should cause us to change our thinking about the safety of power lines.

The 1995 APS statement was based on a report written by David Hafemeister of CalPoly, San Luis Obispo. When asked about this new study, Hafemeister said he still sees no reason to think power lines cause cancer. "The basic physics makes it hard to believe there is cancer being caused. There could be some new paradigm, but that is shooting in the dark." One has to look at the epidemiology for any connection between power lines and health, he said. The area of power lines and public health is "a well-researched area, with much conflicting data, and many have taken one item and ignored the rest," he said.

Richard Wilson, emeritus professor of physics at Harvard, has studied the effects of extremely low-level doses of radiation. When asked about whether this new work might indicate electric fields such as those near power lines could affect the body, he said, "Indeed electric fields in the body have a great effect on cells. But the external fields do not penetrate the body."

Charles Stevens, of the Salk Institute in La Jolla, CA, chaired the 1996 National Academies study. Referring to the recent research, he said, "The fields used were much larger than would occur near power lines or appliances. The fields produced by power lines are lower than those that occur naturally in the body because of currents flowing associated with nerve and muscle activity. These fields are more than an order of magnitude greater than what occur naturally." He said he'd like to see the study confirmed by more research. "I would not take seriously the effect of electric fields on cell division until it has been repeated in another laboratory," he added.

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effect of those programs is hard to measure. The study mentioned two such initiatives: the National Task Force on Undergraduate Physics' Strategic Programs for Innovations in Undergraduate Physics: (SPIN-UP): Project Report and a workshop for new physics faculty organized by AAPT.

Based on junior enrollment figures and the predicted college age population, "It is probably safe to predict that physics bachelor's production will continue to increase for at least the next few years," the report says.

As reported in the August/September *APS News*, APS supports doubling the number of bachelor's degrees, in part to produce more high school physics teachers.

Graduate degrees have been increasing as well, the study found. There were 1244 physics PhDs in the class of 2005, which is 2.8 % of all PhDs in the U.S., and a 14% increase over the previous year. The number of masters degrees, both terminal and enroute to PhD, has also been increasing. The number of PhDs is predicted to continue to increase for at least the next few years, based on first year graduate student enrollment.

The percentage of non-US citizens among physics PhD recipients reached an all time high in 2005, at 60 percent of the class. However, "because first-year student enrollments among US citizens rose sharply in the early 2000s, it is expected that US citizens will return to being the majority of physics PhDs by 2008 or 2009," the report says.

Women and minorities continue to be underrepresented among physics degree recipients at all levels. Among bachelor's degree recipients, in 2005, 21% were women, similar to the previous few years. Among PhDs, the representation of women declined to 14% of the class of 2005, down from 18% in 2002. The report points out that the number of women is small, and "although short-term trends can seem significant, it is advisable to view the overall trend for several years."

The report is online at http://www.aip.org/statistics/catalog.html.

The Back Page

Exploring Science Education in Pakistan

By Usha Mallik

When I was planning a trip to Pakistan in December 2006, quite a few friends were concerned. So was I. Some friends and colleagues who taught at the yearly International Nathiagali Summer College had been given armed escorts when they traveled around during the summer school. I was born in India and am a naturalized US citizen; a few friends pointed out what a winning combination that would make to certain groups in Pakistan and its border areas. In the end, it turned out to be a wonderful visit, however.

I am from the subcontinent, born in Calcutta (now Kolkata) after the independence of India and Pakistan. Together the subcontinent represents nearly 1.3 billion people. Life has been kind to me in allowing me to live a privileged life. Now in my advanced career, I wanted to find a way to contribute substantially by helping where help is very much needed. To me, this is education in science. Having the perspective of an advanced education, I, like many others, recognize the multitude of ways very basic scientific knowledge can open up a whole new world of opportunities for the less privileged children, who by far outnumber the very few with opportunities to build a future life like mine.

This was the purpose of my travel. We all know the problems we face in the US in preparation of science and math in elementary and middle schools. Children do not learn fundamentals of physical sciences in most schools, because knowledgeable teachers are rare in primary and in middle schools. Time and again many studies found (e.g., *Taking Science to School*, published by National Research Council in 2007) that children at early ages are much more intellectually capable than they are generally given credit for. In addition, when science is not presented to them in their early schooling with appropriate challenges and explanations, many children quickly lose interest and develop a subliminal dislike for subjects like physical sciences and math.

Imagine now the situation in countries which are much less privileged, with a much lower GDP, like Pakistan, where few children are fortunate enough even to attend a proper school. For those who do, only a select few have teachers with adequate scientific background. In such cases, most of the children grow up in hopelessness for their future, eventually replaced by frustration and anger, thus providing fertile ground for planting seeds of destruction, which are too easily supplied. This leads to a lose-lose proposition for their future as well as for that of the country-–in fact, for the world at large.

If instead somehow we could enrich them with future options with hands-on physical science training, a large number of them would have many options open to them in future; whether as scientists and engineers or as simple tradespeople such as electricians, carpenters or plumbers. The hope of a productive future will lessen the frustration and anger, making way for constructive thoughts and actions, leading to a win-win proposition all around.

How do we reach the largest number of children in the shortest amount of time? Some people have already found the answer: the best way to start teaching science properly is by teaching the teachers involved. If we can train young teachers (with emphasis on the rural regions) in physical sciences where everything taught is based on demonstrations or experiments, these teachers will themselves get interested and take their training back to their classrooms. The teachers will participate in constructing the equipment as much as possible. The equipment will be constructed out of locally available material. This way science can be taught in a limited budget even in the remote areas. The challenge is in coming up with such ideas.

...the best way to start teaching science properly is by teaching the teachers involved.

This was my reason for joining the APS Committee on International Affairs (CISA) in APS. The committee was very supportive when I broached the subject. My goal was to see whether a pilot program could be established in Pakistan, primarily with the help of local scientists, educators and humanists, because such an education program can only be sustained properly when such a need is strongly felt by the locals.

I contacted a few key people in Pakistan, starting with Pervez Hoodbhoy, a theoretical Particle physicist in Pakistan who has been active in several areas including education and humanitarian causes (http://en.wikipedia.org/wiki/Pervez_Hoodbhoy). Through him I got to know a number of people in and out of Pakistan. Over many phone calls and e-mails, I found an appropriate infrastructure to make a pilot project possible. A number of kindred souls among the physicists who are faculty members at various universities and people involved in higher education were also enthusiastic to help.

Usha Mallik (third from left) in Hyderabad with (l to r) Rozina Junejo, Najma Baladi, Tahmina Junejo, Ambrin Junejo, and Munwar Noor.

For example, Zafar Junejo, a native of Sindh province with a PhD in computer technology, felt a calling to ameliorate lives of the rural areas of Sindh by helping the local people in their general well-being in health, finance, science, environment, etc. He also started a major effort to help women. The game of chess was taught to make the people think strategically about their future, in particular to train them to think about all the options open to them in their various enterprises. Zafar secured some NGO funding for his project (Trust for Rural Development: TRD) and has already developed a successful infrastructure, working in the rural areas with a center in the city of Hyderabad, the largest city in Sindh near the region of Dadu. Being a native of the region was helpful to Zafar. He connected with quite a few local schools, people and started his project. This sounded like a very good organization to use as an infrastructure for a pilot project. Zafar sounded most eager for me to base a part of this project in Dadu.

So I decided to visit the area and meet some of these people to survey the situation for myself. I took a trip to Islamabad, Hyderabad and Karachi. I met with A.H. Nayyar (Executive Director of Developments in Literacy) who is also a physicist and is very well connected to the school system in Islamabad.

Arvind Gupta, an Indian citizen, featured a lot in our discussions. A PhD in Computer Science from the University of Toronto, he felt a calling to take the wonders of science to children by making science toys from very cheap locally available materials, sometimes even garbage (http://www.indiatogether.org/2004/feb/edu-science.htm). With the flair of a superb magician, his demonstrations are apparently mesmerizing. He is well-known, very much in demand, and has a center in Poone, India.

My next stop was the TRD center in the city of Hyderabad where I spent almost a day and a half. My hosts (and hostesses) were Zafar–the Director, Najma Baladi–the Program Officer, and Rozina Junejo–the Administrator. I was also welcomed by about fourteen or fifteen young men and women, all of them participants in the TRD program and many of them school teachers in the Dadu region. A large number of them were single young women in their twenties. I asked questions about their schools, their students and the classes they taught. A handful of the women were really quite outspoken; when asked about what their experiences were in teaching math and sciences (mostly middle and elementary schools) and the difficulties facing them, they were quite forthright. I then got into a discussion of teaching specific topics such as Newton's laws, gravitational force, and the periodic table. They asked questions in specific areas and discussed their problems because of the need to memorize so much in physics and chemistry.

Next morning, a few of them gathered around and wanted to talk more with me to elaborate on what we had discussed the evening before. Apparently, they had discussed the topics from the night before among themselves and had agreed that it was difficult to remember so many isolated laws and rules in physics. I started with reviewing mass, momentum, inertia, force with Newton's laws and conservation of momentum and energy followed by potential and kinetic energy and gravitational force. We worked through the afternoon following a break for lunch. From time-to-time they would take a short break to clear their heads and also to discuss among themselves without me. Then we would resume again. I also gave them problems related to the topics; that is when I realized their need for help in math. But they were following the concepts and the underlying inter-connections very well. Most of all, they wanted to keep going.

At the end of the afternoon, I had to leave for Karachi, and I kept hearing from them "If only you were here for two days, we could have learned so much more." The eagerness in their eyes to learn and the sparkle when they understood would perhaps have made the trip worthwhile by itself. Zafar accompanied me back to Karachi, a two-and-a-half hour drive. Apparently, they told Zafar that after talking with me they could see how everything was connected; that all these laws were not isolated at all; so I felt that my effort was successful. As a token of their appreciation, they presented me with a "chador," a regional custom.

These rural young womens' struggle toward independence, their conviction of helping their society by doing something worthwhile: a courageous journey they had already started by joining the TRD program, touched me deeply. I could not have asked for a more worthwhile organization for an infrastructure of a pilot program.

In Karachi, I met three senior physicists, all women. One, Tahira Arshed, retired from a faculty position in Tennessee, is now working toward science literacy in Pakistan. The other two are Fatima Hasnain, the Secretary General for the Center for Physics Education, and Aquila Islam, who is the director of academics in a secondary school in Karachi.

Based on my discussions with them, I came up with a plan for my pilot project. Except for a few privileged schools, the elementary and middle school teachers typically have similar scientific background whether they work in rural or urban areas. The pilot program will have two centers: one rural, using the TRD's infrastructure, and another urban, say, in Lahore, quite close to Islamabad.

The program will consist of a yearly workshop for six weeks in the summer, when the schools are off. We will have to use four master trainers for each workshop, four of whom will be drawn from Arvind Gupta's school, with two from the US and two from Pakistan. Each workshop will enroll no more that twenty teachers. The lessons will be strongly oriented toward hands-on training. Some of the equipment (science toys) will be constructed and some purchased, focusing on as much construction as possible. This will include physics, chemistry, some biology/botany and math.

Because it is critical to maintain continuity, there will be a week-long practice workshop for the participants six months later to review what they have learned, how they have fared in their respective schools and, in addition, for a few days they should teach certain parts to some elementary and/or middle schools located in Islamabad and/or Karachi. Coming in contact with schools in these large cities will build up confidence among the rural teachers.

These workshops will be supervised with the help of educational authorities. Some of these twenty participants of the workshop will be encouraged to return the following year at a slightly elevated level, as assistants to the master trainers, so that by the third year they can serve as trainers themselves. In this way the two specific centers will mostly be self-supporting, with help from local scientists and support for holding the workshops. Doubtless we would learn in a three-year span of the pilot project about how best to modify our implementation to fit the local needs. If this is successful, the pilot program can be enlarged to other workshops in other areas and even in other neighboring countries.

So far this is my dream, shared with the people I met. These young women, of whom I met a handful, have taken a very courageous step forward. With a little effort we can make a big difference in their struggle to build a future for themselves as well as for the next generations. I have initiated all of the planning and then taken this trip to be able to make a realistic proposal for a pilot project. It is now time to act to make this into reality and find some form of financial support to establish the pilot project. If we from the US (e.g., the APS) cannot help, then who can?

Usha Mallik is a professor of physics at the University of Iowa.

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