APS NEWS

A PUBLICATION OF THE AMERICAN PHYSICAL SOCIETY • WWW.APS.ORG/PUBLICATIONS/APSNEWS

July 2009
Volume 18, No. 7
www.aps.org/publications/apsnews

APS physics

APS Election Preview
Pages 6 & 7

Women's Progress Tracked in Reports by APS, National Academies

The National Academies released a study in early June that found female scientists at major research institutions have made significant progress in overcoming many of the professional barriers they have historically faced in academia. Despite these gains however, women continue to remain underrepresented in science faculties overall.

The congressionally mandated study found that women seeking faculty positions and tenure are being selected at proportionally similar rates as men. In physics departments approximately 20 percent of tenure track positions are being filled by women. The study found that the main reason for this continuing disparity is the small number of women applying for such positions. Overall women make up only 14 percent of the PhDs in physics, and 12 percent of the applicant pool for university positions. The study focused primarily on women already enrolled in physics and did not delve into the underlying cause of the disparities at the undergraduate level.

"I think you can see even in the numbers that I showed that physics is still one of the fields that has an unfortunately quite low representation of women at the higher ranks. It's certainly been improving, at other ranks, but even in the PhD production you can see there that the numbers are still too low," said Claude Canizares of MIT, co-chair of the committee that assembled the report, "[T]he good news is that the discrepancies between the number of PhDs produced and those applying for faculty jobs and entering the faculty is very slight."

Other encouraging findings showed that generally once women became members of faculties, they reported few measurable differences between them and their male coworkers. Indicators such as the number of published papers, grant funding, award nominations, promotions and other job opportunities all showed near parity with men's reported rates. The study did show that women professors on average earned about 8 percent less than men; however at the assistant and associate level, salaries were equivalent.

The study looked specifically at the full time faculties of the top 89 Carnegie research universities, using data collected through

Women continued on page 5

LaserFest Booth Pulls Them In

Photo by Michael Lucibella

Crowds of interested attendees flock to the LaserFest booth that was unveiled at the CLEO/IQEC meeting in Baltimore in early June, while comics super-hero Spectra (left) takes a break from saving the world from the evil Miss Alignment. See story on page 5.

Members Urged to Apply for LaserFest Outreach Grants

Calling all physics performers! APS and the Optical Society of America are seeking grant proposals from their members for outreach events as part of LaserFest 2010. The two organizations plan to jointly award several grants of up to $10,000 each to sponsor activities aimed at reaching and informing the public about the science of lasers for LaserFest on the Road.

This sponsorship, available to either individuals or groups, is designed to establish outreach initiatives and travelling physics demonstrations in communities and institutions across the country. APS and OSA are especially looking to support groups with new and innovative approaches for these outreach activities, particularly if they could potentially be continued past the lifetime of the grant.

2010 is the 50th anniversary of Theodore Maiman's construction of the first working laser. To coincide with this milestone, APS and OSA have partnered to sponsor the yearlong celebration LaserFest to highlight the importance of lasers and to illustrate how basic scientific research can impact the modern world.

The funding is available to groups with members in either APS or OSA, and all proposals must be submitted by September 30th 2009. Contact information and a complete proposal application can be found on the website at www.LaserFest.org.

APS Announces PhysicsQuest Winners

The winners of the APS-sponsored 2008 PhysicsQuest contest have been selected. Jason Holstege's 7th Grade Science class at the Heritage Christian School in Hudsonville, Michigan won this year's grand prize. The class was awarded with a $500 certificate to the educational supplier Educational Innovations, and each student won an iPod Shuffle engraved with "PhysicsQuest Superhero."

"I was pretty shocked when I got the call on a Friday afternoon, and I had to check the website out a couple times just to see the school's name listed there in order to believe that we had really won," Holstege said, "[I]t also feels good, because the students worked hard at understanding the concepts."

Each year APS sends out thousands of PhysicsQuest kits containing simple physics experiments to teachers and students across the country. Each kit includes four classroom experiments and an activity book aimed at middle school students. This year's theme focused on the life and work of Nicola Tesla. These kits were also the first to include an original comic book, recounting the story of young Tesla and his adventures to illuminate the 1893 Chicago World's Fair.

"The goals are to give kids an experience with physics. The main idea is to teach them something without them realizing it," Rebecca Thompson-Flagg, head of outreach for APS said. "The comic book was a big hit. It was something they hadn't seen before."

In keeping with this year's Tesla theme, most of the experiments incorporated the physics of elec-

WINNERS continued on page 7

DAMOP Meets in Charlottesville

The APS Division of Atomic, Molecular and Optical Physics held its annual meeting in Charlottesville, Virginia in May. Featuring more than seventy sessions, the meeting attracted over a thousand physicists from across the country.

The annual award presentations and plenary talks kicked off the meeting. The recipient of the Herbert P. Broida prize, Gustav Gerber, discussed his method to manipulate quantum systems with femto-second laser pulses shaped by a liquid-crystal display. Mikhail Lukin, recipient of the I.I. Rabi prize, spoke about how quantum optic technology is being used in fields as diverse as atomic physics, nanotechnology, many body physics, and quantum information science.

Other highlighted talks included Alex Kuzmich of Georgia Tech who announced his method for greatly improving the lifetime of quantum memory. By minimizing the sensitivity to magnetic fields, Kuzmich has been able to store information on atomic coherences that lasts up to several milliseconds, rather than the few hundreds of microseconds previously achieved. Long term quantum memory could play an important role in future quantum computer developments, matter-light entanglement, and matter qubit rotations.

Ultracold molecules in optical lattices continue to be a major focus of research, with over one hundred papers devoted to the technique. One novel use is a method described by Andrew Ludlow of NIST Colorado to use strontium atoms suspended in an optical lattice to create the next generation of highly accurate atomic clocks.

DAMOP continued on page 7

Physics is Olympians' Idea of a Good Time

In a small classroom at the University of Maryland, nineteen pairs of eyes stare attentively at a blackboard full of a complex array of quadratic equations. Though the physics on the chalkboard is distinctly college level, the class is composed entirely of high school students. This is the training camp for the 2009 International Physics Olympiad's US Team. At the end of the ten-day preparatory camp, five of the nineteen students were selected to travel to Mexico for this year's international competition in July. Though only the five students were selected to go, all nineteen kids in the classroom represent some of the brightest scientific minds in the country.

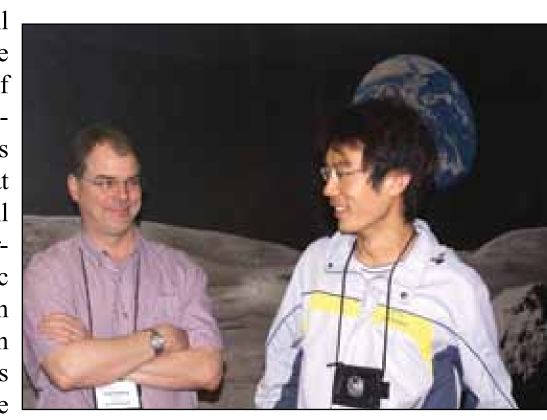

Photo by Michael Lucibella

Olympian Yunfan Zhang (right) takes a break from the rigors of the training camp to enjoy a moment of conversation with coach Paul Stanley.

The International Physics Olympiad is the global zenith for high school physicists. Each year teams of high school students from over sixty different countries vie for the gold by unraveling complex physics problems during the nine-day competition in mid July. Organizers of both the international event and the training camp strive to advance physics education and reward students that have distinguished themselves in the field.

The Olympiad began in 1967 in Eastern Europe and expanded during the 1970s to include the rest of Europe and later the rest of the world. The United States first participated in 1986 when its team brought back three bronze medals from London, the best any team had done on its first outing. The American Association of Physics

OLYMPIANS continued on page 5

Members in the Media

"I always say that what Dan Brown did for the Roman Catholic Church in 'The Da Vinci Code,' he did for me and my research with 'Angels and Demons'."

***Gerald Gabrielse**, Harvard, describing how the film exaggerated aspects of his antimatter research for dramatic effect,* FoxNews.com*, May 15, 2009*

"I know colleagues who began reading the book and said it was nonsense and quit reading it. But the book is good entertainment."

***Manfred Paulini**, Carnegie Mellon, on his role as the science advisor of "Angels and Demons,"* Pittsburgh Post-Gazette*, May 15, 2009*.

"I'm very happy to see popular culture introducing these scientific issues,"

***Boris Kayser**, Fermilab, on why he thought the presence of CERN in "Angels and Demons" would be a good marketing tool for science.* Chicago Tribune*, May 20, 2009.*

"It's like trying to win the lottery. If you buy enough tickets, you're eventually going to win."

***John Beacom,** Ohio State University, explaining the odds of detecting neutrinos at the IceCube detector in Antarctica,* The Columbus Dispatch*, May 17, 2009.*

"We think that these giant flares are coming from really, really big star quakes,"

***Charles Horowitz**, Indiana University, describing how the crust of neutron stars, 10,000 times stronger than steel, can produce incredible bursts of energy.* MSNBC.com*, May 18, 2009.*

"[A]ny time a major breakthrough is reported without the researcher in question showing details of how they carried out the experiment, it's time to start asking questions. If something seems too good to be true, it very possibly is."

***Eugenie Samuel Reich**, from her article and book charting the metoric rise and fall of physics fraudster Jan Hendrik Schön.* The Telegraph*, May, 18, 2009.*

"All wetlands should be returned to the Bay. The Bay is a wetland ecosystem. The Bay is the place we all love to live. It's the most valuable resource we have."

***Ralph Nobles**, hoping that a tract of land in California slated for development will be bought by the state and preserved,* San Jose Mercury News*, May 22, 2009.*

"Very reasonably, a political leader might ask, 'Is it performing up to standards?' ...The scientific community is in a position to give an answer."

***Raymond Jeanloz**, UC Berkeley, on the efficacy of a new global monitoring system to listen for tremors resulting from a nuclear explosion,* The Associated Press*, May 23, 2009.*

"Charlie Bolden is well-qualified to continue moving NASA out of its years of drift."

***Gene McCall**, Los Alamos National Laboratory, commending President Obama's pick of a former astronaut to be the new head of NASA,* NBC News*, May 24, 2009.*

"We put together the best physicists, the best engineers, the best of industry and academia. It's not often you get that opportunity and pull it off."

***Ed Moses**, Lawrence Livermore National Lab, on the team at the National Ignition Facility,* The New York Times*, May 25, 2009.*

"If energy is dirt cheap, it gets treated like dirt,"

***Arthur Rosenfeld**, Lawrence Berkeley National Lab, describing why Americans haven't integrated energy saving appliances into their lives,* The Wall Street Journal*, May 29, 2009.*

"No one has any idea what to do with the space station. We know what to do with a telescope. The ISS is just a way of keeping human beings in space. It's flagpole sitting."

***Robert Park**, University of Maryland,* MSNBC.com*, May 27, 2009.*

"These screw-ups happen…It's going further than I would have gone but doesn't look like a serious breach."

***John M. Deutch**, MIT, on the accidental publication of highly confidential lists of the country's nuclear stockpiles,* New York Times*, June 2, 2009.*

This Month in Physics History

July 1654: Pascal's Letters to Fermat on the "Problem of Points"

Games of chance are as ancient as human history, with archaeologists unearthing evidence of them on prehistory digs. Gambling also led, indirectly, to the birth of probability theory, as players sought to better understand the odds. In the mid-17th century, an exchange of letters between two prominent mathematicians–Blaise Pascal and Pierre de Fermat–laid the foundation for probability, thereby changing the way scientists and mathematicians viewed uncertainty and risk.

Born in 1623 in Clermont-Ferrand, France, Pascal was a child prodigy largely educated by his father, Etienne, a local magistrate who was also well-connected with some of the most famous intellectuals of that era, including Rene Descartes and Pierre de Fermat. As a result, young Blaise was privileged to sit in on salon-style meetings of some of the greatest minds in Europe. At age 11, he wrote an essay on the sounds of vibrating bodies; the following year, he devised his own proof that the sum of the angles of a triangle equals two right angles.

By the time he was 16, Pascal had progressed sufficiently in his mathematical studies to write a treatise on conic sections, giving rise to what we now call Pascal's Theorem, which states that if a hexagon is inscribed in a conic section, then the three intersection points of opposite sides lie on a straight line. One indication of how impressive this achievement was is the fact that Descartes, when shown the paper, initially did not believe the young teenager had written it.

When Pascal's father became king's commissioner of taxes in Rouen and was struggling with endless calculations and re-calculations, Pascal–not yet 19–invented a mechanical calculator for adding and subtracting to ease his father's task, which became known as the Pascaline. By 1646, he had become interested in Evangelista Torricelli's experimentation on barometers, performing definitive experiments to demonstrate the existence of a vacuum. The SI unit of pressure is the pascal, in his honor.

In 1654, a French essayist and amateur mathematician named Antoine Gombaud, who was fond of gambling, found himself pondering what is known as "the problem of points." It was first proposed in 1494 by an Italian monk named Luca Paccioli in his treatise *Summa de Arithmetica, Geometrica, Proportioni et Proportionalita*. In the game of balla, for example, six goals are needed to win the game. The question posed by Paccioli was how one should divide the winnings if the game is interrupted when one player has five goals and the other has three goals? The player with five goals should have a larger share, but how much larger should his share be?

Gombaud turned to Pascal, who had taken up gambling when his doctors advised him to abandon mental exertions for the sake of his health. The year before, Pascal had worked out the principles of "Pascal's Triangle," a method for determining the binomial coefficients for a given value of $(a+b)^n$–similar to a method devised some 400 years earlier by Chinese mathematician Yang Hui.

Intrigued, Pascal realized he would need to invent a new method of analysis to solve the puzzle, since the solution would need to reflect each player's chances of victory given the score at the time the game was interrupted. Thus began his legendary correspondence with fellow mathematician Pierre de Fermat that, over the course, of several weeks, laid the foundation for modern probability theory. Their respective methods involved listing all the possibilities, and then determining the proportion of time that each player would win, in order to solve it.

Fermat's approach rested on a complete enumeration of the possible outcomes. For example, if the winner of a coin toss game needs to win the best of five tosses, and one player is ahead 2 to 1 when the game is interrupted, Fermat reasoned there would be four possible outcomes had the game continued. Three of those four favor the player with the edge; ergo, he should win three-fourths of the pot. A sticking point is a counter-argument using a different scheme of counting that only finds three possible outcomes instead of four.

Pascal's approach sidestepped this issue by devising an algorithm employing what is now known as induction and incursion. It involves a logical cycle of playing out each possible outcome for each successive round, starting from the point where the game was interrupted. Once the end state is reached, it is then possible to work backward through the intermediate steps and assign a number to the probability of winning for each player at the point when the game was interrupted, and the pot would be divided accordingly.

Pascal's analysis stopped short of considering less idealized situations where a finite number of equally likely possible outcomes could not be listed, such as the weather, or the stock market. By the early 18th century, Jakob Bernoulli had devised the law of large numbers in an attempt to provide a formal proof that uncertainty decreases as the sample size increases for problems with an infinite number of outcomes. Other developments by leading scientists and mathematicians followed, ultimately transforming economics, actuarial science, and the social sciences.

A few weeks after his last correspondence with Fermat, Pascal narrowly escaped death when his carriage nearly ran off a bridge, prompting a religious conversion. He switched his focus from math and science to philosophical and religious treatises, and renounced games of chance. He did an occasional bit of math: between 1658 and 1659 he explored the cycloid and how it might be used to calculate the volume of solids, for example.

His early work on probability seeped into his philosophical work as well, most notably the famous "Pascal's Wager," wherein he reasoned that the odds favor belief in God, even though God's existence cannot be definitively proven. Pascal died of a brain hemorrhage on August 19, 1662, just before his 39th birthday. History has yet to record the outcome of his wager.

APS NEWS

Series II, Vol. 18, No. 7
July 2009

Coden: ANWSEN ISSN: 1058-8132

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APS News (ISSN: 1058-8132) is published 11X yearly, monthly, except the August/September issue, by the American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, (301) 209-3200. It contains news of the Society and of its Divisions, Topical Groups, Sections, and Forums; advance information on meetings of the Society; and reports to the Society by its committees and task forces, as well as opinions.

Letters to the editor are welcomed from the membership. Letters must be signed and should include an address and daytime telephone number. The APS reserves the right to select and to edit for length or clarity. All correspondence regarding *APS News* should be directed to: Editor, APS News, One Physics Ellipse, College Park, MD 20740-3844, E-mail: letters@aps.org.

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Subscription orders, renewals and address changes should be addressed as follows: For APS Members–Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, membership@aps.org.

For Nonmembers–Circulation and Fulfillment Division, American Institute of Physics, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502. Allow at least 6 weeks advance notice. For address changes, please send both the old and new addresses, and, if possible, include a mailing label from a recent issue. Requests from subscribers for missing issues will be honored without charge only if received within 6 months of the issue's actual date of publication. Periodical Postage Paid at College Park, MD and at additional mailing offices. Postmaster: Send address changes to APS News, Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844.

"Physics First" Battles for Acceptance

By Gabriel Popkin

"Physics First" is a movement that encourages high schools to offer a full-year physics course to ninth-graders, before they take chemistry and biology. Also sometimes called "early high school physics," the "physics-chemistry-biology (PCB)" sequence, or the "cornerstone to capstone (C-to-C) program," Physics First has been gaining momentum as an organized movement of educators and physicists since around 1990, although the concept of teaching physics to ninth-graders goes back several decades before that. Nobel Prize-winning physicist Leon Lederman, Physics First's most prominent proponent, estimates that around 2,000 US high schools have now adopted some version of the program for at least some of their freshmen.

One of the principal driving forces behind this effort is its supporters' belief that the traditional biology-chemistry-physics course sequence, which has been the standard high school science sequence in the US since the late 1800s, needs to be updated to reflect a modern understanding of chemistry and biology. According to an informational guide published in 2007 by the American Association of Physics Teachers (AAPT): "1) in order to understand modern molecular biology and the biochemical processes in cells, students need a solid background in both physics and chemistry, and 2) mastery of the basic physics concepts of electrostatic and nuclear forces and the concept of energy storage and transfer are crucial to the understanding of chemical structures, atomic binding, gas laws, and the periodic table of the elements."

A publication by the nonprofit Biological Sciences Curriculum Study, also known as BSCS, expresses a similar viewpoint: "Coherence, we argue, is the primary reason to consider the C-to-C approach."

The History

Physics First began appearing in schools due to the efforts of individual teachers. Because of the greater leeway private school teachers have in determining their own curricula, the program is considerably more prevalent in private schools than public schools—the American Institute of Physics (AIP) estimates that 8% of private schools had implemented Physics First in some form in 2005, as compared to only 3% of public schools.

Consistent with this self-selection, teachers' opinions on Physics First seem to depend strongly on whether or not they taught physics to ninth-graders classes, with over 70% of those teaching such classes expressing favorable opinions on the PCB sequence versus less than 25% of those not teaching physics to freshmen. Rose Young, an enthusiastic Physics First teacher at Liberty High School in Carroll County, Maryland, says "teaching physics to ninth-graders is great—they can engage in it and see it around them right away. We try to make it fun so they will come back to physics a second time later in high school."

In the past decade, Physics First has also begun to see support at higher levels, such as at school district headquarters and even at the state level. Districts that have offered Physics First at most or all schools include Baltimore, Carroll, and Prince George's Counties in Maryland; San Diego in California; Little Rock in Arkansas, and Boston and Cambridge in Massachusetts.

Wide-scale implementations of Physics First face challenges that individual schools may not. A principal challenge is finding teachers to teach the additional ninth-grade classes. Most districts are already grappling with physics teacher shortages. Thus, district-wide implementations have required a significant amount of professional development for the so-called "crossover teachers"—often biology teachers—who are now tasked with teaching a subject they may not be familiar with.

In addition, many experienced teachers may be accustomed to mathematically advanced, self-selected juniors and seniors, and may not welcome the challenge of teaching a conceptual physics course to ninth-graders. Lederman has pointed out that a number of veteran physics teachers say they "don't do freshmen."

The movement's most significant setback occurred in the San Diego Unified School District. In 2001, the superintendent decided to implement Physics First in all of the district's high schools. This effort was at the time, and apparently remains, the single largest-scale implementation of the program. On the strength of a large grant, the district selected *Active Physics* by Arthur Eisenkraft as their text, and embarked on a massive professional development effort to double their corps of around 40 physics teachers.

However, the effort was beset by complaints from teachers who felt the program was being forced upon them, and by parents who found the curriculum insufficiently rigorous. In addition, according to Dan Lavine, a resource teacher in the district's High School Instructional Support Department, ninth-graders with inadequate backgrounds in math did poorly in the physics classes they were forced to take, which led to poorer outcomes in the future. "Students that lack algebra skills tend to perform poorly in ninth-grade physics," says Levine "and these failures are correlated with significantly lower graduation rates."

The San Diego district stopped requiring schools to teach physics to ninth-graders in 2006. Now, 20 of the district's 27 high schools offer physics to at least some ninth-graders, but of these, only one tracks all freshmen into a physics course. Nevertheless, according to Lavine, most students who enter high school with poor math skills do take physics in the 11th or 12th grade, for the unrelated reason that district officials recommend that these students take physics rather than chemistry to meet the state's physical science graduation requirement. "Achieving a successful physics experience for all students does not necessarily mean limiting that experience to ninth grade," says Lavine.

Is it Working?

One of the challenges in evaluating the success of Physics First is the difficulty in selecting the criteria by which to measure it. As Young, the Maryland teacher, puts it, "What constitutes success of the PCB sequence? Is it increased numbers of physics majors in college? Increased enrollment in science electives? Increased participation in physics competitions? More positive attitudes of students toward science? Some yet to be determined measure of 'scientific literacy?'"

In fact, AIP data show that most schools implementing Physics First do not even follow the full PCB sequence, which supporters also sometimes call the "right-side-up" sequence. According to AIP data, only 37% of public schools and 57% of private schools implementing Physics First use the full PCB sequence. In addition, not all schools teaching physics to ninth-graders offer the subject to all ninth-graders—some offer it only to mathematically less advanced ninth-graders, others to more advanced students, and still others to a subset with a range of abilities.

Despite the great variety in implementations of Physics First, and the difficulty in determining how to evaluate it, some basic trends have emerged. The program does substantially increase the percentage of students at a school who take physics. In 2005, 73% students at public schools and 100% of students at private schools implementing Physics First took physics at some point in their high school careers, versus 31% of students at public schools and 57% of students at private schools not implementing the program, according to AIP data.

On the question of whether physics is beneficial for later chemistry and biology study, a recent study of college science students published by Phil Sadler and Robert Tai in *Science* found that students who had taken a high school course in one science subject did not perform significantly better in college science courses in another subject. The authors wrote, "With regard to the 'Physics First' movement, the lack of a relationship between the previous study of physics and later chemistry performance, or the previous study of chemistry and later biology performance, casts doubt on the impact of changing the traditional high-school science sequence." However, Michael O'Brien and John Thompson point out in a recent *Physics Teacher* article that "the transition from high school to college courses is very different from the ninth-to-tenth-grade transition.

The Future

Recently Physics First has moved to a new level with two state-wide efforts—one that originated in the governor's office in Rhode Island, and another that is a partnership between two universities and a number of high schools in Missouri. Both efforts are supported by large grants that provide professional development, curriculum, and lab equipment to the crossover teachers being recruited to teach the new physics classes. Although it is too early to fully assess the success of these efforts, representatives of these initiatives at a recent AAPT symposium devoted to "Early High School Physics" said they were encouraged by early progress.

About the future of Physics First generally, Lederman says, "the momentum is picking up," but "we need more physics teachers and lots more data…It will take another decade to get our educational 'system' into the 21st century."

INSIDE THE BELTWAY

Serendipity

by Michael S. Lubell, APS Director of Public Affairs

It may not be a true "come-to-Jesus moment," but within the last year, more members of Congress than I can count have turned to science as the savior. And for several of them, it represents a religious conversion and not a born again experience.

In the fifteen years I have been prowling the corridors of power, I must admit that I rarely encountered anyone who was overtly hostile to science. If there was a Luddite in the crowd of 535, I never met him–or her. More often what I received was a pat on the back, with the implied, but never spoken words, "You're a nice, smart fellow and I've enjoyed talking to you, but I've got more weighty matters to deal with."

No more. Take David Obey (D-WI, 7th), for example, the powerful, intelligent and occasionally irascible chairman of the House Appropriations Committee. For years three attributes summed up his political persona: a commitment to helping hard-working have-nots; advancing medicine and healthcare; and carrying around a pack of carefully sharpened pencils in his white shirt pocket, points up. When the number of pencils exceeded four, his staff knew not to mess with him–his eddied state of agitation could quickly turn into a class F4 tornado.

Science concerns, apart from medicine, would never have led him to add another pointed pencil to his storm alert system. Science, in general, was not one of his priorities.

But within the last year, Obey has become a science champion. And when the Science Engineering Technology (SET) Working Group presented him with the George E. Brown, Jr. Public Service Award this past April, he interrupted his overbooked schedule and trekked across the Capitol to the Senate Hart Office Building for the first time in his life–by his own admission–to receive the plaque.

House Speaker Nancy Pelosi (D-CA, 8th) might not have undergone quite the same epiphany, but in the last year her zeal for science has reached new heights. This column has too few inches for any significant exposition, but if you Google "science, science, science, science" you will quickly get the gist of my point.

In May, in recognition of her work, Craig Barrett, who had recently stepped down from his Intel board chairmanship, presented her with the Task Force on American Innovation's Legislator of the Year award. Pelosi was visibly moved, but just how much I didn't learn until a few days later during a conversation with Louise Slaughter (D-NY, 28th), who chairs the House Rules Committee.

During the weeks preceding the award ceremony, Pelosi had been embroiled in a dispute over whether the CIA had misled Congress on its use of "water boarding" at the Guantanamo detention center, as she alleged, or whether, as her critics asserted, she was covering up her tacit, politically opportunistic support for the practice in 2003 when the CIA said it had briefed her on its use.

The usually feisty Speaker, seemed to have lost her spark in the weeks preceding the Task Force event, and in one memorable press conference, she fumbled for words, a warning sign for any politician that the opposition's volleys were landing close to their intended target.

Pelosi, according to Slaughter, was feeling beleaguered. And Barrett's presentation of the innovation award, she said, came at a time the Speaker needed her spirits to be buoyed most. That it came from Barrett, a fellow Californian, who has Republican leanings, clearly touched her deeply.

Congress and the White House are calling on science, especially the physical sciences, including math and engineering, to help pull the nation out of the deepest recession in more than half a century; to address global warming by cutting greenhouse gas emissions; to make the country less dependent on foreign oil; to lower the cost of medicine through better use of information technology; to strengthen our national defenses; and to reduce the threat of terrorism at home. Those are pretty high expectations. And it's not clear that science can deliver on all of them.

But no one has been calling on the physical sciences to address emotional vulnerabilities, especially those of elected officials. As the case of the Speaker demonstrates, however, science can be serendipitous. It sometimes yields rewards we never anticipate.

Letters

Accelerating Universe: Who Knew What When?

Ed. Note: *We featured the accelerating universe in our "This month in physics history" column in January. This was followed by a series of letters in February and April. With the two letters below, we close our discussion of the history of how this discovery was made.*

Michael Riordan's letter to *APS News* (April 2009) contained a vivid account of the scene as Saul Perlmutter presented the results of the Supernova Cosmology Project at a Santa Cruz colloquium in December 1997. His narrative of Saul reporting evidence for low cosmic mass density and unlimited expansion is fully consistent with what both the High-Z Team and the SCP said in January 1998. This confirms the point I was trying to make in my February 2009 letter to *APS News*: that the persuasive evidence for something qualitatively different–cosmic acceleration–came just a little later. February 1998 if you like Alex Filippenko's conference talk at the Dark Matter meeting, March 1998 if you like the High-Z Team's *Astronomical Journal* submission. Ruth Daly's point in her letter to *APS News* is that ideas about acceleration were in the air in January, mine is that data of adequate precision to make the case in a refereed journal were just ahead.

Riordan makes three additional points. He says that Saul Perlmutter pioneered the technique of taking successive photographs four weeks apart in the dark of the moon to discover supernovae, that experimental particle physicists "familiar with manipulating vast quantities of data" felt up to the task of finding supernovae in digital images from CCDs while astronomers did not, and that the SCP result had "significantly better statistics" than the High-Z Team result. Each deserves a brief factual response.

Saul Perlmutter led the SCP with determination, but he did not invent the rhythm of the moon, which approximately matches the 21-day rise time of supernovae and leads to a four week cycle for efficient searches. This pattern of observing in the dark of the moon was pioneered by Caltech's Fritz Zwicky, starting in the 1930's. Monthly spacing of the search was used extensively in the Calan/Tololo search in Chile to find objects for scheduled follow-up. This set of data on nearby supernovae was used by both groups to establish the reality of cosmic acceleration. Monthly searches were employed, but not invented, by the SCP.

Replacing eyes with computers to find supernovae in digital data was an important development. In 1988, Danish astronomers used their 1.5m telescope at the European Southern Observatory to search for supernovae. They took digital images each month of galaxy clusters, registered the new images with the old, scaled the sky, convolved the images to match atmospheric blurring, and subtracted to find new stars in distant galaxies. All this manipulation of data was done in real time at the observatory. By astronomers.Their discovery of SN 1988U, a Type Ia supernova at the cosmologically interesting redshift, z =0.31, was reported in *Nature*. I wrote the "News & Views" explaining the importance of this work. Experimental particle physicists invented their own methods, but pixel-by-pixel subtraction to find supernovae for cosmology was carried out first by Danish astronomers (who didn't think it was very difficult.) If their detector had been a little bigger, perhaps they would have found cosmic acceleration.

Finally, comparing the error ellipses shows that the statistical uncertainty in the values of Omega_lambda and Omega_matter from the High-Z Team in our September 1998 AJ paper was every bit as good as that from the SCP in their June 1999 Ap J paper, despite our having a smaller sample of high redshift objects. That's because we had a larger sample of low-redshift objects from both Calan/Tololo and the Center for Astrophysics, an object-by-object way of determining the reddening to each supernova, and a larger fraction of excellent measurements from the Hubble Space Telescope. A bigger sample does not always yield a more precise answer.

All of us have had a great scientific adventure in learning that the universe is accelerating. That thrill of discovery is part of the fun of doing science, and it is based on a long sequence of contributions by many minds and hands. That long chain of cooperation is what I'd call success.

Robert P. Kirshner
Cambridge, MA

Having read and reviewed his book, I am well aware of most of the details Kirshner discusses in his letter. But I don't think they invalidate my two principal assertions:

- that a group of mostly particle physicists led by Perlmutter (yes, building on prior work by Kirshner and other astrophysicists) pioneered the use of Type 1a supernovae to serve as precision standard candles in measuring the expansion rate of the Universe; both the LBL and High-Z teams subsequently employed such a technique to find that the Hubble expansion was not decelerating as expected, but instead accelerating.
- that by early 1998, the results of neither group alone were sufficient for cosmologists to conclude that this momentous conclusion was true; both were needed because they addressed important weaknesses in the others' analyses.

Taken together, however, the two observations were quite convincing.

Michael Riordan
Santa Cruz, CA

Letter Condemns Attacks on Iranian Students, Universities

During the last week, members of the Iranian security forces in plain clothes have attacked universities and many student dormitories in Iran. In one of the dormitories in Tehran, several students have been killed. In solidarity with the university professors and students in Iran, the Iranian-American Physicists (IrAP) Network Group Board of Directors wishes to express its outrage and condemn such violent attacks on the universities and student dormitories.

IrAP Board of Directors

Ed. Note: APS News *received the letter above on June 22 from IrAP President Mostafa Hemmati of Arkansas Tech University.*

April Meeting Hosts Future Physicists

By Gabriel Popkin

Eighty-one undergraduates and at least one high school student gave talks, presented posters, and mingled with physicists and graduate students at this year's APS April Meeting in Denver, Colorado, as part of the second Future Physicists Days program. Two sessions of talks were devoted to undergraduate research, and the participants also attended a special luncheon as well as an awards ceremony that included a round of the Society of Physics Students' (SPS) Physics Jeopardy.

Dominick Rocco, a junior from the University of Wisconsin-Madison, won an award for his poster on the "Seasonal Variations of the Atmospheric Muon Flux in IceCube," a neutrino telescope under construction at the South Pole. "I love the talks, and the maximum exposure to professional physicists," said Rocco, who was inspired to go into physics by his high school teacher.

Junior Mallory Kay Young, of Hendrix College in Arkansas, said her favorite session was the networking luncheon for women in physics. Young won an award for her talk on "Neutrino-Stimulated Pair-Creation in Supernovae." She said she was inspired to come to the meeting by her advisor, Todd Tinsley, who brought a total of six Hendrix students to the meeting. Tinsley said that all Hendrix undergraduates do a "capstone" project, and the April Meeting provides a venue where they can present their research to a nationwide audience. "Without the [$200] travel stipends APS provided I could not have brought all the students who wanted to come," said Tinsley.

Future Physicists Days were jointly sponsored by APS, SPS, and the Council on Undergraduate Research, in order to provide undergraduates with early exposure to the scientific conference culture.

According to Cathy Mader, a Hope College professor who coordinated the students' activities, this year's program evolved as a result of students' feedback from last year. Mader said "We changed the format to allow undergraduates to participate in more of the meeting activities. We found they really appreciated the chance to go to sessions and meet professionals in the field."

For more information about Future Physicists Days, go to www.aps.org and search on "Future Physicist".

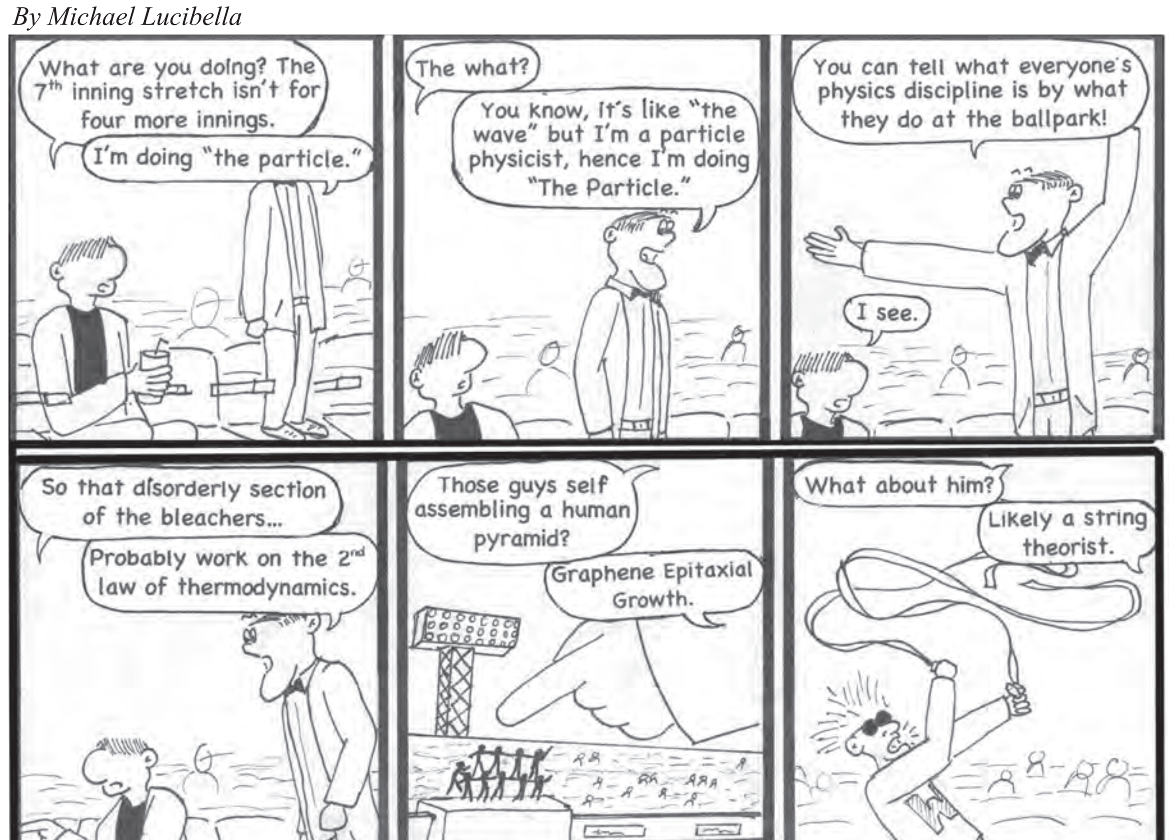
Molten Salt Reactor Will Solve Energy Problems

Our country will need lots more electric power in the foreseeable future. Back-of-the-envelope calculation shows that all green "alternative" sources combined–wind, solar, etc–are not going to cut the mustard, because of inherently low energy densities. If foreign oil and dirty coal are out, the only way left is the dreaded "nuclear option." Here is where physicists ought to step up to bat. They consider themselves knowledgeable about energy alternatives…but how many know that before 1969 this country did successful proof-of-concept research into a liquid fluoride thorium reactor that offered improved safety and efficiency, 1/30th the waste volume (compared to a uranium reactor), reduction of high-level waste storage requirements from over 10,000 years to around 300 years, reduced target-value to terrorists (due to nonproduction of weapons material), cheaper construction costs and raw materials (over 1000 times the fuel reserve), etc.? After 1969, dominated by technically-uninformed, fear-driven nuclear revulsion, America curtailed research and even junked half-completed nuclear plants, with the result that today South Africa has more imaginative nuclear designs than we do. The US needs to put "stimulus" funds into researching nuclear power innovations, rather than coasting on 1940-era designs. And who will advocate such funding, if not you as a physicist? Protecting your grant? Speak up, if you have the guts and dare to boast of the "moxie"! The silence is deafening.

Thomas E. Phipps, Jr.
Urbana, IL

zero gravity

By Michael Lucibella



Education Corner

A column on educational programs and publications

APS Releases Education Video

The APS website now features a five-minute video on a DC-motor activity created by APS educator Ed Lee for the APS High School Physics Teachers Days. In the video, APS education and diversity director Ted Hodapp and outreach director Becky Thompson-Flagg trade quips as they explain how to do the activity and how the motor works. The video, which is intended to be a resource for high school teachers who want to do hands-on activities in their classrooms, can be found on the APS website by searching on the keyword "teachers day" and clicking on Downloadable Workshops & Research Talks. The website also provides an annotated handout explaining the various steps of the activity.

NSF STEP grant proposals due in late September

The National Science Foundation's Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) seeks to increase the number of undergraduate science, technology, engineering, and mathematics (STEM) majors. Among other activities, currently funded projects focus on recruiting STEM majors from current high school and undergraduate student populations, provide scholarship support and research opportunities for potential majors, and help build bridges between universities and local community colleges and K-12 schools. The NSF is soliciting two types of proposals—those that provide for full implementation efforts at academic institutions, and those that support educational research projects on associate or baccalaureate degree attainment in STEM. For more information, see www.nsf.gov/funding/pgm_summ.jsp?pims_id=5488.

AAPT 2010 Summer Meeting

The American Association of Physics Teachers (AAPT) 2010 Summer Meeting will run from Saturday, July 25th to Wednesday, July 29th in Ann Arbor, Michigan. The theme of the meeting will be "Discovering the Universe: Democritus and Galileo to Fundamental Particles and Cosmology." Just prior to the meeting will be a workshop on the Advanced Lab, and immediately following the meeting will be the 2009 Physics Education Research Conference. For more information, see www.aapt.org.

Standards to Provide Educational Achievement for Kids Act (SPEAK) Act

On June 10, Congressman Vernon J. Ehlers (R-MI, and APS Member) and Senator Christopher Dodd (D-CT) introduced the SPEAK Act, which would create or adopt voluntary national standards for K-12 math and science education. This is an effort to provide more consistency in states' standards in these areas. For more information, go to thomas.loc.gov and search on Bill Number H.R. 2790 or S. 1231.

LaserFest Booth Debuts at CLEO

LaserFest made an early public appearance at June's Conference on Lasers and Electro-Optics and International Quantum Electronics Conference (CLEO/IQEC) in Baltimore. APS, partnering with the Optical Society of America, unveiled the yearlong celebration of lasers at the conference to get a head start at promoting the wide array of programs planned for next year.

Timed to coincide with the 50th anniversary in 2010 of Theodore Maiman's construction of the first working laser, LaserFest will highlight the importance of lasers through history and their potential for future innovation. Throughout the year a variety of programs and events nationwide will raise public awareness about the laser and its applications in today's world. Planned programs include public demonstrations, traveling shows, videos, and educational materials for schools across the country.

"The goal is to introduce the public to lasers and convey the idea that basic science is very important, especially because so many things we use in our daily life are laser-based or use lasers in some way. The fiftieth anniversary is a great way to highlight that," Nadia Ramlagan, APS's LaserFest project Coordinator said.

The program is just getting underway. The traveling booth at CLEO/IQEC was the first official LaserFest event aimed at disseminating information about next year's activities. The booth featured stickers, posters, light-up pins and other giveaways emblazoned with LaserFest logos and information about the LaserFest website. As 2010 approaches, the booth's focus will expand further as events and programs start to take off. It will travel to scientific and teaching conferences featuring information and demonstrations on how to convey to the public the importance of lasers.

Ramlagan said that the reaction by the optics scientists at CLEO/IQEC was overwhelmingly positive. The LaserFest booth at the conference's PhotonXpo was one of the trade show's most popular exhibits. People could be seen wearing the light-up LaserFest giveaways throughout the convention hall. By the end of the conference, nearly three hundred people had signed up for the LaserFest e-newsletter.

"I think it's a great idea," said Xaio Qin Li from the University of Texas in Austin, "Lasers are one of the greatest technical inventions ever."

LaserFest is designed to appeal to broad segments of the population, including educators, legislators, and anyone else interested in science. One segment the organizers are especially trying to reach out to are youngsters. This fall APS will release its annual PhysicsQuest kit themed to coincide with LaserFest. Aimed at middle school students, next year's kits will feature classroom laser experiments and a comic book starring Spectra, LaserFest's super-heroine. In it she will explain the history and physics of the laser while combating her arch nemesis, the evil Miss Alignment.

"I never would have thought of a comic book, but I like it," Daniel Mittleman of Rice University said, "I think it's a very cool idea. I have a seven-year-old at home. I'm very in favor of her becoming a physicist when she grows up."

Funding from the National Science Foundation and the Department of Energy will also help LaserFest promote the importance of laser science. The agencies have awarded $300,000 in grants for events such as LaserDays and LaserFest on the Road, to bring the excitement of lasers to people nationwide.

"Anything to interest young people in lasers is a good thing," said Andy Bayamian of the National Ignition Facility, "We don't have enough young people going into laser technology,"

WOMEN continued from page 1

surveys conducted between 2004 and 2005. Incorporating nearly 500 departments and over 1800 faculty members, the study focused on six disciplines; biology, chemistry, civil and electrical engineering, mathematics, and physics.

The information collected by the National Academies closely parallels the findings in the recently published report of the APS-sponsored 2007 Gender Equity Conference. The conference report states that "the physics workforce in academia and national laboratories remains one of the last areas in science where women are significantly underrepresented relative to their proportion in the population." In addition it assembled a broad series of suggestions and recommendations to better retain women faculty at universities and national labs and encourage more woman to seek degrees in physics.

Many of the recommendations from the conference report dovetailed with recommendations made by the National Academies study. Both recommended more aggressive recruitment by institutions, as well as greater transparency about promotion and tenure policies and maternity leave.

Other organizations have also endeavored to promote women in the sciences. The American Association for the Advancement of Science partnered with the cosmetics company L'Oréal USA to establish its Fellowships for Women in Science in 2004. This year the fellowship awarded five women $60,000 in grant money to aide their research, up from $40,000 from last year.

This year two of the five recipients were physicists. Tiffany Santos, of Argonne National Labs, won for her work synthesizing epitaxial oxide heterostructures and superlattices. Beena Kalisky of Stanford University said she will use her grant to further develop a SQUID microscope for imaging and characterizing individual magnetic nanoparticles.

"This scholarship made me think specifically about the status and contributions of women to the field of physics… it is not a secret that there are only a small number of women in physics, especially if you look at higher career levels," Kalisky said, "Today's culture and technology makes daily life much easier, and it is possible to find solutions for women who do make the choice of physics as a career and feel they encounter difficulties. As soon as the number of women in science grows, there will be more role models for other women to follow."

Not only is it essential to retain talented women in the field, but also to find new ways to draw them to it in the first place.

"It is important to generate interest in young girls to study physics starting in grade school. This is difficult to do because in most cases, the physics teachers are male." Santos said, "If young girls do not see women teaching science, then they are likely not to consider it as an option… Women are just as capable as men in studying physics, but they are getting lost along with way, mainly due to these gender biases and societal perceptions.

The fellowship was established to help women advance their postdoctoral research in the sciences. Recipients are chosen by a panel of seven leading scientists in a range of fields. This year's panel included three physicists and the president the National Academies.

OLYMPIANS continued from page 1

Teachers along with the University of Maryland have organized and trained each US team since the beginning. More than a dozen other organizations including APS and the American Institute of Physics also help to sponsor the team.

This year's traveling team is made up of: David Field, a sophomore from Andover, Massachusetts; Bowei Liu a sophomore from Fremont, California; Marianna Mao, a senior from Fremont, California; Anand Natarajan a senior from San Jose, California; and Joshua Oreman a senior from Los Angeles, California.

"It's been really intense but really worth it," said Oreman upon learning he had been selected to the final delegation, "I'm really thrilled, it's going to mean a lot more work, but it's definitely worth it."

Getting through to the Olympiad has been quite a feat for the students. To make to the training at UMD, each student passed through a rigorous selection process. More than 4,000 students from over 350 schools across the country took the preliminary first round test. Dubbed the "F=MA Exam," the multiple choice test focused primarily on introductory mechanics.

The top 400 scorers on the test moved on to the quarterfinals. There, students were given three open-ended problems on a much broader range of topics. From there, the top 150 scorers took a third quiz, six problems long, from which the final group was selected to attend physics camp. All of the students attending the camp are considered part of the US team, and the five selected at the end of the camp make up the traveling team.

After the camp concludes, the members of the traveling team are sent home with a hefty packet of homework, mostly problems culled from previous Olympiads. There's a brief, three-day refresher camp held in mid July right before the traveling team jets off to the city of Merida on the Yucatan Peninsula.

At the Olympiad, the US team will face off against over sixty countries on three complicated theory problems and an experimental lab. Last year the United States placed second overall, its best standing yet. The US Team generally places in or near the top ten in the world, facing some of the toughest competition from nations such as China, Russia, Vietnam, and Iran.

To prepare for this challenge, the training at physics camp was rigorous and intense. For ten days straight the students rose early to face a full schedule of lectures, labs and practice exams. Topics ranged from basic wave mechanics and oscillations to relativity and other modern physics.

"It's tiring after a while," said junior Dan Li, who attended last year's camp as well, "It's a lot of fun getting to work on physics without distractions, but after a while you do need time to relax."

"It's gotten to the point we can't work them much harder and probably shouldn't work them much harder," said Andrew Lin, an assistant coach. Lin started out as a member of the team eleven years ago, and has returned each year to help coach. He said that since then, "the Olympiad has grown… I'd like to think that it's improved [and] I think the students are better."

Despite the intensity of the training, there's very little jockeying for position for a coveted spot on the traveling team. Instead there is a strong sense of camaraderie among the students.

"I never felt that the camp was about fostering competition over the five traveling team spots," said Marianna Mao, "Physics is our idea of a good time."

The coaches have sought to foster this collegial spirit amongst the students. Paul Stanley, the academic director for this year's team, said that they want to establish an environment where the students can both shine academically and enjoy themselves while meeting other like-minded high school students.

"They love it," Stanley said. "They can be who they are without being self conscious about being the only kid in the room who likes physics."

2009 GENERAL ELECTION PREVIEW

The APS Nominating Committee is pleased to present the following candidates for the 2009 APS annual election. Members will elect a Vice President, Chair-Elect of the Nominating Committee, two General Councillors, and an International Councillor. The election is open from June 15 through August 31, and those who are elected will begin their terms on January 1, 2010. Full biographies and candidates' statements can be found at: http://www.aps.org/about/governance/election/index.cfm. Most APS members who vote will do so online after receiving email instructions; a paper ballot option is also available.

VICE PRESIDENT

Robert L. Byer

Stanford University

Professor Robert L. Byer is the William R. Kenan, Jr. Professor of Applied Physics at Stanford University. He has conducted research and taught classes in lasers and nonlinear optics at Stanford University since 1969. He has made numerous contributions to laser science and technology. He received his BS degree in physics in 1964 from the University of California, Berkeley, and his MS and PhD degrees in 1967 and 1969 in Applied Physics from Stanford University.

Byer has served as department chair of Applied Physics in 1980-83, and 1999-2002; Associate Dean of Humanities and Sciences from 1984-86, and Vice Provost and Dean of Research at Stanford University from 1987 to 1992. He has been director of the Hansen Experimental Physics Laboratory from 1997 to 2006, and the Edward L. Ginzton Laboratory from 2006 to 2008.

He was elected President of the Laser and Electro-optics society of the IEEE in 1984 and of the Optical Society of America in 1994. He has served on the AIP Governing Board from 1993 to 2000 and was a founding member of the California Council on Science and Technology in 1989 and served as chair from 1994 to 1998.

Byer will receive the Frederic Ives Medal/Quinn Endowment from the Optical Society of America in 2009 and was awarded the IEEE Photonics Award in June, 2009. He has been the recipient of the IEEE Third Millennium Medal, the A. L. Schawlow Award of the Laser Institute of America, the R. W. Wood prize of the OSA, the Quantum Electronics Award of the Lasers and Electro-optics Society, and the Adolph Lomb Medal of the Optical Society of America. He is a fellow of the APS, AAAS, LEOS, LIA and OSA. He was elected to the National Academy of Engineering in 1987 and to the National Academy of Science in 2000.

He has served on the Editorial Boards of *Optics Letters*, *Journal of Applied Physics, Applied Physics Letters*, *Review of Scientific Instruments,* and the *Proceedings of the IEEE.* He served on the NRC Committee on Optical Sciences and Engineering, and the NRC Committee on Inertial Confinement Fusion. He served as Vice Chair of the NIST NRC Advisory Board, Physics Panel. He completed a four year term on the Air Force Scientific Advisory Board in 2006. He is serving on the LLNL, NIF, and PS Directors Review Committee and on the SLAC Coherent Light Source Science Advisory Committee.

Robert C. Richardson

Cornell University

Bob Richardson attended Virginia Polytechnic Institute between 1954 and 1960 where he obtained both BS and MS degrees in physics. His thesis work involved NMR studies of solid ^{3}He. He obtained his PhD degree from Duke in 1966. In the Fall of 1966 he began work at Cornell University in the laboratory of David Lee and were later joined by Douglas Osheroff. Their research goal was to observe the nuclear magnetic phase transition in solid ^{3}He.

In the Fall of 1971, they made the accidental discovery that liquid undergoes a pairing transition similar to that of superconductors. The three were awarded for that work the Simon Prize in 1976, the Buckley Prize in 1981, and the Nobel Prize in 1996.

Bob has been on the Cornell faculty since 1967. He served as Director of the Laboratory of Atomic and Solid State Physics from 1990 to 1997 and is currently the F. R. Newman Professor of Physics. After 32 years of teaching he joined the Cornell Administration to serve as the Vice Provost for Research and as the Senior Science Advisor to the Provost and President of Cornell.

Richardson has served on a number of boards related to research and teaching among which are: The National Science Board, the governing body of the NSF; The Duke University Board of Trustees; The Board of Directors of the American Association for the Advancement of Science; The Board on Physics and Astronomy of the NRC; The Board of Directors of Brookhaven Science Associates; and The Board of Directors of Associated University Incorporated.

Richardson has made it a point to serve on committees and panels of the APS. He served on the APS Panel on Public Affairs (POPA) in 1989 to1991. Richardson's principal contribution to POPA was to chair the committee that wrote the statement of ethics for members of the APS. In 1990 through 1991 he was a member of CISA, the Committee on International Scientific Affairs. He served as Vice Chair, Chair, and Past Chair of the Division of Condensed Matter Physics from 1994 through 1996. Finally, he served on the PPC, Physics Planning Committee (PPC) between 1998 and 2002, the last three years as the Chair. In that capacity he gave testimony before Congress four times on behalf of the APS.

CHAIR ELECT-NOMINATING COMMITTEE

Gregory Boebinger

National High Magnetic Field Laboratory

Greg Boebinger is director of the National High Magnetic Field Laboratory (MagLab) and a Professor of Physics at Florida State University and the University of Florida. Dr. Boebinger received his PhD in Physics from the Massachusetts Institute of Technology in 1986 where he was a Hertz Fellow and Karl Taylor Compton Fellow during his research measuring the magnetic field dependence of the fractional quantum Hall effect (FQHE).

His research career has been centered on the utilization of intense magnetic fields as a thermodynamic parameter to access and elucidate new correlated electron phases. Prior to MIT, he was a Churchill Fellow at the University of Cambridge, working on the then-newly-discovered organic superconductors, focusing on structural phase transitions underlying magnetic ordering. After MIT, he received a NATO Fellowship to the Ecole Normale Superieure in Paris. In 1987, he joined Bell Laboratories where he engineered and constructed with his colleague a pulsed magnetic field program that was the first to achieve millisecond-duration magnetic fields exceeding 70T. His high-magnetic-field research included resonant tunneling spectroscopy, chaos in quantum wells, new correlated electron states in double quantum wells, and the low-temperature behavior of the high temperature superconductors in the absence of superconductivity. His research has continued while MagLab Center Leader at Los Alamos National Laboratory (1998-2004) and MagLab Director (2004-present) responsible for all three MagLab campuses.

He is a Fellow of the American Physical Society and the American Association for the Advancement of Physics. Among his service on numerous boards and committees is his chairing of the Neutron Advisory Board for Oak Ridge National Laboratory. For the APS, he has served on the Buckley Prize Selection Committee and the Committee on Meetings during the shift from the notorious 'phone book' to wireless. His outreach includes dozens of public lectures and demonstrations appearing on the History Channel and Discovery Channel.

Steven Girvin

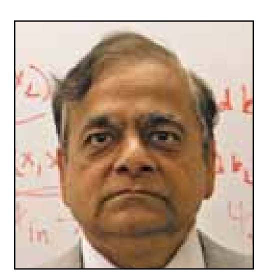
Yale University

Steven Girvin is the Eugene Higgins Professor of Physics and Professor of Applied Physics at Yale University where he also serves as Deputy Provost for Science and Technology. His research interests are in condensed matter, quantum optics, and cold atom physics. While nominally a theoretician, he works exceptionally closely with experimentalists. He has broad oversight for all natural sciences departments within the Faculty of Arts and Sciences, as well as several administrative units.

In 1999 he co-founded the Boulder Summer School in Condensed Matter and Materials Physics. Professional service includes: Member, Executive Committee, Division of Condensed Matter Physics, APS, 2001-2004; Divisional Associate Editor, *Physical Review Letters*, 2000-2002; Member, National Research Council Panel, which wrote the decadal report on Condensed Matter and Materials Physics, 1996-98; Member-at-Large of the Gordon Research Council, 2009-11; Member external advisory board, Harvard MIT Center for Ultra-Cold Atoms, 2008-; Member external advisory board, Harvard Smithsonian ITAMP, 2008; Member external advisory board, University of Maryland –NIST Joint Quantum Institute, 2009-; Member, Advisory Council, Princeton University Department of Physics, 2009-15.

Girvin received a BS in physics from Bates College (1971), an MS from the University of Maine (1973), and PhD from Princeton (1977). He did his postdoctoral research at Indiana U. and at Chalmers U. in Göteborg, Sweden. After serving as a staff physicist at the National Bureau of Standards (now NIST) from 1979 to 1987, Girvin joined the faculty of Indiana U. Girvin moved to Yale in 2001; in 2007 he was appointed Deputy Provost. Honors include Fellowship in the APS, the American Academy of Arts and Sciences, and the American Association for the Advancement of Science. He is a member of the National Academy of Sciences and a Foreign Member of the Royal Swedish Academy of Sciences. For his work on the quantum Hall effect he shared the 2007 Oliver E. Buckley Prize of the APS.

GENERAL COUNCILLOR



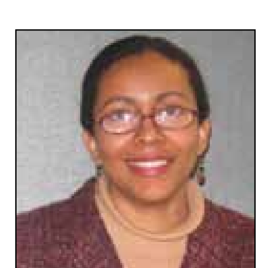
Girish S. Agarwal

Oklahoma State University

Girish S. Agarwal is Regents Professor at Oklahoma State University and holds the Noble Foundation Chair. He received his PhD in Physics from the University of Rochester in 1969. He has worked at many centers around the world, including the Joint Institute for Laboratory Astrophysics, University of Colorado, and Max-Planck Institute for Quantum Optics, Garching. He served as Director and Distinguished Scientist at the Physical Research Laboratory, Ahmedabad, India, and held the Einstein chair of the Indian National Science Academy.

Agarwal is a theoretical physicist with contributions spanning many areas of quantum optics, coherence and statistical optics, and plasmonics. He is the author of a well-known research monograph "Quantum Optics". He introduced the idea of coherences induced by vacuum, which is important in understanding the quantum control of matter.

His 1975 papers on the QED phenomena at surfaces showed, much before the development of near field techniques, how to probe surface features by using dipolar fields. His theory of optical resonance in fluctuating fields became the driving force of many theoretical and experimental studies in the area. He discovered how entanglement can be transferred from field to atoms which led to methods for the production of the squeezed states of atoms; these ideas are now being applied to Bose condensates. He was recently elected a fellow of the Royal Society, UK. He has been a fellow of the APS and the Optical Society of America for many years. His awards include Max Born Prize from the Optical Society of America, Humboldt Research Award of Germany, and the Physics Prize of TWAS, Trieste.



Marta Dark McNeese

Spelman College

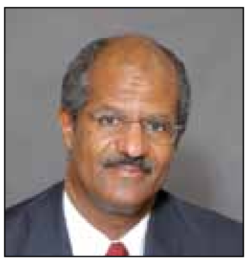
Marta Dark McNeese serves as a professor in the Physics Department at Spelman College. She received her BS in Physics with an Astronomy minor from the Univer-

ELECTIONS continued from page 6

sity of Virginia in 1992. Subsequently, she attended MIT, receiving a PhD in Physics in 1999. She worked as a Postdoctoral Associate in the Center for Bio-Molecular Science and Engineering at the Naval Research Laboratory for one year. In 2000, she accepted the position of Assistant Professor at Spelman College.

Dr. Dark's research focus is laser interactions with biomaterials. She has contributed to research with various materials including the study of electro-optical effects on nematic liquid crystals, and the photoacoustic and photothermal effects in soft fibrocartilage tissues. She regularly participates in her Department's activities to revise and reform the physics curriculum based on the modeling of real phenomena.

Dr. Dark has served on local and national committees, ranging from co-chair for the Chemical and Biological Physics section of the National Society of Black Physicists, to New York University's "Physics in the Science Curriculum" Network Summer seminar. Currently, she is completing her term on APS Committee on Minorities. She has also served on the American Association of Physics Teachers Committee on Minorities.



Stephen C. McGuire

Southern University and A&M College

Stephen C. McGuire is professor of physics at Southern University and A&M College and a Fellow of the American Physical Society. He received his BS in physics from Southern University, MS in nuclear physics from the University of Rochester, and PhD in nuclear science from Cornell University. After receiving his doctorate, he spent four years as a staff scientist at the Oak Ridge National Laboratory. Upon joining the physics department at Alabama A&M University in 1982 he began research with the High Energy Particle Astrophysics Laboratory of the Marshall Space Flight Center. In 1989 he was appointed to the Cornell faculty. In 1999 he returned to Southern University, a major producer of undergraduate minority physics majors, as chair of the department of physics, a position he held until 2009.

His research focuses on solid-state materials, and his teaching interests emphasize the integration of technology in the development of science education.

He is a past-president of the National Society of Black Physicists (1987-1989). In 2004 he was named Outstanding Research Investigator at Southern University and A&M College and in 2005 he was named the Faculty Researcher of the Year in its College of Sciences.

From 1988-1989 he served as chair of the APS Committee of Minorities (COM) in Physics. He has also served as an APS-sponsored minority speaker and as a member of the advisory board of its Insurance Trust.

McGuire holds the concurrent positions of Visiting Associate in the Division of Mathematics, Physics and Astronomy at the California Institute of Technology and Guest Researcher at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD. He is a member of the external advisory committee of the Materials Science Research and Engineering Center of the University of Chicago and is the Southern University Principal Investigator for the Laser Interferometer Gravitational-Wave (LIGO) Observatory Project. He also serves on the Executive Committee of the LIGO Science Education Center.

Warren B. Mori

University of California, Los Angeles

Professor Warren B. Mori received his BS from UC Berkeley in 1981, and his MS and PhD from UCLA in 1984 and 1987, respectively. He has been on the research and regular faculty of the Physics and Astronomy and of the Electrical Engineering Departments at UCLA since 1987. Starting in 1998 he has been a full professor in both departments. Since the fall of 2006 he has been the Director of the UCLA Institute for Digital Research and Education.

His current research interests are in plasma physics, laser and beam plasma interactions, plasma-based accelerators and light sources, inertial confinement fusion, high energy density science, relativistic shocks, and high performance computing. Prof. Mori holds patents for upshifting light frequency by rapid plasma creation, and for the use of relativistic ionization fronts for tunable radiation. He was awarded the International Center for Theoretical Physics Medal for Excellence in Nonlinear Plasma Physics by a Young Researcher in 1995, and in 1997 he was elected a Fellow of the APS for his "outstanding contributions to particle simulations of complex laser-plasma phenomena and of plasma-based light sources." He was elected a Fellow of IEEE in 2006 for his work in plasma science. He has served on many panels and committees. He has advised fifteen graduate students including two recipients of APS best thesis prizes and mentored 7 postdoctoral researchers.

INTERNATIONAL COUNCILLOR

Blas Alascio

Argentine Consejo Nacional de Ciencia y Tecnica-Centro Atomico Bariloche

Blas Alascio graduated at the University of Tucumán, Argentina in 1962 and obtained his PhD in physics from the same university in 1964 after successive scholarships at the Instituto de Física in Bariloche and the University of California (Berkeley).

In 1964, he joined the Argentine Comision Nacional de Energia Atomica, working at the Centro Atomico Bariloche, where he led the Solid State Theory group from its beginning in 1965. Later, he acted as Head of the Basic Research Department of the same institution from 1982 to 1984 and from 1986 to 1995.

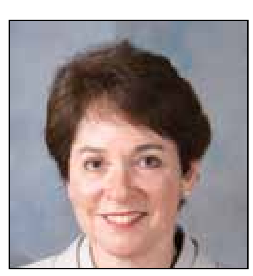
He was simultaneously (1966 to 2007) full professor at the Physics Institute (later Instituto Balseiro) in Bariloche where he taught quantum mechanics, statistical physics, and condensed matter physics. He has also been a visiting professor at the Universidad de Cordoba, Argentina, and at the University Louis Pasteur, Grenoble, France.

His main research interest is in Solid State Physics. He has been an associate member of the International Centre for Theoretical Physics in Trieste, Italy from 1970 to 1980 and a visiting scientist at the same Centre (1984-1985). During Abdus Salam's Directorship of the Centre, Blas Alascio has integrated several Committees concerning the international activities of the ICTP, and has also been a Member of the Committee for Evaluation and Projection of the ICTP presided by Prof. L. Matheus (1978).

He has also been a member of the Scientific Committee of the International Centre for Condensed Matter Physics in Brasilia from its creation in 1988 to 2007. The Brasilia Centre was created by the University of Brasilia to increase the exchange of scientific knowledge between Brazil and the international community, especially with the Latin American community.

He has also been cofounder and member of the Advisory Committee of the Balseiro Foundation in Bariloche, Argentina from 1991 to the present and president of the Committee from 1991 to 1996. The Balseiro Foundation is an institution devoted to the support of research in science and technology and its transfer to society.

He received the 1982-1983 "Teófilo Isnardi" prize from the Academia Nacional de Ciencias Exactas, Físicas y Naturales. Argentina, and has been a Fellow of the APS since 1998.



Belita Koiller

Physics Institute, Federal University of Rio de Janeiro, Brazil

Belita Koiller is a Professor of Physics at the Instituto de Fisica, Universidade Federal do Rio de Janeiro (UFRJ), Brazil. Belita Koiller received her PhD in Physics in 1975, at University of California, Berkeley, where she worked in theoretical Condensed Matter Physics under the supervision of Leo Falicov. She returned to Brazil upon completing her PhD, starting her professional activities at the Physics Department of the Pontificia Universidade Católica do Rio de Janeiro (PUC/RJ) where, in 1992, she was appointed Full Professor. She left PUC/RJ in 1994 to become Full Professor of the Physics Institute at Universidade Federal do Rio de Janeiro (UFRJ), where she remains to the present. At PUC/RJ, she was Chair of the Physics Department in 1983/1984. She was elected three times as a General Councilor of the Brazilian Physical Society, for the 4-year periods starting in 1993, 1999, and 2005. In 2008 she chaired the 29th International Conference on the Physics of Semiconductors, held in Rio de Janeiro and sponsored by IUPAP.

Belita Koiller is a condensed matter theorist. She has collaborated with several institutions in the United States including with UC Berkeley, Johns Hopkins University, and the Condensed Matter Theory Center at the University of Maryland. She was in the Editorial Board of *Applied Physics Letters* and *Journal of Applied Physics* for three years, starting 2006.

Belita Koiller received a Guggenheim Fellowship in 1982, and she has been a research fellow of the Brazilian National Research Council since 1985. In 1995 she was the first woman to be elected a full member to the Brazilian Academy of Sciences in the Physical Sciences division. She was decorated "Comendador da Ordem Nacional do Mérito Científico" by the Presidency of Brazil in 2002. Belita Koiller is a L'Oréal UNESCO 2005 Laureate for Women in Physical Sciences (Latin America).

She served for 3 years, starting in 1994, as a member of the ICSU Committee on Capacity Building in Science. Since 2005 she has been a member of the Executive Committee of the International Human Rights Network of Academies and Scholarly Societies, which assists colleagues (scientists and scholars) who suffer repression. In 2008 she became a member of the IUPAP Commission on Semiconductors.

ANNOUNCEMENTS

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Wetting and spreading

Daniel Bonn, Jens Eggers, Joseph Indekeu, Jacques Meunier and Etienne Rolley

Wetting is a pervasive phenomenon which is the key to capillary flow in plants, the secret ingredient of ice skating, and necessary for the proper coating of optical and electronic devices. However, the basic understanding of wetting is far from simple and there are still many open questions and puzzles. In this review, the authors lead the reader through the current knowledge of static and dynamic wetting, spreading on random substrates, and highlight the burning issues in the field.

Correction

In the story headlined "Physicists Bring Their Moxie to National Intelligence" in the June *APS News*, there were two inaccuracies that we wish to correct. At the press conference mentioned in the report the speakers were NIST scientists only; there were none from Los Alamos. The microcalorimeter that was described can be used to make the delicate distinction between Uranium and Radium, not Uranium and Radon as stated in the report.

We thank Joel Ullom of NIST for bringing these errors to our attention.

WINNERS continued from page 1

tricity, emphasizing its close connection with magnetism. These included dropping a magnet through a coil of wire to induce a current, using an electrical current's magnetic field to change the direction a compass points, and combining a magnet and battery to turn a pinwheel. The kit also taught students about how light bends in a transparent medium whose index of refraction is greater than 1.

The kits have become favorites among school systems with limited resources and home schooled students because they're offered free of charge to anyone who requests them. In addition, by focusing on seventh and eighth grades, the kits help to fill a gap in physical science teaching resources for that age group.

"Middle school kind of gets forgotten about," Thompson-Flagg said, "It's hard to target them directly."

PhysicsQuest started in 2005 as a tie-in with the World Year of Physics celebration. The first kit featured experiments and activities based on the life of Albert Einstein. Subsequent kits highlighted scientists Benjamin Franklin and Marie Curie. In conjunction with next year's LaserFest program, the 2009 kits will include a series of laser-based experiments and original laser superhero Spectra.

Even the method for picking the winners affords students and teachers a physics lesson. This year's winners were chosen using a random number generator based on fluctuations in atmospheric radio static. This yields truly random numbers, as opposed to pseudo random numbers which are usually calculated by a computer using a complex algorithm.

DAMOP continued from page 1

Christopher Foot of the University of Oxford discussed his new method to rotate a two-dimensional optical lattice which he hopes to use to further investigate the quantum Hall effect.

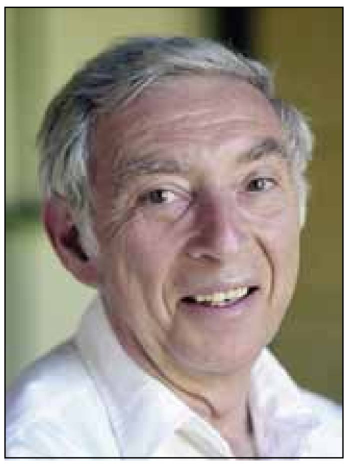
Erik Winfree of Caltech expanded on the established idea of using artificial DNA-like sequenced molecules for computer memory. Winfree discussed what kind of additional technologies would be needed to make molecular programs feasible, including the theoretical models that might describe their behavior and the need for new specialized programming languages.

To lighten things up a bit, Diandra Leslie-Pelecky of the University of Texas, Dallas presented the public lecture about the physics of car racing. Drawing on her book, *The Physics of Nascar,* Leslie-Pelecky spoke to the crowded hall about how everything from fundamental mechanics to thermodynamics and molecular structures play a major role in the most popular racing sport in America.

The Back Page

Administrative Burdens Stifle Faculty and Erode University Resources

By Arthur Bienenstock



According to a recent survey by the Federal Demonstration Partnership (FDP), on average faculty are spending 42% of their federally-funded time on administrative matters that do not include proposal writing. Two decades ago, that number was only 18%. This heavy commitment of researchers' time to administrative functions is a terrible waste of faculty time and government money. Many of the tasks that faculty are performing could be managed better, and at a lower cost, by skilled administrative staff who are, for example, familiar with the requirements associated with personnel actions, export control, as well as human and animal subject protocol reviews. [The Federal Demonstration Partnership is a cooperative National Academies of Sciences initiative among nine federal agencies and 120 institutional recipients of federal funds, seeking efficiency and effectiveness in government-university research administration. Its report is available at http://www.thefdp.org/Faculty_Committee.html]

The situation is likely to grow worse as faculty help to provide the new information required for research funded under the American Recovery and Reinvestment Act of 2009 (the "stimulus" bill). Just as the government is clearly recognizing, through increased funding, the important role scientific research plays in the nation's economy, it is adding additional administrative burdens to those leading that research. The situation is likely to be exacerbated by universities' spending cutbacks associated with the economic downturn. Universities will almost undoubtedly decrease the administrative support they provide to faculty in the face of quite significant budget cuts. It is vital that we give considerable thought to how the situation might be improved.

Three factors have contributed to this increase. The first is the set of changes made to OMB Circular A-21 in the early '90s. This circular (http://www.whitehouse.gov/omb/circulars/a021/a021.html) contains federal regulations governing the reimbursement of universities for both direct and indirect costs associated with the performance of federally-funded research. Direct costs are those that can be associated with a specific research project, such as faculty and graduate student salaries, research supplies, etc. Indirect costs are those that are associated with the performance of federally funded research, but which cannot be attributed to a specific project. These include items like university research administration, utilities, and research building depreciation. Indirect costs are further subdivided into Administrative and Facilities. One of the changes to A-21 limited the reimbursement of indirect administrative costs to 26% of the related direct costs. Since most universities lose money with this reimbursement rate, almost all of them cut back the local administrative support upon which faculty could draw directly while centralizing the corresponding administrative functions. The A-21 changes also meant that faculty no longer charge for administrative functions directly to the grant. Prior to this change, one or more faculty would commonly hire an administrative assistant who was, or would become, skilled in the administrative functions directly associated with the specific research. A-21 no longer allowed reimbursement for this function. As a consequence of these two changes, faculty took on administrative tasks previously performed more effectively and inexpensively by administrative assistants.

Over the almost two decades since these changes took place, the administrative burden on university resources and faculty has also grown as a result of increased local and federal requirements. These include export and ITAR control, environment, health and safety reporting, controlled substance regulations, as well as requirements related to human and animal subject experiments. During the time that I was Stanford's Vice Provost and Dean of Research and Graduate Policy, 2003-2006, Stanford typically allocated around 20% of its funds available for new endeavors to research compliance. Universities dare not reduce central administrative staff needed to meet these requirements. Indeed, universities perceive many of these regulations as vital for the appropriate conduct of research–which should be federally funded as part of the research support. Given the financial exigencies that universities face presently, therefore, it is more likely that they will cut back on local faculty administrative support.

The third contributing factor, largely unrecognized in the various discussions of administrative support and indirect cost reimbursement, is the increase in the ratio of NIH funding to that from other agencies. The ratio of NIH funding to that of all agencies grew from 52% in 1992 to 63% in 2007, according to Appendix Table 5-6 in the National Science Foundation's publication, Indicators 2008 (http://www.nsf.gov/statistics/seind06/). The administrative costs associated with human and animal subject experiments make the average indirect administrative costs associated with NIH funding significantly greater than those associated with research funded by the other agencies. In addition, the Institutional Review Boards associated with human subject research require a great deal of faculty time for which they are not, for the most part, compensated. While it is important to have faculty input on these boards, participation takes the faculty away from direct participation in their research. The $10B appropriation for NIH contained in the American Recovery and Reinvestment Act of 2009 will only exacerbate this situation.

It is important to understand the financial burdens placed on universities by federal reimbursement and cost-sharing policies. According to Indicators 2008, university expenditures on R&D rose from $3B to $9B between 1990 and 2006. Approximately one-half of this is for unreimbursed costs and cost sharing. This amounts to something like an increase from $0.5K to $1.5K per research university student over that period for these costs. This increase is shocking, given the heat that Congress has thrown at public universities for average tuition increases from less than $3000 per year in the early 90s to approximately $6000 per year presently. The increase is of great concern because it is limiting access of those in the lower economic strata to the public institutions, and thus limiting the traditional American dream. It would be much wiser for the government to fully fund the research it supports, so that universities have the $9B for educational expenses like financial aid.

I believe that a comprehensive review of the validity of both university and governmental policies is in order. In particular, universities should make sure that they are meeting federal requirements in an efficient manner. For example, they should ensure that Institutional Review Boards are using exemptions effectively and appropriately. Too often, universities err on the side of conservativism, wasting considerable faculty time in reviews of human subject protocols that should have been exempted.

Similarly, the federal government should review the regulations that apply to universities. It should ensure that regulations associated with export control, ITAR, and controlled substances are appropriate for the university environment.

The big issues, however, relate to OMB Circular A-21 and indirect cost reimbursement. Here, several options are open. The first, which OMB probably would prefer, is to maintain the status quo. While that will make life easy for OMB, it will not deal with the general consequences of unreimbursed indirect costs and cost-sharing, nor will it ease the administrative burdens that faculty face.

As discussed above, some of the most expensive compliance items that universities face are the human and animal subjects review processes. A relatively simple fix for this is to allow universities to charge a fee for these services. Such fees are already in place for human subjects studies funded by nongovernmental agencies like pharmaceutical companies. It would be particularly painless to implement during the next two years, when NIH's ARRA funding is so appreciable.

The most appropriate way of dealing with the true increases in university administrative burdens resulting from federally-funded research would be to lift the cap on administrative cost reimbursement. In this regard it should be noted that other nonprofit and for-profit institutions do not face such a limitation on indirect cost reimbursement. Instead, they receive full cost recovery. The same principle should apply to universities. Whenever detailed studies have been performed, university indirect cost rates are less than or equal to those in the other sectors. There is no justification in singling out universities for this differential treatment.

While this solution would address the financial problems that universities face due to unreimbursed indirect costs, it would not necessarily ease the burdens of the faculty. One can count on government auditors to attempt to keep the indirect cost rate as low as they can achieve. Indeed, it is rare that a university negotiates with the Department of Health and Human Services the indirect cost rate that an objective reading of OMB Circular A-21 would imply. As a consequence, it is quite unlikely that lifting the cap will lead to a significant increase in direct and local administrative support for faculty. Given past history, it is also likely that some faculty will protest strongly to Congress should there be a move to lift the cap. In response to that, Congress may not react completely rationally and with a broad perspective.

Still another approach would be to eliminate the prohibition in OMB Circular A-21 on the direct charging of administrative support for faculty. I believe that this, coupled with the above-mentioned fee for human and animal subject review, is the politically most feasible approach. It places the decision as to whether the funding of administrative assistants is appropriate and desirable in the hands of the faculty member and the agency program officer. These are the people most capable of making that decision.

The one objection that has been voiced to this approach is that universities are likely to decrease the administrative support that they provide via indirect cost reimbursement if the faculty can fund that support directly. My own sense is that this concern is irrelevant in the present climate. The severe economic situations in which most universities find themselves, coupled with the less-than-full indirect cost recovery, will necessarily lead to such cutbacks. Unless direct charging is allowed, the 42% figure discussed above will only increase. The nation will lose the research time of the faculty that it has selected through careful peer review processes to lead the nation's basic and long-term applied research.

I cannot close without noting that discussions of indirect cost rates are painful for faculty. We all want to maximize the funds that we have available for use in the laboratory. As principal investigator for the Stanford Synchrotron Radiation Laboratory (SSRL), I was one of the two or three largest single "payers" of indirect costs for many years. Throughout those years, SSRL was constantly short of staff. A 1% increase in the indirect cost rate typically meant a decrease by one of the number of SSRL staff, which we could ill afford. Hence, I was, and remain, very sensitive to that rate. Yet, I believe, for the reasons discussed above, that the government should provide full reimbursement for both the direct and indirect costs of research and also ensure that faculty research time is used effectively. Thus, I urge faculty to support both a lifting of the administrative cost reimbursement rate cap and the direct charging of relevant administrative support. At the same time, they should ensure that faculty representatives can provide reasoned oversight of their universities' indirect cost rate proposals. If faculty do support these measures, they will become politically viable.

Arthur Bienenstock is the Special Assistant to the President for Federal Research Policy and Director, Wallenberg Research Link, at Stanford University. He served as APS President in 2008.

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