APS NEWS

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

August/September 2010
Volume 19, No. 8
www.aps.org/publications/apsnews

How to Get More Physics Majors
Page 8

APS Joins the Crowd at Comic-Con

Photo by Michael Lucibella

This July the APS outreach team was given the opportunity to show off their hit comics at the world's largest comic book convention, Comic-Con International. The 5-day convention in San Diego attracted over 125,000 attendees dressed in many exciting costumes including several decked out as Nikola Tesla. APS participation was featured in both *Wired's* "geek dad" blog and the photo section of IMDB. The APS comics, two about laser super hero "Spectra" and one about the life of Nikola Tesla, were widely distributed and universally enjoyed. APS put more than a ton and a half of comics in the hands of these excited comic book enthusiasts, some of whom can be seen in the photo thronging around APS Outreach Specialist Chris Discenza (center, with the fake mustache), while Spectra's nemesis Miss Alignment looks on balefully at right. The event was so successful in connecting with a previously untapped audience that the APS team plans to exhibit at Comic-Con again next year. More information about the comic books, including online copies, is at the APS outreach website PhysicsCentral, www.physicscentral.com.

Congressional Letter Backs APS Bid to Curb Proliferation

Members of Congress have joined the American Physical Society in calling for tighter protection of isotope refinement technology to prevent nuclear proliferation. In an open letter addressed to the chairman of the Nuclear Regulatory Commission, a bipartisan collection of six House members called for the commission to carry out nuclear proliferation assessments for any company seeking to license nuclear technology to prevent its further spread. The letter was sent at the same time that APS is petitioning the NRC for the same types of changes.

Currently the NRC conducts nonproliferation assessments for any foreign company licensing American nuclear refinement technology, while United States companies are not subject to such a review. The congressional letter and APS are both calling for the NRC to complete nonproliferation assessments for domestic companies as well.

"We believe that the Nuclear Regulatory Commission (NRC) should take all appropriate actions to ensure that the nuclear technologies they license are not diverted to uses that could threaten the security interest of the United States," the letter reads, "We are writing to express our support for

LETTER continued on page 6

APS Impacts Prisoner Release

By Michael Lucibella

An important but under-reported aspect of the dramatic prisoner transfer between the United States and Russia in early July is the plight of Igor Sutyagin, an arms control researcher from Moscow. First imprisoned over a decade ago by the Russian security forces on trumped-up espionage charges, Sutyagin had been the focus of an international effort to protect the human rights of scientists across the globe. The APS Committee on the International Freedom of Scientists (CIFS) has been trying to free him since his arrest in 1999.

The fight for human rights of scientists is a cause as old as Galileo. In repressive societies around the world even today, scientists face intimidation and imprisonment because of their political views or research focus. CIFS is marking its thirtieth anniversary this year. Notwithstanding the high profile circumstances surrounding Sutyagin's release, his case in many ways exemplifies the kind of work that CIFS does to protect the welfare of scientists.

"This is probably a little more dramatic, but in many ways it's typical in that things sometimes take forever," said Michelle Irwin, the international programs administrator for APS.

Despite being a part of the so-called "spy swap" with Russia, Sutyagin was no secret agent. With a background in physics, Sutyagin researched Russian military technology and policy and worked for the prestigious USA and Canada Institute. In 1999 Russian security forces arrested him in Moscow and charged him with colluding with foreign powers. Sutyagin had done work for a British "think tank" that the Russian security forces claimed had ties with foreign intelligence

RELEASE continued on page 7

Program to Aid Minority Transition to Grad School

By Gabriel Popkin and Sara Webb

Photo by Ken Cole

Yesim Darici of Florida International University (left) and JD Garcia of the University of Arizona do their homework during the Minority Bridge workshop.

For three days this summer, APS brought together a group of university faculty, students, and administrators to address the low participation of minorities in physics graduate programs. The workshop was the culmination of the first year of the Minority Bridge Program (MBP), which aims to increase the number of underrepresented minority physics majors making the transition to graduate school. Currently, only five to six percent of physics PhDs granted to US citizens are awarded to these minority students.

The goal of the MBP is to develop "bridge programs" that facilitate the transition to graduate school for physics students from underrepresented minority groups. During its first year, project manager Michelle Iacoletti conducted site visits to minority serving institutions and held meetings with doctoral granting institutions to learn about the issues involved, and recruit participants. Project director Theodore Hodapp, who is Director of Education and Diversity at APS, says, "the Minority Bridge Program is a major initiative aimed at closing the gap between undergraduate and graduate programs for minority students, and providing the next generation of mentors."

Fifteen faculty members from minority serving institutions and 15 faculty from doctoral granting institutions attended the workshop, along with undergraduate and graduate students, members of the MBP Steering Committee, National Science Foundation pro-

MINORITY continued on page 7

New APS Policies Enhance Access to Journals

In July, the editors of the APS journals *Physical Review Letters, Physical Review,* and *Reviews of Modern Physics* announced two major initiatives allowing freer access for the public. One new policy will give all US public libraries free online access to all APS journals. The other ensures that the first experimental results published in the APS journals from the Large Hadron Collider will be made freely available for anyone to access.

The new library policy will let the public freely access all 400,000 journal articles, ranging from current papers to ones first published in 1893. The libraries will not be charged a fee for the service, needing only to accept an online site license and supply a valid IP address for public computers. Users will be able to access the journals only from within the library.

"Public libraries have long played a central role in our country's intellectual life, and we hope that through this initiative they will become an important avenue for the general public to reach our research journals, which until now have been available only through the subscriptions at research institutions that currently cover the significant costs of peer review

POLICIES continued on page 3

Marking Two Decades of Journal Leadership

Photo courtesy of Benjamin Bederson

As reported in the July *APS News*, APS presented a plaque to the Ram's Head Inn on Shelter Island, in recognition of a historic conference that took place there in 1947. Coincidentally, the occasion brought together the three individuals who have provided the leadership for APS journals over the last two decades. In 1990 the journals existed only as paper copies, and individual subscriptions still played an important role. Now the primary medium for both communication and archiving is electronic, and journals are distributed mostly through institutional subscriptions and consortia. Even the editorial process has changed–the handling of manuscripts, including peer review, is almost all done electronically, and the vast files of paper copies have largely vanished. In the picture are Benjamin Bederson (right) who served as editor in chief from 1992 to 1996, Martin Blume (center) who held the position from 1996 to 2006, and the incumbent since 2006, Gene Sprouse (left).

Members in the Media

"I never hit home runs. I just aim for good line drives."

***Robert J. Soulen Jr.**, describing playing softball while suffering from Parkinson's disease,* The Washington Post*, June 29, 2010.*

"We once led the world in the development of nuclear power. We lead no more. We once led in the development of solar cells. We lead no more. We once led in the development of wind energy. We lead no more. Our present course will likely lead to the U.S. being one of the world's biggest consumers of advanced energy systems rather than one of its major producers,"

***Burton Richter,** SLAC, on the need to spur development in clean energy technologies,* NewYorkTimes.com*, June 28, 2010.*

"[I]t would be quite revolutionary. It would mean that we know a lot less than we thought we knew…If it is a fundamental problem, we don't know what the consequences are yet,"

***Peter J. Mohr**, NIST, on research by an international team of physicists that found a 4 percent discrepancy between the predicted and measured radius of a proton,* The Los Angeles Times*, July 7, 2010.*

"These folks have been working on this experiment a very long time, and they expected to measure a number which was in agreement with previous measurements, the proton size. And instead, they were very surprised to find strong disagreement,"

***Brian Odom,** Northwestern University,* NPR*, July 16, 2010.*

"I just consider it my equivalent of ... vegging out in front of the TV,"

***Steven Chu**, Department of Energy, on writing scientific papers as a way to relax,* The Associated Press*, July 7, 2010.*

"It's been a remarkable mission of discovery…It's just wonderful that the Voyagers are still revealing things from so far away that before now we really couldn't know existed,"

***Edward C. Stone**, Caltech,* The San Francisco Chronicle*, July 6, 2010.*

"Accordingly, our own universe may be the interior of a black hole existing in another universe,"

***Nikodem Poplawski**, University of Indiana,* USA Today*, July 14, 2010.*

"What Josh has done is create a system that is absolutely secure, where you can be sure based on the most well understood laws of physics that no one has intercepted the message,"

***William Phillips**, NIST, on researcher Joshua Bienfang's advancement in quantum cryptography,* The Washington Post*, July 12, 2010.*

"Some people have said it can't be right, others that it's right and we already knew it–that it's right and profound, right and trivial… What you have to say is that it has inspired a lot of interesting discussions. It's just a very interesting collection of ideas that touch on things we most profoundly do not understand about our universe. That's why I liked it."

***Andrew Strominger,** Harvard, on researcher Erik Verlinde's paper stating gravity is a product of thermodynamics,* The New York Times*, July 12, 2010*

"We could be entering the final chapter in this tragedy. For the first time in 87 days we actually have a hold on what to do and perhaps maybe able to choke and cap this leak. It is a light at the end of the tunnel. … Look at the big picture–for the first time we know what we're doing. We were floundering for almost three months because it's a science experiment in action,"

***Michio Kaku,** CCNY, on the cap placed on top of the leaking oil pipe in the Gulf,* CNN*, July 15, 2010.*

"It's nature's weapon of mass reproduction,"

***Dwight L. Whitaker**, Pomona College, on how sphagnum launches its spores at high speeds,* The New York Times*, July 26, 2010.*

"If we are going to build an ambitious machine, then it's got to be a global machine,"

***Barry Barish**, Caltech, on the proposed International Linear Collider,* MSNBC.com*, July 26, 2010.*

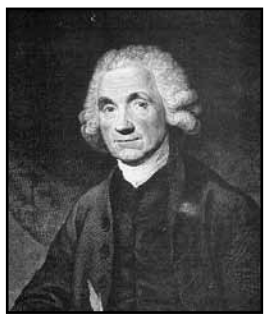
Members continued on page 3

This Month in Physics History

August 1774: Priestley isolates a new "air," leading to discovery of oxygen

Born in 1733 in a small town near Leeds, Joseph Priestley was the eldest of six children born to Jonas Priestley, a "dresser and finisher of cloth," and Mary, the daughter of a local farmer. His mother died when he was nine, and he was adopted by his father's sister, where he was exposed to the theological and political discussions of "Dissenters," a group of believers who did not strictly adhere to the doctrines of the official Church of England, and were often discriminated against for their unorthodox beliefs.

Priestley attended local schools, but a bout with tuberculosis in his teenaged years forced him to drop out. He had learned Greek, Latin, and a bit of Hebrew, and taught himself French, Italian, German, Chaldean, Syrian, and Arabic, as well as the basics of geometry and algebra. Once recovered, he enrolled at Daventry Academy with the aim of becoming a minister, and it was here he first became interested in natural and experimental philosophy.



He became a minister, nonetheless, despite alienating some members of his first rural congregation in Needham Market, Suffolk, with his strong Unitarian leanings. He was much happier in his second post at Nantwich, Cheshire, where he helped establish a school.

In 1761, he was transferred to Warrington to become a tutor of modern languages and rhetoric at the local Dissenting Academy. This was an excellent environment for Priestley's growing interest in scientific experimentation. During a trip to London, he met Benjamin Franklin, who encouraged him to investigate electricity. Priestley soon found himself designing his own experiments. He published *A History and Present State of Electricity*, and was elected a fellow of the Royal Society.

We owe the artificial carbonation process to Priestley. In 1767, Priestley was living next to a brewery in Leeds and started experimenting with the brewery gas using candles and burning pieces of wood. In one such experiment, he placed a bowl of water above the surface of a liquor in the process of fermenting, and found it quickly took on a sweetly acidic taste akin to the famed mineral water of Niederseltsers. The result was the 1772 publication of *Impregnating Water with Fixed Air*.

Priestley was working at a time when most scientists still adhered to the principles of Aristotle–namely, that there was only one kind of "air." This was an era dominated by the "phlogiston theory," in which it was believed that burning or oxidizing a given substance corresponded to the release of another material substance. It was used to explain things like combustion, smelting, calcination, and similar chemical processes.

In an experiment conducted on August 1, 1774, Priestley focused sunlight through a lens, thereby heating a sample of mercuric oxide using a pneumatic trough, resulting in a gas that allowed a candle to burn brightly, and also enabled a mouse to live for a long period while under glass. "I have discovered an air five or six times as good as common air," he wrote. Over the next 12 years, he compiled *Experiments and Observations on Different Kinds of Air*, replacing Aristotle's outdated theory of four elements with his own variation of phlogiston theory. He called his discovery "dephlogisticated air."

While traveling in Paris later that year, Priestley met Antoine Lavoisier and replicated his experiment for the French chemist. It was Lavoisier who determined that Priestley had discovered purified air ("without alteration"), an observation that led to the eventual abandonment of phlogiston theory by the scientific community. The new chemistry embraced the concepts of elements and compounds, and the notion of conservation of mass.

Priestley rejected the Lavoisier school of thought, including conservation of mass. Even though he successfully isolated carbon monoxide, he never realized it was a different kind of "air." French naturalist George Cuvier, writing in the 19th century, lamented Priestley's uncharacteristic stubbornness in clinging to the phlogiston theory, describing him as "the father of modern chemistry [who] never acknowledged his daughter."

Priestley's religious convictions cost him dearly, both personally and professionally. While serving as a minister in Birmingham, he earned considerable public enmity for some of his pamphlets, particularly those attacking the doctrine of the Holy Trinity. He was branded an agent of the devil and denounced in the House of Commons. On July 14, 1791, a drunken mob sacked and burned both Dissenting meeting houses. Warned that a mob was after him, Priestley fled "with nothing more than the clothes we happened to have on." His house burned to the ground, destroying his laboratory and many unpublished manuscripts.

The hostility followed them to London. Poor Priestley was burned in effigy, once again denounced in the House of Commons, as well as from Church of England pulpits, and was even forced by scientific colleagues to resign his membership in the Royal Society.

Priestley emigrated to America with his family in 1794, when he was 61. He was offered a chair in chemistry at the University of Pennsylvania, but opted instead to settle 150 miles north, in the town of Northumberland. He continued his experiments, but found himself spending winters in Philadelphia to stave off the isolation.

Unfortunately, Priestley's physical health wasn't as robust as his mind. He nearly died in 1801 during a trip to Philadelphia, and never fully recovered. By February 1804, he could no longer shave or dress himself, and was bedridden. After bidding farewell to his children, he reviewed some unfinished manuscripts, finally nodding and saying, "That is right. I have now done." He died 30 minutes later.

In 1833, on the 100th anniversary of Priestley's birth, Michael Faraday praised his forebear's "freedom of mind" and "independence of dogma and of preconceived notions, by which men are so often bowed down and carried forward from fallacy to fallacy." Faraday exhorted his listeners to follow Priestley's example, fostering "a mind which could be easily moved from what it had held to the reception of new thoughts and notions."

Further Reading:

Holt, A. *A Life of Joseph Priestley*. London, England: Oxford University Press, 1931.

Priestley, Joseph. *Autobiography of Joseph Priestley*. Cranbury, NJ: Associated University Presses, 1970.

Rhees, D.J. *Joseph Priestley, Enlightened Chemist*. American Chemical Society, Center for History of Chemistry, Publication No. 1, 1983.

APS NEWS

Series II, Vol. 19, No. 8
August/September 2010

Coden: ANWSEN ISSN: 1058-8132

Editor . . . . . **Alan Chodos**
Staff Science Writer . . . . . **Michael Lucibella**
Art Director and Special Publications Manager. . . . . . **Kerry G. Johnson**
Design and Production. . . . . . **Nancy Bennett-Karasik**
Proofreader. . . . . . **Edward Lee**

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.

Subscriptions: APS News is an on-membership publication delivered by Periodical Mail. Members residing abroad may receive airfreight delivery for a fee of $15. Nonmembers: Subscription rates are available at http://librarians.aps.org/institutional.html.

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.

Education Corner

A column on educational programs and publications

PhysTEC Request for Proposals Coming Soon

The Physics Teacher Education Coalition (PhysTEC) project is planning to release a request for proposals for new sites to develop model physics teacher preparation programs, beginning in the 2011-2012 academic year. Proposals are solicited for two types of sites:

Comprehensive sites, which will receive up to $100k per year for three years. These sites will implement the full PhysTEC program.

Focused sites, which will receive up to $25k per year for three years to implement specific elements of teacher preparation programs.

Institutions wishing to apply must submit a pre-proposal by November 1. More details will be posted on www.PhysTEC.org by late September. Minority-serving institutions are strongly encouraged to apply.

Minority Speaker Travel Grants

APS offers travel grants for institutions that wish to host a minority physicist colloquium speaker. The program provides a reimbursement of up to $500 to colleges and universities for the travel expenses of one minority colloquium speaker per academic year. Eligibility extends to physics departments of American colleges and universities; Canadian and Mexican colleges and universities are also eligible to apply, provided that the speakers they invite are currently employed by U.S. institutions. Funding for the program is limited, and institutions are encouraged to apply early in the academic year, even if the speaker is not scheduled until the spring semester. For more information, see www.aps.org/programs/minorities/speakers

Introducing new Education & Diversity Staff

Deanna Ratnikova has joined APS as the Women and Education Programs Administrator, replacing Sue Otwell, who retired in June. Ratnikova is helping administer many of the department's initiatives, including the Blewett Scholarship, professional skills development workshops, and various committee meetings. She has degrees in chemistry and public affairs, and experience in organizational planning and social marketing.

Sara Webb has joined APS as the Education and Diversity Projects Coordinator. Webb is primarily assisting the department's two largest projects: PhysTEC and the Minority Bridge Program. Webb has a degree in math and significant experience in a variety of roles, including teaching, volunteer management, and web design.

Noyce Scholarship Video Released

The PhysTEC project has produced a video introduction to the NSF's Robert Noyce Teacher Scholarship, as told by two Noyce Scholars and a Noyce Program Coordinator. This two-minute video highlights some of benefits of the scholarship, which is intended for science, math, and engineering majors who want to become teachers. The video is intended to be screened in university classrooms, department open houses, scholarship information sessions, or other places where potential future teachers meet. It can be viewed and downloaded at www.PhysTEC.org/video.

PhysTEC Learning Assistant Workshop

The PhysTEC project is sponsoring a workshop focusing on the University of Colorado's Learning Assistant program. The Learning Assistant program is a highly supported peer teaching experience that has been shown to improve students' learning and attitudes toward science in undergraduate lecture classes and recruit talented science and math students into teaching careers. The workshop will take place on October 13 and 14; housing and on-site meals will be provided. For more information, see www.PTEC.org/conferences/CULA10.

POLICIES continued from page 1

and online publication," said APS treasurer and publisher Joe Serene.

"The Public Library program is entirely consistent with the APS objective to advance and diffuse the knowledge of physics," said APS editor in chief Gene Sprouse. "Our goal is to provide access to everyone who wants and needs our journals, and this shift in policy represents the first of several steps the APS is taking towards that goal."

The other new policy allows free access to the first experimental papers from the LHC. The journal articles will be available to anyone under a Creative Commons Attribution 3.0 license and will apply to any experimental LHC papers coming out of CERN in 2010.

The decision was made in acknowledgment of the fundamental significance of, and broad interest in, the work being done at this international facility. In addition, CERN has been urging an open access policy for papers coming from the collider.

"The successful operation of the LHC is a huge milestone for physics and worthy of a celebration, so APS has made the articles open access to celebrate the great achievement of the LHC," said Sprouse.

"I'm glad we're doing this," said Serene, "so that everyone who is interested can see the early results from the LHC."

Creative Commons is a nonprofit corporation that provides free licensing agreements to content authors, artists and other content providers. The Creative Commons Attribution 3.0 license gives anyone the right to freely access, distribute and adapt the papers as long as that the original work including author and publication is properly credited.

The APS has historically been a leader in the publishing field for providing open access to its published articles. *Physical Review Special Topics-Accelerators and Beams* was first published in 1998 as an online-only open access journal. The journal *Physical Review Special Topics-Physics Education Research* is likewise an open access online journal. In addition papers that appear in other APS journals can be open access if an author or organization buys the rights. These CERN papers are the first to use a Creative Commons license. In the past, APS has made select papers open access as well, including Nobel Prize-winning papers and ones of historical importance.

Currently the editors and publishers are working to implement new open access options for all the journals.

MEMBERS continued from page 2

"I think the agency prefers, and those of us who serve to advise the agency prefer, that NASA have a role in defining the science and mission requirements, and not serving as just a trucking service,"

***Jack Burns**, University of Colorado Boulder,* The Boston Globe*, August 2, 2010.*

"I don't like cell phones and I don't like writing about cell phones, but the damned issue just won't go away,"

***Robert Park**, University of Maryland, on whether cell phones cause cancer,* Time Magazine*, August 5, 2010.*

Brewing a Life of Worts and Ale

By Alaina G. Levine

I guess physics can be boring sometimes. How many times can you measure the expansion of the Universe? And what's the deal with lasers? We get it–they're coherent light and they help cell phones work and remove facial hair. While most physicists don't mind enduring a *burdened* lifetime of examining nature, there are a few who thirst for more. And if one is opting to choose something other than physics, what's the next best thing? The answer is clear: Beer.

George Stranahan and Anning Smith are both physics-educated professionals who felt there was plenty more barrels of satisfaction to be had in brewing beer, so they went into the business. Smith owns a brew-your-own-beer microbrewery, Shenandoah Brewing Company in Alexandria, VA, in which he and his staff assist customers in mixing and preparing their own beer. Stranahan, based in Colorado, has owned a tavern, brewpub, and brewery, and is currently a partner in another brewpub. Although each took a decidedly different route to become a brewmaster, both have never regretted their decisions. In fact, Stranahan, who took his first swig of beer at the tender age of 12 and adored it, knowingly calls this career choice "intoxicating". "I love it when people say 'I love your beer'," he says.

Photo by Alan Chodos

Anning Smith

The best part of being a brewer, notes Smith, is that "nobody's bummed out about being in a brewery. The people who come here want to be here." His foray into brewing was fomented by a love of science and a desire to be an entrepreneur. As a pupil at tiny Hiram College (where only 1000 students were enrolled) in Hiram, OH, he was thrust into an environment that valued creativity and frugality. The school had "good professors and very little money… I was the only physics student in (my) graduating year," he recalls. "I had the run of the physics lab and if in the middle of the night I felt like it I could go in there and play,…as long as I didn't blow anything up."

After graduation, he pursued an engineering and policy master's degree, specializing in technology and human affairs, at Washington University in St. Louis. When he completed his studies, he accepted a position at the Environmental Protection Agency, where he helped implement the Toxics Release Inventory and the Pollution Prevention Act of 1990.

During his time at the EPA, he began to realize that he wanted to launch his own business. He remained at the EPA for seven years, all the while traveling for pleasure, enjoying global beers that could not be found in the US, and realizing that the "bug" to start a business was biting him. In 1991, when homebrewing was beginning to be a national fad, he and his wife started brewing beers at home. By 1994 they formed the company and only two years later opened the brewery.

Stranahan, on the other hand, got more than just his feet wet in physics, among other endeavors, before he crafted his microbrewery enterprises. With a BS from Caltech and a PhD from the Carnegie Institute of Technology, he labored as a postdoc at Purdue and an associate professor at Michigan State before he left the field. He

ALE continued on page 5

Letters

Memory of Feynman

I was a postdoc at Caltech from 1970-1972 (Chemistry) trying to explore my non-chemistry "side" so I signed up for an art class run by the artist in residence Lukas van Vuuren. It was several weeks into the class before I realized that this "guy" sketching next to me was Richard Feynman. I recall that he was working on a lithograph at the time and even with that more difficult medium he was creating a better image than some of us who were using charcoal and paper.

Alvin Manalaysay
Fenton MO

No Limit to Age of a Graduate Student

The letter from Edgardo Browne in the July 2010 issue of the *APS News* had the headline "World's Oldest Graduate Student?" and contained the statement that "he (Feynman) was over 60 years old, and definitely NOT a graduate student at Princeton, nor anywhere else." This comment, in conjunction with the title, implies that it is not feasible (or perhaps possible) to find a 60 year old graduate student. This is not true. Just to provide a data point contradicting the statement, I was a 60 year old graduate student, as well as a 61 year old graduate student when I received my PhD in Mathematics on May 18, 2008. Furthermore, I expect that there are, or were, graduate students in many institutions older than myself. Perhaps even at Princeton!

John A. Dudek
Milwaukee, WI

What Fizeau Thought He Was Doing

The discussion of Fizeau's experiment on the speed of light in moving water (*APS News*, July 2010) requires some elaboration.

In 1851, when Fizeau performed his experiment, the ether theory held full sway. The experiment was in fact designed to measure the value of the so-called "ether drag" coefficient, the extent to which a moving body drags along the ether within it. The speed of light in a moving medium should be $c' = (c/n) \pm fV$, where c is the velocity of light relative to the ether, V the velocity of the medium relative to the ether, n the index of refraction of the medium, and f the ether drag coefficient (f = 1 for complete drag and f = 0 for no drag.) A theory due to Fresnel predicted the value $f=1-1/n^2$.[1] Fizeau's experimental result, f =0.48, was consistent (within the experimental error) with Fresnel's predicted value f=0.43. Therefore Fizeau believed that he had confirmed Fresnel's theory.

By a remarkable coincidence, the same result $c' = (c/n) \pm V(1 - 1/n^2)$ is obtained (to lowest order in V/c) from special relativity. Notice that, unlike the predicted result of the Michelson-Morley experiment, this effect is of first order in V/c. Einstein cited Fizeau's result and the data on stellar aberration (and not the null result of Michelson-Morley) as the experimental data that had most influenced him in his development of relativity.[2] But Fizeau believed he had confirmed an entirely different theory.

Leo Sartori
Granby, MA

[1].Fresnel postulated that the density of ether within a material substance is proportional to the square of its dielectric constant. Only the "extra" ether is dragged along when the medium is in motion. Fresnel's theory suffers from a serious defect: the dielectric constant of most substances varies with the frequency of the light. This was apparently not pointed out at the time. For additional discussion, see L. Sartori, *Understanding Relativity* (Univ. of California Press, 1996), pp 111-114.

[2].R.S. Shankland, "Conversations with Albert Einstein", *Am J Phys* 31 (1963), pp 47-57.

Empedocles Had the Right Idea

In July's "This Month in Physics History," that recounts the fascinating story of Armand Fizeau and his terrestial determination of the speed of light, it is pointed out that before the 17th century most scientists believed the speed of light to be infinite. An interesting, but obviously fallacious, argument in support of this view can be found in Aristotle who remarked that dawn takes place in the west at the same time as it does in the east, and this can only reasonably interpreted to mean light propagates instantaneously. In contrast, about a century before Aristotle, Empedocles (c493-c433) of Acragas (now Agrigento), a Greek colony in Sicily, maintained that the speed of light was finite. His argument was that everything takes time to travel, and hence light must take time to travel, say, from the sun to the earth. To the best of my knowledge, no one in ancient times actually tried to construct an apparatus to measure the speed of light, although I have often wondered whether a version of Fizeau's (or indeed Foucault's) experiment could have been carried out in Graeco-Roman antiquity, upon recalling the remarkable gearwork of the Antikythera mechanism (c150-100 BC), an astronomical computer that was about 1400 years ahead of its time, as well as the enormous analytical skill and mechanical ingenuity of extraordinary mathematicians such as Archimedes (c287-c212 BC) of Syracuse, another Greek colony in Sicily. Even if no such determination were possible for them, a lower limit to the speed of light might have been obtained, although I know of no historical evidence for this.

Frank R. Tangherlini
San Diego, CA

Only Males Respond

When I wrote my letter suggesting that we perhaps seek substitutes for the word "seminal" (May 2010 issue) in describing important work, I was making a sincere suggestion but at the same time was curious if the response to this issue in the physics community would be similar to that in the education listserv where this topic originated, in which the split was largely (though not exclusively) along gender lines. I could not help but notice that all five letters that *APS News* published (July 2010) that disagreed with me and said the word should be retained had male signatures. Of course, this sample is too small to draw any conclusions but it was interesting nonetheless.

Mano Singham
Cleveland, OH

Ed. Note: *See the accompanying letter by Tarynn M. Witten.*

New Word Solves the Problem

In response to the discussion on whether the word "seminal" is sexist as well as sexual, there are two points to be made, and I would also like to offer a potential solution. First, seminal carries forward the homocentric view of scientific research from a time when males were predominant and considered more important researchers in science. Consequently, it is a sexist term unless one is talking about physiological or related dynamics.

As for seminal being seen as a sexual term, I am not sure that we should necessarily eliminate all such terminology from the dialog in science just because it refers to "sexuality." One need only look at the extensive literature that conflates birth sex with gender. The question "What is your gender?"is incorrect unless you are doing research on gender identity. The correct question is "What is your sex?"

Many individuals incorrectly conflate the word "sex" with sexuality. Consequently, numerous scientific papers, research surveys and discussions misuse gender as an equivalent to birth sex or natal sex in response to the aforementioned difficulty.

I propose the following solution, that I have used for years. When suggesting that a particular piece of research is "seminal" simply replace the word "seminal" with the word "seminovarian." Everyone gets equal play. Of course, we could take up the question of which should go first, but that's another letter to the editor altogether.

Tarynn M. Witten,
Richmond, VA

Economics Underlies Lab Problems

I was pleased to see the June, 2010 article on Los Alamos and Livermore regarding for-fee management and the declining role of science at these institutions. I would like to add economics to your identification of risk aversion as an element undermining excellence and innovation. LANL and LLNL senior managers are motivated to protect the fee and their compensation by first ensuring total compliance with regulations. Compliance is an easier, lower risk job than taking on hard problems.

Combining the aspects of maximizing the fee with a focus on risk aversion and compliance, the tone at the laboratories has definitely changed, and there is less incentive to solve the national security problems of today.

The nation is in effect losing the full engagement of two distinguished FFRDCs. The management structure DOE put into place is wrong for science laboratories and needs to be changed.

Stephen Knox
Fairfax, VA

Academy Study Prelude to Congressional Action

I would like to add just one important detail not mentioned in the otherwise excellent piece of investigative journalism by Michael Lucibella and Alaina G. Levine that appeared in the June issue of *APS News* ("It's a Bumpy Ride to Private Management for Los Alamos, Livermore").

The article does not mention that concerns over the Labs' privatization have also captured the attention of the US Congress. The FY 2010 National Defense Authorization Act, signed into law last Fall, includes language that mandates a National Academy of Sciences (NAS) study of the effects of the contract transition on the Labs' science and national security missions. Congress is unlikely to make any changes without a comprehensive and authoritative investigation of the facts by the NAS. I have no doubt that, assuming the NAS asks the right questions, with diligent pursuit of supportable, documented answers, they will conclude, as many of us at the Labs have already concluded, that Congress must act to de-privatize.

Even with an NAS study, though, change is going to be extremely difficult to achieve. This is because of a broader trend that has been underway in this country for many years now: the corporatization of university science and the de-funding of public education. While state legislatures everywhere are cutting education budgets, public universities are taking more and more money from corporations, much of it directed to individual researchers to do research in support of product development. It has become cheaper for corporations to put their research dollars into university labs than to fund and maintain their own corporate research labs.

This change in the business and funding model for public universities has the longer-term consequence of making undergraduate education more expensive and less accessible, not to mention the adverse effect on basic science. The recent 32% rise in student fees at the University of California–manager of the Labs before the privatization–is just the latest manifestation of this trend. The problem is not unique to California. Almost all states are experiencing the same problem, to greater or lesser degree, but in California there is a growing realization that change is needed, and that change has to be de-privatization and the return of public universities to their original mission of public education and public service.

For this to happen, however, the entire scientific community must take the lead on building public support for change. Nothing less than the integrity of our science–and the future of our nation's economy–is at stake.

Jeff Colvin
Livermore, CA

"Best and Brightest" are not Deceived

Re: The story headlined "It's a bumpy ride to private management for Los Alamos and Livermore" in the June *APS News*: As much as many of us would have far more to say on this subject, I shall restrict myself to one subject only.

One can wrap all kinds of reasonable sounding talk around "the transition" to private management –the plain reality is that Washington simply wants no further innovation or advances in nuclear weapons, while at the same time keeping some fig leaf capability, "just in case." A few thousand top physicists, chemists, computer science people and engineers managed by the top university system in the world just wasn't the right recipe for that. Period. All else is rationalization, as much as the personal repercussions for any of us are brutal.

What astounds me is the continued drivel regarding "the best and the brightest", from personal comments all the way to the 2010 *Nuclear Posture Review*. Be assured, those "best and brightest" have long figured out what the labs have turned into: That people not qualified to be technicians shut you down if they "feel" what you do is "not safe"-your PhD level training and professionalism count for nothing whatsoever. Or that salary and benefits are now "industry average" (ingenious incentive, isn't it?). Or imagine the professional pride of being managed by a concrete outfit, with the latest Associate Director holding no more than a bachelor's degree. And for all that you get to scratch the rust off of some 40 year old warhead once in a while? How can "the best and the brightest" possibly not be attracted by this?

Of course, any director/spokesperson who gets paid well to not have to admit to any problems in public will always assure you just how magnificent it all is. Indeed, to hire new, young people is one solution, because they don't know any better. But "the best and the brightest?" They're not that dumb. In fact if you do manage to deceive one, experience shows they'll leave again quickly enough.

Name Withheld by Request,
Livermore, CA

Letters (continued)

Group Disapproves of Iranian Exception

In an interview with *The New York Times* on April 5, President Obama discussed *The Nuclear Posture Review* and indicated, "The United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Nuclear Non-Proliferation Treaty and in compliance with their non-proliferation obligations," and renounced the development of new nuclear warheads. The Iranian-American Physicists Network Group (IrAP), of which I am president, welcomes President Obama's commitment not to use nuclear weapons against non-nuclear states. However, considering Iran as one of the "outliers", Obama made an exception regarding Iran.

The IrAP Board of Directors has issued a statement, which says, in part: *As physicists, we realize the devastating power of nuclear weapons and believe no human society should face such a horrible punishment. Through their numerous political parties and NGOs, peace movement, woman's organizations, student movements, labor unions and human rights organizations, the Iranian people have condemned the current escalation of hostilities and have strived for Iranian government's compliance with the Nuclear Nonproliferation Treaty. We believe all issues should be resolved by nonviolent means and negotiations. We strongly disapprove the notable exception regarding Iran in* The Nuclear Posture Review *and believe it should be reconsidered. The Iranian people should not endure the constant threat of nuclear annihilation, but deserve a peaceful and secure future.*

Mostafa Hemmati,
Russellville, AR

Fraud Could Be More Common than Thought

With the appearance of David Goodstein's Back Page [*APS News,* June 2010], as well as his recently published book, it is a good time to revisit the subject of scientific fraud. Hendrik Schön is possibly the greatest fraudster in the history of physics, and it is all the more remarkable that this fraud took place only ten years ago and at Bell Telephone Laboratories

This scandal has raised a number of very troubling issues, and it is about time that the physics community started to seriously and openly discuss them.

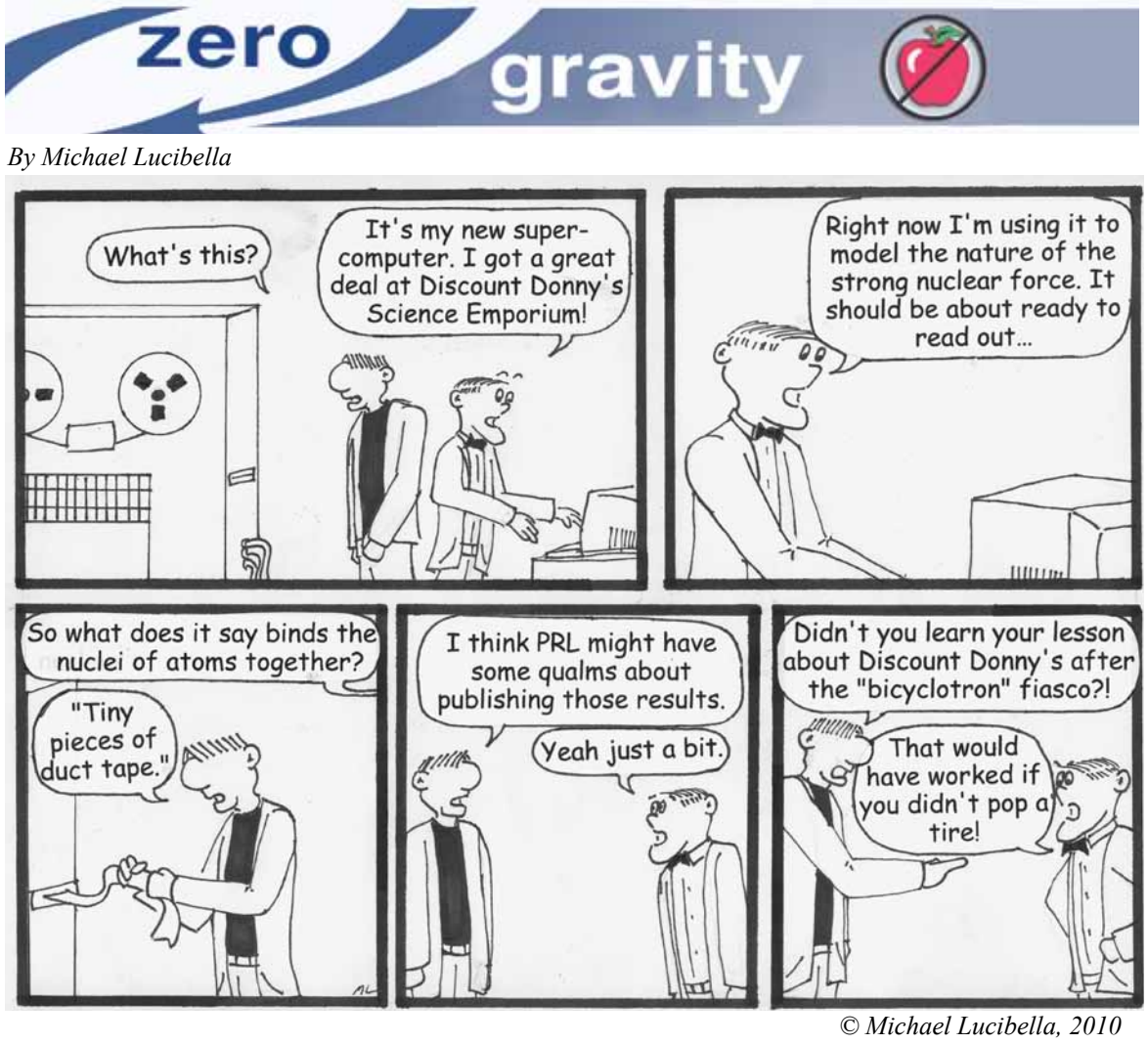
To start, the physics community needs to deal with possibility that fraud is far more common than most of us would like to admit. We need to add to our graduate curriculum a discussion of fraud and ethics in the scientific enterprise. We need to explain to students that science is a human endeavor with both human strengths and human weaknesses. We need to protect and reward whistle blowers and severely punish wrongdoers.

Second, the Schön affair raised the issue of the responsibility of supervisors for the work done by the underlings. I believe we need to hold supervisors to a higher standard of supervision and ethical training that we presently do.

Third, one of the most fundamental tenets of science is the idea that scientific work is reproducible. This tenet was violated numerous times during the Schön affair. The scientific community needs to view nonreproducibility the same way it views the statistically insignificant–namely, a result is only suggestive, until that result is both reproduced by other groups and statistically significant.

Finally, we need to get over our embarrassment of the Schön affair and stop trying to sweep it under the rug. It is by openly and frequently discussing this fraud that we make future frauds less likely.

Bernard J. Feldman
St. Louis, MO



By Michael Lucibella

INSIDE THE BELTWAY

The Passions of Politics

by Michael S. Lubell, APS Director of Public Affairs

Whenever we have a disagreement, Laura will say accusatorily, "You're such a linear thinker."

"I'm a scientist. What do you expect? It's part of my training," I will respond defensively.

"And I'm an artist," she will continue, "so I'm much more intuitive." Then she will add, "You just don't process your emotions. They're there, and you act on them. You just don't want to admit it, so you cover them up with thinking linearly."

It's at that point I usually give up. But the truth is, Laura is right. She invariably is.

We all behave based on our emotions, as Drew Westen, a neuro-psychologist from Emory University, documented several years ago in his book, *The Political Brain*, which I recommended in my December 2007 column as essential reading for anyone interested in communication.

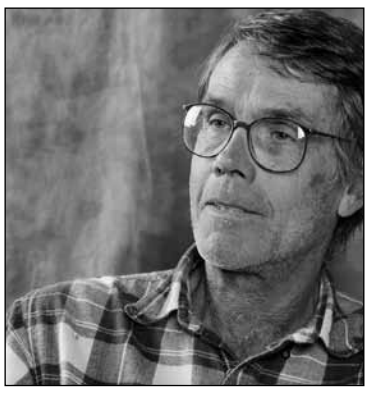
Westen targeted politicians and the minions who surround their campaigns and staff their offices as a key segment of his readership. It's clear why: They live and die based on their effectiveness in packaging their messages to voters.

It may not be a secret, but it's the dirty truth–politicians are just as susceptible to acting on their emotions as the people who vote for or against them. Just how much of today's Republican obstructionist strategy is embedded in emotion and how much is rooted in a rational political calculus is not easy to determine. Both play a role.

The rational calculus is easy to understand. When Barack Obama won the 2008 election and Democrats swept into congressional office, Republicans had two choices. The first was to work with the new president to help pull the country out of its financial economic morass. If policies succeeded, Republicans correctly reasoned, the

PASSIONS continued on page 6

ALE continued from page 3



George Stranahan

also was an award-winning cattleman and restaurant-owner. But his physics legacy will always be that he co-founded the Aspen Center for Physics.

In 1961, while still at Carnegie, he proposed the following argument: "I am a theorist…I don't need to be in Pittsburgh." Stranahan had spent a few weeks in Aspen before, and loved it so much he wanted to live there. And he realized "you don't do physics alone with a pad and pencil. You do physics at a blackboard–it's a social experiment." He and Michael Cohen of the University of Pennsylvania suggested the creation of a new research center for theoretical physics to the executive director of the Aspen Institute for Humanistic Studies. The goal was a place where theorists could come in the summers to take part in that "social experiment" and discuss physics in an unstructured and relaxed environment. The Aspen Institute agreed to support the novel scheme, and by 1962 the first group of physicists arrived at the mountain community to talk shop.

Despite this grand contribution to physics, Stranahan doesn't consider himself a physicist, although his comrades would question otherwise. "I'm a beer- and whisky-maker and a farmer," he admits, "but my friends say you can't wash it out. It's a Lady Macbeth thing." It's a good thing, though, because he still gets free coffee at the Aspen Center where he occasionally goes to gab with his buddies.

Stranahan's career took many other turns before it dipped into beer. After relocating to Aspen permanently, he ran a farm and raised cattle. He published a magazine. He ran a Central American restaurant. In later years, he became a photographer. In 1980, he founded Woody Creek Tavern, which became a popular watering hole in the region. And in the 1990s, he and a partner launched Flying Dog Brewpub. The unusual moniker came from a mountaineering expedition he did to Pakistan in the early 1980s. Stranahan was at the Base Camp of K2 when he realized "we had run out of alcohol," he recalls. When they finally got back to their hotel in the village, "we were thirsty and in one of our rooms was a painting of a bird-dog flying through the air–a ridiculous painting."

He adopted what he felt was the attitude that trip embodied–one of danger and "purposeful irreverence," and Flying Dog Brewpub was born. Later, he launched Flying Dog Brewery. The company had distribution deals and won many awards for their beer. It has been very important to Stranahan for people to enjoy his beer, and not just for its taste. "I want them to have the Flying Dog experience… We push the envelope with the taste curves…we're not in the middle–it's quite political–we're trying to express civil disobedience (with the labeling)."

He views the beer bottle labels as art rather than marketing, although he acknowledges the importance of marketing in telling stories and selling product. "If ever there was a physicist who loved marketing, it was Feynman," he opines. "He loved creating stories and telling myth and the Flying Dog is a myth."

Stranahan and Smith both see parallels and connections between physics and brewing. "Brewing is a nice combination of art and science," remarks Smith. The scientific aspect is apparent in the biological process of fermentation, he says, and even in the technological requirements of a clean environment. But it is not all science. A trained eye and an appreciation for unknown variables in brewing are needed to produce excellent beer. But this is where physics know-how comes in especially handy.

"Science is a kind of an attitude to understand things more deeply, a search–as intense as an ache," explains Stranahan. "Making the beer and searching for the myth and creating the marketing,…I'm driven by finding answers. It's very similar. I feel good doing this."

Alaina G. Levine is a science writer and President of Quantum Success Solutions, a leadership and professional development consulting enterprise. She can be contacted through www.alainalevine.com.

LaserFest On Display at Boy Scout Jamboree

Photo by Michael Lucibella

Boy Scouts at this year's Jamboree in Virginia in late July wait in line to earn their merit badge at the engineering tent, co-sponsored in part by APS and SPIE as part of LaserFest. The activities included learning how lasers work and where they're used.

LETTER continued from page 1

including a nonproliferation assessment as part of the process for evaluating license applications.

The APS petition goes further and contains specific recommendations for changes to regulatory language. It states also that "Carrying out nonproliferation assessments as part of the NRC licensing process is consistent with the Strategic Plan's intent to assure US and international counterparts that proliferation is being appropriately considered and controlled."

The congressional letter does not reference the APS petition specifically, but does cite the Society's recent *Technical Steps to Support Nuclear Arsenal Downsizing* report.

Proponents for these assessments are concerned that individuals working within the companies might act irresponsibly and transfer the technology to foreign nations. The assessments would pinpoint potential security risks within a company applying for a refinement license.

"You may think you don't proliferate but there may be someone on your staff who does," said Francis Slakey, associate director of public affairs for APS, "The problem is that [the companies] don't proliferate, but in the case of Urenco, A.Q. Kahn did," referring to the Pakistani scientist who stole nuclear secrets from a Netherlands uranium enrichment facility and sold them on the black market. Khan is referenced in the congressional letter sent to the Chairman of the NRC.

The concern about proliferation was prompted in part also by a new refinement technology that has recently been perfected. As *APS News* reported in June, the Separation of Isotopes by Laser Excitation, or SILEX, is making opponents of nuclear proliferation nervous because of how difficult it would be to detect. The technology uses lasers to excite atoms of uranium-235, and requires less energy and space than conventional methods of refinement, making it easier to conceal. The fear is that a country or other entity could get hold of the technology and create weapons-grade uranium in secret.

The commission did not have a prepared response to the congressional letter by press time. However past responses to similar requests indicate that the NRC is hesitant to take on the additional task of conducting nonproliferation assessments for US companies.

Responding to a request earlier this year by the organization Friends of the Earth for a nonproliferation assessment of SILEX technology, the commission said that, "[t]he NRC considers a nuclear nonproliferation impact assessment to be outside the scope of the agency's statutory responsibilities." The response said also that existing licensing requirements for the handling of classified information, nuclear material accountability, and the protection of the physical technology accomplish the same goals that a nonproliferation assessment would.

Richard Meserve, current president of the Carnegie Institution for Science and former chairman of the NRC said that he felt that nonproliferation assessments fell within the NRC's responsibilities and that the commission will respond positively to being asked directly by Congress.

"I'm a little surprised at that," Meserve said when asked about the NRC's past reticence to conduct nonproliferation assessments on domestic companies, "I think that people [in the NRC] are legitimately worried about the proliferation issues associated with nuclear technologies."

The bipartisan letter was signed by four Democrats, John Spratt of South Carolina, Andre Carson of Indiana, Bill Foster of Illinois and Adam Schiff of California, as well as two Republicans, Jeff Fortenberry of Nebraska and Doug Lamborn of Colorado.

"For years, there has been a broad consensus that a terrorist attack with a nuclear weapon is the gravest threat facing our nation," said Schiff, "Given the evolution of nuclear technology, it is critical that the Nuclear Regulatory Commission includes a nonproliferation assessment as part of the process for evaluating license applications. Doing so could provide an additional and perhaps crucial layer of protection against the proliferation of nuclear technologies that could be diverted and used against the US."

Fortenberry echoed these sentiments, "A. Q. Khan's clandestine proliferation networks taught us that we can never be too careful. The possibility that, despite the best of intentions, this very secretive and sensitive technology could leak internationally and be ramped up to produce weapons-grade material should prompt the Nuclear Regulatory Commission to robustly fulfill its original mandate by assessing nuclear proliferation risks as part of evaluating license applications."

Members of Congress have been working with the NRC looking at ways for the commission to include nonproliferation assessments. Legislation has been one method discussed though it is unclear at press time when or if such legislation may be introduced.

PASSIONS continued from page 5

president would get the credit. If policies failed, they would all share the blame. It was a lose-lose choice.

The second option was opposing the president whenever possible. If his policies failed, the president would get the blame, and Republicans would smell better than Washington's cherry blossoms in the spring. If the president's policies succeeded, he would get the credit, and the Republican naysayers would be no worse off than if they had worked with him.

The rational political calculus dictated a course of resistance. The question was whether it should be one of loyal opposition or adversarial obstructionism. It was at this juncture that emotion entered the picture. Its essence was captured by the four words, "I hope he fails," which Rush Limbaugh, conservative radio shock jock, uttered four days before Obama took his oath of office on the steps of the Capitol.

Before scrolling forward to the present, I need to emphasize that the left is as culpable as the right when it comes to succumbing to emotions. Here are two instances that I recall from my past.

In 1969, Vietnam dominated American political discourse, and TV network news bombarded viewers every night with the latest pictures of flag-draped coffins as they streamed into the military mortuary at the Dover Air Force Base by the hundreds. Yet, as shocking as those images were, I remember that many antiwar protesters on the Yale campus–my roommate among them–privately yearned for increased body bag counts, since they believed that more killing would more quickly spur an American withdrawal.

More than a decade later, in 1982, Ronald Reagan was in the first term of his presidency, and the nation was mired in recession. I knew many Democrats in Connecticut at that time who harbored the hope the economy would get so bad and unemployment would rise so much that voters would turn Reagan out of the White House in 1984.

In both instances, an emotional craving for ideological victory trumped any temptation to seek solutions and accommodation. Today, the emotional shoes are on Republican feet. And as the prospect of retaking control of Congress looms larger, GOP emotions are heading into overdrive–understandably so.

You don't have to look very hard to see that passion has pushed aside rationality as justification for opposition. There is simply no other way to reconcile two apparently conflicting positions Republican leaders took this June. In the Senate, they held up passage of a bill to extend unemployment benefits, demanding that the $33 billion cost be offset with reductions to other federal programs.

At the same time, they pressed for extension of the 2001 and 2003 Bush tax cuts but, in this case, without any offsets–even though the original legislation deliberately sunsetted the reductions at the end of 2010. [As an aside, I agree with continuing the tax cuts, at least so long as the economy is continuing to sputter and small business has difficulty raising revenue.] Both extensions–unemployment benefits and tax cuts –inject money into the economy and rationally should be considered on the same footing. That Republicans have chosen not to accord them parity speaks to the emotional role obstructionism has taken on.

However you characterize it, the GOP strategy seems to be paying dividends. As I write this column, it appears quite possible Democrats will lose control of the House in November and, not entirely impossible, the Senate as well.

And as for scientists, since we are linear thinkers and not prone to emotion, we simply don't fit into the passions of political practice–or do we?

US Earns Five Medals at Physics Olympiad

The traveling team representing the United States at this year's International Physics Olympiad tied with South Korea for 11th place overall. The US team took home one gold, two silver, and two bronze medals from the competition. Senior Dan Li from Alexandria, Virginia placed fourth overall, one of the highest ranks a US individual team member has earned in the last decade.

The Olympiad is an annual international competition for high school students, who vie for the gold by solving complicated physics problems. This year's competition, held in Zagreb, Croatia from July 17th to the 25th, featured over 400 students representing more than 80 nations.

China, Taiwan, and Thailand tied for first with five gold medals each. Each student is graded individually with gold medals awarded to students with total scores from the five tests in the top 8 percent, silver to students in the top 25 percent and bronze to those in the top half. Team rankings are determined by the number of medals the individuals earn on the team.

The team's standing was somewhat lower than the United States has typically placed in the last decade. Head coach Paul Stanley of Beloit University said this was largely because the style of questions asked was a departure from previous years.

"In the past decade the exams have grown toward a more cookbook approach, guiding the competitors along a path with small bite-sized questions that facilitated grading of exams at the possible expense of creative solutions," Stanley said, "This year, the 'chunks' were large; students were given information and then asked to assemble it with many possible approaches. In some cases, this made the questions much harder, but it rewarded those with an ability to synthesize."

Photo courtesy of Paul Stanley

Senior coaches Paul Stanley (left) and Warren Turner (right) flank US traveling team members David Field, Daniel Li, Anand Oza, Jenny Lu, and Eric Spieglan.

In addition some of the theoretical questions featured material drawn from outside the syllabus. The diverse questions asked the students to use Bernoulli's principle to design a solar chimney, model the nucleus of an atom, and to determine the charge of a metallic object in an electric field. The two experimental questions had the participants find the equilibrium positions between bar and donut magnets and to measure the bending rigidity of different materials.

Despite the difficult questions, Stanley was positive about this year's showing.

"I was pleased with the US performance. The test was hard," Stanley said, "Because of the 'out of syllabus' questions, teams with more training would likely have been exposed to topics that would give them an edge. If the Croatia style of questioning were to become the new trend, we would likely adapt our training slightly, but in general we feel as if the US team demonstrated the kind of flexibility and quickness to adapt that we want to see in future physicists."

In addition to participating in the competition, students were able to see the sights of Croatia. The Olympiad sponsored tours of downtown Zagreb, a trip to the official Nikola Tesla Memorial Centre in Gospic and excursions to nearby towns and national parks.

The Olympiad was first held in 1967 in Warsaw, Poland for the nations of Eastern Europe. During the 1970s the competition expanded to the rest of Europe and later the rest of the world. In 1986 the United States sent its first team to the competition in London and returned with three bronze medals, the best any team had done on its first outing.

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

ANNOUNCEMENTS

Childcare Grants Available

What: Small grants of up to $400

Who is eligible: parents/caregivers who plan to attend the APS March or April meeting with their small children or who incur extra costs to bring them along or leave them at home. Preference is given to early career applicants.

Deadline: Apply by **January 17, 2011** (for March) or **February 17, 2011** (for April)

Details at http://www.aps.org/programs/women/

These grants are made possible by funds from the Elsevier Foundation and the American Physical Society.

Grants are also available for the November Division of Plasma Physics meeting in Chicago.

***Apply by October 8, 2010** at http://www.aps.org/units/dpp/meetings/dpp10/services.cfm.*

Reviews of Modern Physics

Recently Posted Reviews and Colloquia

Colloquium: Ettore Majorana and the birth of autoionization

E. Arimondo, Charles W. Clark and C.W. Martin

Ettore Majorana's life is surrounded by mystery since his disappearance in the late 1930s. He left behind, in only nine published papers, results, however, that are still having impact in physics up to these very days. In this Colloquium the authors discuss from a historical point of view his contributions to the issue of "autoionization," i.e., the problem of localized states immersed in a continuum. Those states were first observed in atomic spectra in the 1930s but since the 1960s autoionization has become a pervasive effect in different areas of physics. Several interesting puzzles in the treatment of Majorana's seminal work in subsequent developments towards the modern theory of autoionization are pointed out.

http://rmp.aps.org

APS Division of Plasma Physics JOB FAIR

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

For more information contact Alix Brice at 301-209-3187 or at abrice@aip.org.

APS physics

Division of PLASMA PHYSICS

RELEASE continued from page 1

agencies.

Pavel Podvig of Stanford University, a close friend of Sutyagin's and co-author of one of his books, has been working for years to secure a pardon for his imprisoned colleague.

"To everyone it was clear that there was no substance to the charges," Podvig said. "He was accused of transferring classified information to certain companies, but he never had access to anything classified. The FSB (successor organization to the KGB) never even tried to show that he may have had access to classified data or anything like that. The FSB just kind of asserted that this company had these intelligence connections, but never provided evidence he had any kind of knowledge of this."

The book that Podvig wrote with Sutyagin was used as evidence in the trial that the FSB claimed showed Sutyagin had access to classified information. Podvig insists that the book cited only freely available sources and that the real aim of the FSB was to intimidate academics from collaborating with foreigners. At the time of the arrest, a number of other Russian academics were similarly intimidated and imprisoned for having connections to foreign nationals.

The judge presiding over Sutyagin's first trial dismissed the case, finding the charges against him too vague. The FSB, then brought the case back to trial for a second round. The judge and jury that were first selected were dismissed without explanation, and replaced by a judge with a history of ruling in favor of the FSB.

This time there was no jury, and the judge refused to let Sutyagin's lawyers enter evidence that showed he had only accessed publicly available information. Sutyagin was found guilty of espionage against the Russian government in 2004 and sentenced to 15 years of hard labor. He has spent the intervening time in a Russian prison near the site of some of Stalin's old gulags deep in Siberia.

The US Department of State condemned the trial at the time for its "lack of transparency and due process" and subsequently listed Sutyagin as a political prisoner. Amnesty International, the Committee of Concerned Scientists, the New York Academy of Science Human Rights Committee, and the American Association for the Advancement of Science's Committee on Scientific Freedom have all called for his release.

CIFS likewise has been involved since his initial arrest. The committee first wrote to local Russian prosecutors and governors demanding a fair trial. As the case finished working its way through the contorted Russian legal system, the committee wrote to then Russian President Vladimir Putin requesting a pardon. In addition, the committee has written to the Russian ambassador to the US every year bringing the issue to his attention.

Though Sutyagin's imprisonment is over, people who have worked on his case say that it is a bittersweet victory. Because he was a part of the so-called "spy swap" he has essentially been branded as a spy. In addition, in order to secure the pardon that ultimately released him, Sutyagin was compelled to sign an admission of guilt, something he'd steadfastly refused to do. He was reportedly told that if he refused to sign, he would scuttle the entire deal, and the three other prisoners in the swap would remain behind bars.

"Certainly I think that it's a good thing that he's out of jail. That's certainly good. The circumstances may not be ideal." Podvig said, adding that his participation in the swap does not amount to an admission of guilt.

Irwin reflected Podvig's sentiments, saying "Even though we're glad he's out, the way it happened was not optimal,"

CIFS will continue to stay in touch with Sutyagin and his family. It is unclear whether he plans to return to Russia with his family. With the pardon there should be no legal recourse for Russia to block his return, but there is no way to tell if he would be able to continue his research should he go back.

At the same time, CIFS will continue to work on other human rights cases both in Russia and throughout the world. Another high profile case in Russia is that of Valentin Danilov, who is currently serving a 13-year sentence for allegedly transferring weapon secrets to the Chinese. Like Sutyagin, there's no evidence that any of the data Danilov supposedly transferred was classified, or that he ever had access to any classified data. The State Department considers Danilov a political prisoner as he was first arrested around the same time as Sutyagin, a time when the Russian security forces were cracking down on scientists with any foreign connections.

"Our mission is really to monitor the freedom of scientists in the world to travel and do their science," said committee chair, Noemi Mirkin, "We feel you can't put borders in science; science is international."

Mirkin has seen the repression of scientists up close. She and her husband José were residents of Argentina when the government was toppled by a military coup in 1976. An unknown number of scientists, including her husband, disappeared into the country's prisons under the repressive regime. APS, working at the time through an arm of its Panel on Public Affairs, convinced the State Department to send a representative to Argentina to secure the release of the imprisoned scientists.

CIFS has recently been actively involved in securing the right to travel for seven students in the Gaza Strip who received Fulbright scholarships. A 2007 Israeli embargo prevented them from traveling to their universities. They had initially been issued visas to study abroad, but these were revoked after the embargo was imposed. CIFS partnered with the State Department and several other international rights organizations to allow them to study abroad in 2008. At present CIFS is working to ensure the same rights to the hundreds of students throughout the Gaza Strip who have received other scholarships.

MINORITY continued from page 1

gram officers, and APS staff. The minority-serving institutions represented were primarily historically black colleges and universities and Hispanic serving institutions that have strong undergraduate physics programs; the doctoral-granting institutions comprised many of the most prestigious and largest-enrollment programs in the country, including Berkeley, Harvard, MIT, Stanford, the University of Arizona, and the University of Maryland.

Faculty from several institutions already offering bridge programs gave presentations describing their models. One such program is the Fisk-Vanderbilt Masters-to-PhD Bridge Program, which since its inception in 2004 has enabled 30 students (16 of whom are women) to successfully "cross the bridge" from Fisk University to a PhD program in the physical sciences at Vanderbilt University or another institution of their choice. Co-director Keivan Stassun, a Vanderbilt University physics and astronomy professor, said the program looks for unrealized or unrecognized talent in potential students and then puts individualized measures in place to help them succeed.

Workshop participants also heard from a panel of current minority graduate students about the important roles mentors played in their success. Vanderbilt student Erica Morgan spoke about the importance of mentorship in navigating the transition to graduate school: "My mentor set clear standards and held me to those standards." Student panelists also stressed the importance of a mentor's ability to understand and provide support on personal issues that affect student success, such as financial issues, feeling like part of a community, and family considerations.

Breakout discussions and group feedback sessions encouraged candid conversation and networking, which participants said led to valuable connections. Willie Rockward, a physics professor at Morehouse College in Atlanta, Georgia, stated that "the MBP Workshop stimulated a strong pulse of excitement, thoughtfulness, and collaborative synergy among the vast cross-section of students, faculty, and administrators from minority and majority institutions."

"Faculty from minority serving institutions often don't go to the same conferences as their colleagues from doctoral granting institutions, and consequently don't have enough opportunities to network with each other," says Iacoletti. "One of our goals in holding this workshop was to provide a venue for these kinds of connections to be made."

The MBP recently received further recognition and support through a resolution passed by the APS Executive Board in June:

The American Physical Society recognizes the significant disparity in participation by underrepresented minorities in physics at all levels, and commits to support the Minority Bridge Program that will establish a set of programs and related efforts to help underrepresented minority undergraduates transition to doctoral degree-granting programs and obtain PhD degrees in physics.

Funding for the workshop and other efforts comes from the National Science Foundation. In the following months, project leaders will work to finalize the structure for the program and secure funding for a large-scale, multi-year initiative.

The Back Page

Enlarging Physics Programs at Colleges and Universities

By Sacha Kopp

Much has been made about the crisis in STEM education, and in physics in particular. The National Academies' *Rising Above the Gathering Storm* report tells us the economic sky is falling, and we don't have enough physicists to hold it up. More must be done to increase the number of physics students and increase the quality of physics education. How should physics departments respond?

At UT Austin, one could conclude all is well. We have a highly-ranked department at a premier state university which draws some of the best students in Texas. Our majors go on to prestigious graduate schools. At the same time there's more dark cloud than silver lining when you look at the entire picture. Our department has a near-stagnant 200 undergraduate population, compared with an ever-growing 3,000 in biology and 1,500 in chemistry. Only half of our 60-70 freshmen graduate with a physics BA or BS. Much of that 50% attrition is migration to other majors, especially engineering. Finally, students carry a negative perception about the utility of physics in seeking jobs and about the quality of instruction and mentoring within the department. Acknowledging such dark clouds, we began a program at UT to reinvigorate the physics major, thereby attracting and retaining a broader cadre of students.

Giant "singing" Tesla Coils accompany an ArcAttack concert.

UT isn't lacking for good applicants; students are choosing other, challenging majors like biochemistry and engineering because of perceived employment opportunities, relevance to everyday life, and the sense that by pursuing these careers they will enter an intellectually-stimulating community tackling important questions. Among physics majors, such sense of identity and mission is often lacking. When faced with a major whose advantages are unclear, students choose others whose advertised virtues are many.

Our task was to better understand how students perceive and experience physics and the physics major and how those perceptions and experiences influence their choices. We began by conducting focus group research, interviewing current physics majors and also non-physics majors (engineering, biology, chemistry, etc) who said they would not consider majoring in physics. What we found was sobering but not unique to UT. Students reported that professors don't convey a passion for physics and don't discuss it; without a role model it's hard for students to identify their own passions for physics. Students felt that professors rarely make connections between physics and other scientific topics or careers that utilize physics. Students feel professors don't tie classes to their own research, so that they lack any role models for future careers within physics. Students expressed a sense of feeling lost and that professors don't care whether they "get it" or not. They identified a disconnect between introductory physics courses (inclined planes and pulleys) and the more exciting, modern physics that initially attracted them to the subject. While some student perceptions are unfair to the intentions of the faculty, the disconnect between student perceptions and faculty/department intentions requires our attention.

On the bright side, current and past students in physics could identify what initially got them excited about physics. Nearly every student indicated that, while other majors told them what various things are, physics could answer the "why." Why is the sky blue? Why are some materials conductors and others insulators? Why is the universe expanding? Twenty-nine out of 30 students in the focus groups said they were in physics to pursue the why. This suggested that our department and our field more generally needs to recognize this pursuit as our unique role and skill set and intentionally promote that identity if we are to connect with the broad array of talented students who desire and value that skill set for whatever passions or careers they pursue. Physics is a tool kit that teaches students how to think and how to pursue the "why" in whatever they do.

We set about communicating that message to intentionally promote UT Physics as a major that helps students pursue the why. We also set about changes to the program that refines our courses and our teaching to help students attain that goal. The promotion effort reached out with the signature phrase, "Does the 'Why' keep you up at night? Us too. UT Physics." Then to promote that identity effectively and broadly, we used methods borrowed from the discipline of consumer marketing.

We had a multi-pronged approach, with all prongs contributing to a larger strategy. First, we told student leaders such as the Society for Physics Students about the focus group findings and sought their input on our plans for changes in the physics program and promoting this identity of physics pursuing the "why." Second, we anchored the effort with real physics student testimonials. Third, we sent emails to all physics and non-physics students taking any physics course telling them changes were being made and what the changes would mean to them. Fourth, we asked physics students, especially those in the testimonials, to make short announcements in all physics classes (for majors and non-majors) about major events. Fifth, we designed and found ways to give out humorous tee shirts to non-physics majors–there are 200 physics majors and we've given away 950 shirts–that broadened the message all around campus. Sixth, we made the identity visible in our physics building, hanging a huge banner in the ground floor lobby with pictures of students in the testimonials and the effort's signature phrase. Every student taking physics passes that banner en route to class. Seventh, we developed large-scale events intended not only to educate students about physics but also to convey that physics can be fun and will help them pursue their passion for the "why." These events further built up the department as an academic community, something previously lacking. Eighth, we sought coverage of the events by campus print media and local TV, knowing that changing an identity involves reaching prospective majors through as many channels as possible.

Clearly, efforts to promote an identity would be hollow without responding to critiques that students don't see the connection between physics and everyday life or other careers. We therefore developed a freshman conference course that allowed students to read papers, meet faculty, and learn about careers. We held a Physics Department Open House, consisting of a poster session that was conducted by undergraduates in the lobby of the building, open tours of all the research labs in the building, and a measurement of the gravitational constant g made by dropping watermelons off the 9th and 17th floors of the building. The event drew over 600 students. We solicited student testimonials explaining their career choice and connection to physics, that we then gave out in all non-major physics classes (10,000 printed so far). We developed a sophomore/junior design class in which students collaborated on the design of a pico-satellite. We also constructed an undergraduate web page that prominently features student and alumni testimonials about physics and careers. We're hoping to expand the number of degree plans available to include emphases on biophysics.

Similarly, efforts to draw students interested in the why would be futile without addressing the student concern that faculty have no passion for physics and don't make connections to other careers in their classes. We shared this finding with faculty and asked them to talk about their passion for physics research, and make connections to other subjects. We asked key faculty to teach introductory physics courses. We developed a new modern physics course for 3rd semester (sophomores). We instituted a monthly student-faculty pizza lunch to encourage students to ask professors about their research and their interests in physics. Students in recent focus groups commented on how helpful the pizza sessions were in establishing personal relationships with physics faculty. We also set up a faculty team to hold mandatory advising sessions for every student every semester.

In parallel, we set out to address student concerns that they feel lost in a sea of complicated calculations and classes. We instituted a peer teaching assistant program using a model promoted by the University of Colorado in lower-division courses. We created a weekly study night led by senior physics students open to all students in any physics class. We instituted faculty-led recitation sections for upper-division classes. We also recognized that surviving through classroom struggles is often aided by opportunities to have fun with their peers, effectively building the identity of a physics community. In addition to dropping watermelons off the building, we held Science Movie nights, a public lecture about the movie *Angels and Demons* (which features the CERN Large Hadron Collider), and we hosted a concert by the group ArcAttack attended by over 1500 students, which featured giant "singing" Tesla Coils utilized like synthesizers whilst zapping one of the performers in a chain mail Faraday suit. Really.

Looking ahead, we are expanding our effort to area high schools. Students in focus groups reported liking their high school physics classes, and on that basis choosing engineering majors in college. Why? Because some fraction of high school teachers, counselors, and parents convey the messages that engineering degrees are more practical and lead to better paying jobs. Students reported receiving visits to their high school physics and math classes from engineering schools. The absence of any visits from physics departments simply didn't raise their awareness of our field as a possible discipline of study. We hope the same literature and events used to impact the college students' choices could in fact have impacts on high school students.

We have indications these strategies are working. First, recent focus groups of junior/senior physics majors suggest they perceive faculty are concerned about student success. Further, they recognize one of the values of the department as being a small, tight-knit academic community situated within a large university. Together with a renewed sense of commitment between the department and the students that physics is a discipline that will teach them to think and ask 'why,' that academic community has led to a visible sense of identity and pride within students about their major. Recent focus groups of freshmen show that they believe the department to have some of the best teaching they've ever experienced; furthermore, they expect such because UT's reputation as a research university translates to an expectation of teaching. Student attitudes have changed dramatically in one year. Perhaps most significantly, the number of students declaring physics as their major has gone from 215 to 268 in just one year. In the UTeach teacher preparation program, the number of physics teachers has gone from a typical 2 per year to 16 this year. These gains are due both to improved retention and to the attraction of students from other majors. We don't know how many of these new majors will make it to graduation, but the increase is significant and larger than increases in other departments in the College. Strategies to embrace and promote an identity, combined with changes in the academic program, clearly work.

Yet, these exciting prospects yield their own challenges. Increased enrollments in lower-division physics require increased TA support. Upper division courses are increasing as well, by as much as double. Increased class sizes will require changing techniques for faculty-student interaction. The newly-recruited students will bring varying expectations for physics courses because many of them don't intend to do graduate study in physics, and faculty will have to respond to this diversity of expectations. But such challenges are worth the effort if the result is to reinvigorate our field with a broader cadre of students who will lead the field toward new ideas and directions. This broader cadre with diverse interests embodies precisely the core principle that we believe about physics: it is a skill set that teaches students how to think and enables scientific inquiry into a broad range of problems.

Sacha Kopp is Associate Professor of Physics at the University of Texas, Austin.

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