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Diversity Corner

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At the Big Board

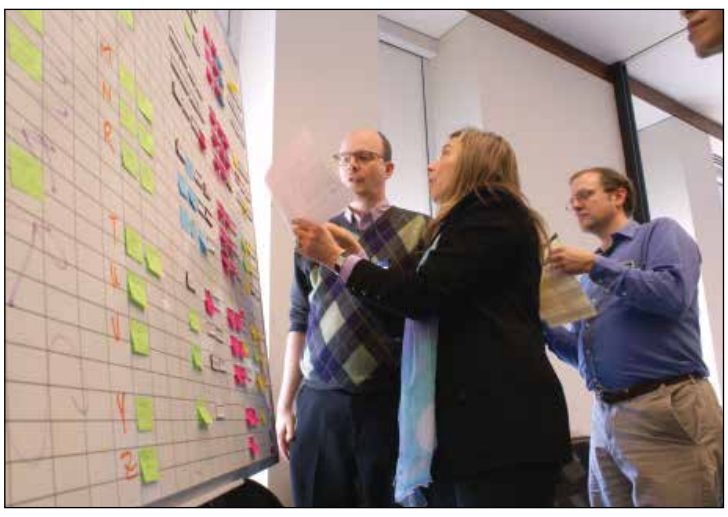

Photo by Michael Lucibella

In early December, 170 physicists from all over the country descended on APS headquarters in College Park, MD, to perform the onerous but very important task of sorting the 8,303 contributed abstracts that were submitted to the 2013 March Meeting. In the photo, Wolfgang Losert (University of Maryland), Pupa Gilbert (University of Wisconsin) and Eric Hudson (Penn State University) line up their sessions at the meeting's legendary big board. The March Meeting will take place in Baltimore, March 18-22.

April Meeting Features Latest Research and More

The 2013 APS April Meeting will take place at the Sheraton Denver Downtown Hotel in Denver, Colorado from April 13 through 16.

The annual meeting is expected to attract about 1,200 attendees and will feature 72 invited sessions, more than 120 contributed sessions, three plenary sessions, poster sessions and an outreach event.

The meeting highlights the latest research from the APS Divisions of Particles and Fields, Astrophysics, Nuclear Physics, and Beam Physics, as well as the Topical Group on Gravitation and General Relativity. In addition, the Forums on Education, Graduate Student Affairs, History of Physics, International Physics, and Physics and Society will be participating, along with the Topical Groups on Energy Research and Applications, Few-Body Systems, Gravitation, Hadronic Physics, and Precision Measurements & Fundamental Constants.

Plenary sessions throughout the meeting will highlight some of the latest developments in research, as well as some recently revealed history.

The Kavli Foundation Keynote Plenary session is titled "Recent advances in physics at the CERN Large Hadron Collider, neutrino physics, and the study of the cosmic microwave background." Lloyd Knox from the University of California, Davis will talk about his work using data from NASA's Planck satellite to glean insights into the standard cosmological model. Florencia Canelli from ETH Zurich will highlight the recent discovery of the Higgs boson at the Large Hadron Collider at CERN. Sam Zeller from Fermilab will also focus on high energy physics, highlighting new experiments and developments in determining the value of the neutrino mixing angle, and the search for charge parity violation.

A second plenary session will be about "The quantum in 1913, 2013, and the future." John Heilbron from University of California, Berkeley will look back on the personal life of Niels Bohr through recently uncovered letters and correspondence before and while formulating his model of the atom. Deborah Jin at the Univer-

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Despite Challenges, New President Sees a Great Time for Physics

Michael S. Turner, the Bruce V. & Diana M. Rauner Distinguished Service Professor, and Director of the Kavli Institute for Cosmological Physics at the University of Chicago, assumed the APS presidency on January 1st 2013. In the following interview with APS News, *he discusses his priorities for the Society during his presidential year.*

Congratulations on taking office as APS President!

It's a great honor to serve as President of APS. The American Physical Society is a fantastic organization: it publishes the best journals, is a strong advocate for physics, serves society by giving science advice, and engages in education and outreach. What really makes APS a great organization is that it has the respect of its members–the members really think very well of APS. And last but not least there are excellent dedicated people working for it. So my goal is not to screw it up, and maybe even make it better.

Michael S. Turner

What do you see as the most pressing issues facing the physics community right now?

The most pressing issues have to do with science budgets. Important decisions will be made in Washington that affect the way that science is funded in the US, and so APS needs to be a strong voice both for science and for basic research and for physics. Not unrelated to that is the public appreciation of science. Science is definitely center stage in this country and around the world. People see science as being the key to innovation. But when you get on center stage, sometimes they throw tomatoes. There are a number of issues, particularly in the US where science is not completely appreciated for what it is and what it isn't. So I think APS has to be a voice for science. Our nation has big problems, for example energy and climate, and science is the key to solving these problems. APS has played a role in providing the best scientific advice to the public and to the government, and that's even more important now.

An important challenge to the Society itself has to do with publishing. For almost 120 years we've published the *Physical Review*, which I would call the leading set of journals in physics, accounting for 30% of the citations in physics. We're at a time where people are looking at new models for publishing, in particular open access. The survival of the *Physical Review* in this brave new age is very important, and we're really going to have to stay on top of publishing.

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Bringing Star Power to NIF

Photo courtesy of Lawrence Livermore National Laboratory

On November 27, APS brought the star power of 125 APS Fellows to Livermore, for a tour of the National Ignition Facility (NIF), followed by a reception at a nearby winery. Fellows from Livermore Lab (the site of NIF) were joined by busloads from both Berkeley and Stanford. At the reception, in addition to enjoying the food accompanied by some of the local vintages, the Fellows heard from APS President Bob Byer of Stanford, Executive Officer Kate Kirby, Treasurer/Publisher Joe Serene, and Director of Public Affairs Michael Lubell, as well as some words of welcome from NIF Director Edward Moses. In the photo, a subset of the attendees is captured at the entrance to the Ignition Facility. APS President Byer is at far left in the 2nd row.

Neutrino Experiment Passes Funding Hurdle

By Michael Lucibella

The Department of Energy's next generation neutrino experiment has passed its latest round of reviews and is moving towards construction. The Long Baseline Neutrino Experiment, or LBNE, passed the department's "Critical Decision 1" review on December 10, which outlined the project's budget and overall plan.

The experiment will push limits of existing technology by deploying a new generation of detectors to attempt to unravel the mass hierarchy of neutrinos. However, budget compromises mean that the project will have to take on a limited scientific scope unless outside investment can be secured to move the detectors deep underground.

The Sanford Underground Research Facility, located at the former Homestake gold mine in Lead, South Dakota, will be home to the LBNE. Fermilab will shoot a beam of neutrinos through 1300 kilometers of rock to the detectors at Homestake. Located on the surface of the underground research facility, the detectors will look for the hierarchy of neutrino masses and evidence of charge parity violation in hopes of finding clues to why matter won out over antimatter in the early universe.

The planned experiments have been significantly scaled back from their original scope. When it was first conceived, the LBNE was to be a part of the Deep Underground Science and Engineering Laboratory, or DUSEL, run in conjunction with the National Science Foundation. However in December of 2010 the NSF backed out of the project and the scope of experiments at the mine had to be reduced. The plan shrank from dozens of underground multidisciplinary scientific projects to three physics experiments, a dark matter detector, a search for neutrinoless double-beta decay, and the LBNE.

The designers of the LBNE proposed a budget of about $1.7 billion, but the DOE demanded more reductions. They dropped the proposed near detector that would have measured neutrinos at the beam's Fermilab origin. After a review that included evaluating other sites and other kinds of

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Members in the Media

"It was the influence of him and my mom teaching me to always be curious about the next layer of the universe that drove me into physics in the first place. It has been a great treat to get to work with my father at Sanford Lab while I was completing my master's degree and working with LUX."

Mark Hanhardt, Black Hills Pioneer*, November 17, 2012.*

"I think we're looking in enough different ways that unless it's something that we just haven't thought of at all yet, it seems to me we're very likely to find it within the next decade."

Dan Bauer*, Fermilab, on the search for dark matter,* Space.com*, November 27, 2012.*

"Wales needs more science graduates–and not necessarily only graduates but technically-orientated people. I think hi-tech industry is going to be essential to the prosperity of Wales in the future and to attract them we need more scientists."

Lyndon Evans*, CERN,* BBC-News.com*, November 29, 2012.*

"The Higgs particle arises from a field pervading space, known as the Higgs field… Everything in the known universe, as it travels through space, moves through the Higgs field; it's always there lurking invisibly in the background."

Sean Carroll*, Caltech, quoted from his new book, "The Particle at the End of the Universe: How the Hunt for the Higgs Boson Leads Us to the Edge of a New World,"* The Los Angeles Times*, November 30, 2012.*

"If we had looked at particle data alone, we would have said, 'We're out! Goodbye, solar system!'"

Stamatios Krimigis*, Johns Hopkins University, on whether Voyager I has exited the solar system,* The Los Angeles Times*, December 3, 2012.*

"As ever, Voyager seems to have a remarkable capacity for providing observations that suggest ... we're almost right… It would be nice for the theory and the observations to agree all at once. But it may not ever happen that way."

Gary Zank*, University of Alabama in Huntsville on whether Voyager I has exited the solar system,* The Los Angeles Times*, December 3, 2012.*

"We're moving into this headwind of WIMPs."

Katherine Freese*, University of Michigan, on the Earth's movement amongst theoretical dark matter particles coming from the constellation Cygnus,* The Washington Post*, December 3, 2012.*

"They're still not quite high enough for fusion… and I wish we were going a little faster."

Edward Moses*, Lawrence Livermore National Lab, on the temperatures achieved by the lasers at the National Ignition Facility,* The San Francisco Chronicle*, December 4, 2012.*

"Not only do you hear the chirps–the alien birds as my wife calls them–but you hear that sort of cricket-like thing in the background… So this is really a fantastic new measurement."

Craig Kletzing*, University of Iowa, on the sounds made by Earths' radiation belts as detected by NASA's Van Allen Probes,* The Washington Post*, December 4, 2012.*

"If in the future they develop a nuclear warhead small enough to put on a rocket, they are not going to want to put that on a missile that has a high probability of exploding on the launch pad."

David Wright*, the Union of Concerned Scientists, on North Korea's nuclear ICBM capabilities,* The Washington Post*, December 12, 2012.*

"There turns out to be a slight tension between the two masses… They are compatible, just not super compatible."

Beate Heinemann*, University of California, Berkeley, describing two apparent measurements of the mass of the Higgs boson coming out of the LHC,* Wired*, December 14, 2012.*

This Month in Physics History

January 2, 1839: First Daguerrotype of the Moon

Taking high-resolution, colorful pictures of the stars is now a mainstay of astronomy research, whether from ground-based telescopes or instruments like the Hubble Space Telescope, but this wasn't always the case. Before the invention of photography, astronomers had to sketch what they saw in their telescopes by hand, often missing crucial details. Astronomers made reproductions by redrawing the original illustrations, enabling errors to creep in. It was the invention of the daguerrotype that showed them a far superior method was possible.

In 1814, a Frenchman named Nicéphore Niépce began experimenting with ways to record light, and managed to transfer an image to paper two years later via a camera obscura. By 1822, he had figured out how to make such an image permanent by capturing it on a flat sheet of polished tin coated with bitumen. One of the oldest surviving photographs dates back to 1825, when Niépce captured the black-and-white image of an engraving of a boy pulling a horse. But this method required a full eight hours of exposure.

Six years later, French painter and inventor Louis Daguerre–who had worked with Niépce briefly before the latter's death in 1833–discovered how to reduce exposure time to 20 to 30 minutes. Daguerre had been apprenticed in architecture, theater design, and panoramic painting, and later invented the diorama, and his visual sensibility was fascinated by the potential of Niépce's research.

Legend has it that he accidentally broke a mercury thermometer, giving him the idea that a shorter exposure time would produce a very faint image, but this image could be further enhanced via a chemical process involving the vapor given off by mercury heated to 75° Celsius. Daguerre then "fixed" the image, so it wouldn't be sensitive to further exposure to light, by rinsing it in a solution of common salt. The surface was still prone to tarnishing, even by the slightest friction, so most daguerrotypes were sealed under glass before being mounted in a small folding case.

He failed to find private investors for his work, so Daguerre approached the French Academy of Sciences on January 7, 1839 about his invention. Initially, he withheld the specific details of the process, revealing the secret only to the academy's secretary, François Arago, but all the members were enthusiastic about the potential. By August, Daguerre had "gifted" the French government with permission to make his process freely available in exchange for a modest lifetime pension–except in England, where Daguerre obtained a patent so that only licensed photographers could use his process.

Daguerrotype of Louis Daguerre in 1844.

Earliest known surviving photograph of the Moon, a daguerreotype taken in 1851 by John Adams Whipple

These "daguerrotypes" were the earliest form of still photography and became hugely popular. Renowned figures as diverse as US President Abraham Lincoln and poet Emily Dickinson had their images captured for posterity in daguerrotypes, and the process enabled the first photojournalists to document the horrors of the American Civil War. Samuel Morse, while a fan, expressed astonishment when he realized daguerrotypes of Parisian street scenes showed no people or carriages, because the still rather long exposure time meant that objects in motion weren't captured.

Daguerrotypes were expensive, and the only way to produce copies was to use two separate cameras side by side. Also, because Daguerre had patented his invention in England, photographers needed a license to make daguerrotypes there, opening a door for competitors. An Englishman named William Henry Fox Talbot invented a rival technology, the calotype, which produced paper negatives of poorer quality than the daguerrotypes, since the images tended to darken over time, but had the capability to produce an unlimited number of positive prints. His process relied on using toxic chemicals, however, and he also patented his process, limiting its commercial spread.

Photography studios began springing up throughout Europe in the 1840s. By the mid 1860s, London's Regent Street boasted 42 photography studios; in America, there were 77 in New York alone by 1850. It became standard practice to include photographs on one's calling cards, the use of which was a common rule of etiquette for the social elite.

Appropriately, it was an astronomer who coined the term photography in 1839, when Johann Heinrich von Madler combined "photo" (from the Greek word for "light") and "graphy" ("to write"). Astronomers quickly embraced the use of photographic plates because of their good resolution and the ability to make much larger images.

Daguerre himself is believed to be the first person to take a photograph of the moon, using his daguerrotype process, on January 2, 1839. Unfortunately, in March of that same year, his entire laboratory burnt to the ground, destroying all his written records and much of his early experimental work–and that historical image of the moon. A year later, John William Draper, an American doctor and chemist, took his own daguerrotype of the moon.

In 1850 Draper collaborated with astronomer William Cranch Bond to produce a daguerrotype of the star Vega. An attempt had been made in 1842 to photograph the sun, but the resolution was poor, so few details were vis-

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Diversity Corner

A column on programs related to diversity

APS Bridge Program Accepting Member Institution Applications

The APS Bridge Program is developing a coalition of academic institutions that share a commitment to increasing educational opportunities for underrepresented minority physics students. Membership is free, and institutions that are actively working to improve diversity in the physics community may join. This network of member institutions will share innovative ideas, learn from leaders in the field, and promote awareness of the importance of diversity in physics. More information is available at www.APSBridgeProgram.org.

Minority Scholarship Application Process Now Open

APS is once again pleased to announce the Scholarships for Minority Undergraduate Physics Majors. African American, Hispanic American, and Native American students who are college freshmen or sophomore physics majors, and who are US citizens or permanent residents are invited to apply. The online application deadline is February 4, 2013. Awards are $2000 and $3000 per academic year. More information can be found at http://www.aps.org/programs/minorities/honors/scholarship/index.cfm

APS Speakers Lists Featuring Women and Minorities

Planning a colloquium series and want to include a minority or female speaker? Check out the APS Speakers Lists! The lists contain names, contact information, and talk titles of physicists who are willing to give talks on a variety of subjects. Check it out here: http://www.aps.org/programs/women/speakers/index.cfm

And don't forget that travel grants are available for institutions inviting women and minority speakers. Find more information about the grants here: http://www.aps.org/programs/women/speakers/travel-grants.cfm

2012 Professional Skills Development Workshops for Women

APS, with support from NSF, will host two Professional Skills Development Workshops in 2013 for female physicists. Postdoctoral associates and early-career faculty and scientists are invited to apply for the March 17, 2013 workshop in Baltimore, MD. Postdoctoral associates and senior-level faculty and scientists are invited to apply for the April 12, 2013 workshop in Denver, CO. Senior graduate students are also welcome to apply.

Applicants affiliated with a US institution/facility are eligible for travel and lodging funding consideration. Those needing funding assistance are encouraged to apply early. The deadlines for the workshops and a link to the online application can be found at: www.aps.org/programs/women/workshops/skills/

APS/IBM Research Internships for Undergraduate Women: Deadline is February 1, 2013

APS and IBM co-sponsor a research internship program for undergraduate women. The goal is to encourage women students to pursue graduate studies in science and engineering. The internships are salaried positions typically 10 weeks long at one of three IBM research locations (San Jose, CA, Austin, TX, or Yorktown Heights, NY), and give the opportunity to work closely with an IBM mentor. Learn more at research internship program for undergraduate women at: http://www.aps.org/programs/women/scholarships/ibm/index.cfm

Nominations for the CSWP Woman Physicist of the Month

The Committee on the Status of Women in Physics (CSWP) recognizes a female physicist each month who has had an impact on others' lives and careers. Do you know female physicists worthy of recognition? Nominate them! Find more info at: http://www.aps.org/programs/women/scholarships/womanmonth/

Women in Physics (WIPHYS) Email Group

The Committee on the Status of Women in Physics (CSWP) welcomes you to join WIPHYS, its electronic mailing list. WIPHYS is sent weekly and includes funding, job, and professional development opportunities for women. WIPHYS was "officially" started in January 1993, and now has over 800 subscribers. Join here: http://www.aps.org/programs/women/email-lists/wiphys.cfm

Network with other physicists on LinkedIn

Join the LinkedIn groups for Minorities in Physics (http://go.aps.org/minoritiesinphysics) and Women in Physics (http://go.aps.org/womeninphysics) and start networking today!

INSIDE THE BELTWAY

New Directions or More of the Same

by Michael S. Lubell, APS Director of Public Affairs

January 3 has often been an eventful day. On that date in 1825, Rensselaer College opened its doors to the first engineering class in the United States. Ninety-nine years later, Howard Carter, a British explorer, discovered the sarcophagus of the Boy Pharaoh, King Tut, near Luxor, Egypt. And in 1973, CBS divested itself of the New York Yankees, selling the team to George Steinbrenner and his associates for $10 million.

Today, *Forbes Magazine* pegs the Yankees' worth at $2 billion; Tutankhamun exhibitions continue to draw extraordinary crowds around the world; and economists attribute as much as 70 percent of America's current economic growth to the STEM fields–science, technology, engineering and mathematics.

This year, January 3 marks the beginning of the 113th Congress. And just how it will be eventful is still in doubt. During the next two years, 535 elected members of the House and Senate will have a choice certain: to foster economic growth by investing in scientific discovery and innovation or to perpetuate an ideological stalemate that peddles our nation's future prospects for a fire sale price.

Regardless of any deals Congress and the White House strike on taxes and entitlements (Medicare, Medicaid and Social Security), the nasty fight between Democrats and Republicans over reducing discretionary spending is likely to continue for the next two years. The president may have the public wind at his back on taxing the rich and minimizing damage to the social safety net, but polling suggests that the public wants to see deficit spending reined in and growth in the national debt significantly constrained.

And those public sentiments resonate well with conservatives who want to slash the size and scope of the federal government. President Obama won a second term with a four percent majority margin in the popular vote and a 332 to 206 margin in the Electoral College. And Democrats extended their effective majority in the Senate to 55-45. But Republicans retained control of the House of Representatives with a 34-vote cushion (pending a special election in the 2nd district in Illinois compelled by Jesse Jackson Jr.'s unexpected resignation). And the GOP majority, its shrinking band of moderates having shrunk even further at the 2012 ballot box, tilts more to the right in the new Congress than it did in the last one.

During the last two years, with overt or threatened obstructionism, Tea Party ideologues severely constrained House Speaker John Boehner's ability to negotiate with the White House and a Democratically controlled Senate, especially on budgetary matters. Their tactics nearly pushed our nation into default, arguably leading to a rating downgrade of U.S. treasury bonds. And their opposition to compromise forced

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MEETING BRIEFS

Fall APS Section Meetings

The **Ohio-Region Section** held its meeting on October 5th and 6th at Wayne State University in Detroit, Michigan. The theme for the meeting was "Frontiers of Nanoscience and Nanotechnology," and featured Bhanu Jena of Wayne State University speaking about her research into the molecular machinery of cells. Adrian Cho, writer for *Science*, also spoke at the meeting, as did Wolfgang Bauer from Michigan State and Marc Hausmann from the national Superconducting Cyclotron Laboratory.

The **Northwest Section** held its 14th annual meeting at Simon Fraser University in Vancouver, British Columbia from October 18th through the 20th. Reiner Kruecken kicked off the meeting with his public lecture about how elements are produced in the nuclear furnaces of stars. The meeting formally began on the morning of the 19th when Eric Donovan, University of Calgary, delivered the first plenary talk about using the aurora to investigate Earth's magnetosphere. Nate McCrady from the University of Montana spoke on Saturday about how the Minerva array of telescopes will help hunt for Earthlike planets outside our solar system.

The **New York State Section** held its annual fall meeting over October 19 though the 20th at Canisius College in Buffalo New York. The meeting's theme was "The Physics of Water." Robin Bell from the Lamont-Doherty Earth Observatory at Columbia University delivered the keynote address about the changing ice sheets at the poles. James Brownridge from Binghamton University did his best to lay the "Mpemba effect" to rest, explaining the only way hot water would freeze before cold water was if ice nucleation points spurred freezing in hot water, and cold water simultaneously being supercooled, delaying its phase change.

The **Texas Section** held its meeting in conjunction with the Texas Section of the American Association of Physics Teachers and zone 13 of the Society of Physics Students from October 25th through the 27th in Lubbock, Texas. Stefan Estreicher, a professor of physics at Texas Tech University spoke about how he uses chemical archeology to show that wine making has been going on for more than 7,000 years. Ginger Kerrick shared her experiences starting as an intern at the Johnson Space Center, and rising to become for a flight director for NASA.

The **Four Corners Section** held its meeting from October 26th through the 27th at New Mexico Tech in Socorro, New Mexico. Kerry Emanuel, professor at MIT, spoke about his research into understanding the science of hurricanes. Kate Kirby, Executive Officer of APS, spoke about the Society's outreach efforts, including traveling to Comic-Con International to promote science.

The **California-Nevada Section** held its annual meeting at California Polytechnic State University in San Luis Obispo, Calfiornia. Brian Hackney, a meteorologist at KCBS in San Francisco spoke about how after getting his bachelor's in physics he pursued a career in broadcast news and meteorology. Pete Schwartz from Cal Poly delivered a plenary talk about his work helping Guatemalans develop environmentally sustainable technology in their developing nation.

The **Prairie Section** held its annual meeting from November 8th through the 12th at the University of Kansas in Lawrence, Kansas. At Friday's banquet, David Hogg from New York University spoke about how datasets everywhere are growing, giving rise to the need for more powerful and subtle models to glean useful results. Albrecht Karle from the University of Wisconsin brought an update on the performance of the IceCube neutrino detector at the South Pole, and some of the first data coming out of it.

The **New England Section** held its annual meeting in conjunction with the New England Section of AAPT from November 9th through the 10th at Williams College in Williamstown Massachusetts. The Banquet talk by Seth Lloyd of MIT, titled "Quantize This!" highlighted the weirdness of quantum mechanics, including quantum codes by living systems and the quantum mechanics of time travel. Kyle Cranmer from New York University spoke about the Standard Model and the discovery of the Higgs Boson at CERN.

The **Southeastern Section** held its 79th annual meeting from November 14th through the 17th in Tallahassee Florida. Harrison Prosper from Florida State University delivered the first public lecture on why the discovery of the Higgs Boson was the biggest event in particle physics in 40 years. James Gates from the University of Maryland spoke about how CERN is capable of going even farther, by investigating the theory of Supersymmetry and looking for hidden super-partners of particles in collisions at the LHC.

Letters

Readers interested in submitting a letter to APS News ***should email letters@aps.org***

Need to Communicate Science

According to the October Back Page, "Science can't answer moral questions such as whether we should allow gay marriage...". At least science can provide data whether a gay sexual relationship is healthy or natural or may provide more health risk to society, to judge whether such activity should be legally allowed. The same can be said about the problem of alcohol. However, society seems to prefer hiding some truth, to keep the usual way or pleasure of life. This raises the need to have a more science-minded society, hence the need of communicating science.

Pramudita Anggraita
Yogyakarta, Indonesia

Peer Review Can Perpetuate Dogma

The November Back Page, "APS and the Challenge of Open Access," emphasized the importance of peer review journals and articles. Ordinarily, I would agree. But in light of the East Anglia email scandal and the campaign to paint as know-nothings all who disagree that "global warming" is established science, there is a danger of promoting a regime similar in many ways to that of Lysenko in the Soviet Union. If the peers doing the peer reviewing are all adamantly of the attitude of the East Anglia and similarly minded scientists, it will be hard to get any science published which doesn't meet their dogma.

Arthur Cohn
Portola Valley, CA

The Problem of Collateral Damage

With reference to the letter by Michael Gerver in the October *APS News*, we know that war always involves more civilian casualties than military losses, as shown in World Wars I and II, and subsequent conflicts over the years. In addition, the rights of an occupying power have been discussed in UN documents, and invoking "self-defense" is an ironic notion. The British always invoked it during the Quit India agitation.

Is there a scientific, compassionate way of determining the proportion of acceptable collateral casualties which, to quote Gerver's letter, "are in proportion to the military goals to be achieved ?"

Radhakrishna
Bangalore, India

Preprints Are Not The Problem

I was disappointed to find that while nearly a page of the November *APS News* was devoted to a story about a scientist rushing to publish a result in order to claim precedence, the article made no mention of the greater underlying issue this story is indicative of. In today's PR and instant communication driven rush for fame, recognition, and ever more scarce grant funding, we sometimes forget that as scientists our first and foremost goal should be to find, describe, and understand the underlying truths about the physical world around us.

Submitting a new paper every few weeks because we may have found another tiny bit of what we know is a much bigger puzzle cannot be the right path to get to the essence of the questions we are trying to answer. But that is what the pressures of trying to claim precedence and to publish as many papers as possible in as high profile journals as possible drives us to.

When, as indicated in the article, the topic of a paper published in *PRL*, one of the premier physics journals, is not considered serious enough to be discussed at conferences, something must be wrong with our publication system. When I hear my colleagues state that they think they understand a certain physical phenomenon but will not share their ideas until they are published, I know there is something wrong with our academic environment.

One of the biggest challenges we as researchers face today is not whether or not to put our papers on arXiv, but how to sort through and digest the avalanche of papers published by the world-wide scientific community on almost any topic of interest. That is, after all, what the scientific publications are supposed to be for: to communicate the essence of one's results and ideas to the rest of the research community. Instead, too often the goal seems to be to pad one's résumé with yet another publication.

I don't know how to relieve some of the competitive pressures we feel in our academic and research workplace, but that is what I would like to read a page-long *APS News* article about.

Vyacheslav Lukin
Washington, DC

Einstein and the Presidency of Israel

In his letter in the November *APS News*, Walter Schimmerling writes that "[w]hen Einstein was asked to become the first president of Israel, the people who asked him had to worry about a worst-case scenario: that he might accept." The first president of Israel was Chaim Weizmann, the renowned chemist. After Weizmann's death in 1952, Abba Eban, then Israel's UN ambassador, delivered to Einstein a message from Prime Minister David Ben Gurion, offering to Einstein to nominate him as a candidate for president. I am unaware that either Eban or Ben Gurion were worried that Einstein might accept. Had Einstein accepted and been elected by the Knesset, he would have been Israel's second president, not the first. Interestingly, the reasons that Einstein gave for declining Eban's offer, as appearing in his 11/18/1952 letter (Einstein Archive 28-943) would help Schimmerling make his case: Einstein argued that since he had devoted his life to objective matters, he lacked "both the natural aptitude and the experience to deal properly with people and to exercise official functions."

Lior Burko
Normal, Alabama

Scientific Method Counsels Humility

In reference to the assertion, in my letter in the June *APS News*, that Fermi (and others) did not follow the scientific method, Glen Herrmannsfeldt recommended, in the August-September issue, that one should read the first chapter of David Goodstein's book, *Of Fact and Fraud*, to gain an impression of how the scientific method actually works. I found the first chapter of value, but for the case in question I found a statement toward the end of Chapter 5, dealing with cold fusion, more relevant. Goodstein says, "...the cold fusion saga offers a classic case of how scientists, bent as they are on deepening and enlarging their understanding of nature, may convince themselves that they are in possesion of knowledge that does not in fact exist." In the case of nuclear fission, nuclear scientists, apart from Ida Noddack and her husband, felt that they knew that if they performed the experiment she had suggested, they wouldn't find any elements lower down on the periodic table, indicating that Fermi had fractured the nucleus, so why bother to do the experiment? The scientifc method cautions us to be humble, and to do it anyway, if it is at all possible, and one can fund it.

Frank R. Tangherlini
San Diego, CA

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repeated stalemates over spending with determined Democrats in the Senate.

In an attempt to contain the obstructionism, the House Republican leadership announced last month that it was booting three far-right ideologues off prime committees. After Speaker Boehner pulled rank, rank-and-file public reaction remained muted. But inside sources warned that the rebellious rabble is not likely to refrain from its rousing rhetoric once serious budget negotiations get under way.

Most Capitol Hill observers believe Mr. Boehner will continue to have trouble corralling enough votes from his Republican minions for any compromises with the White House, and he will have to reach across the aisle to attract support from Democrats to seal any deal. But to achieve success, he will have to deliver a performance worthy of an Olympic gold medalist on the balance beam.

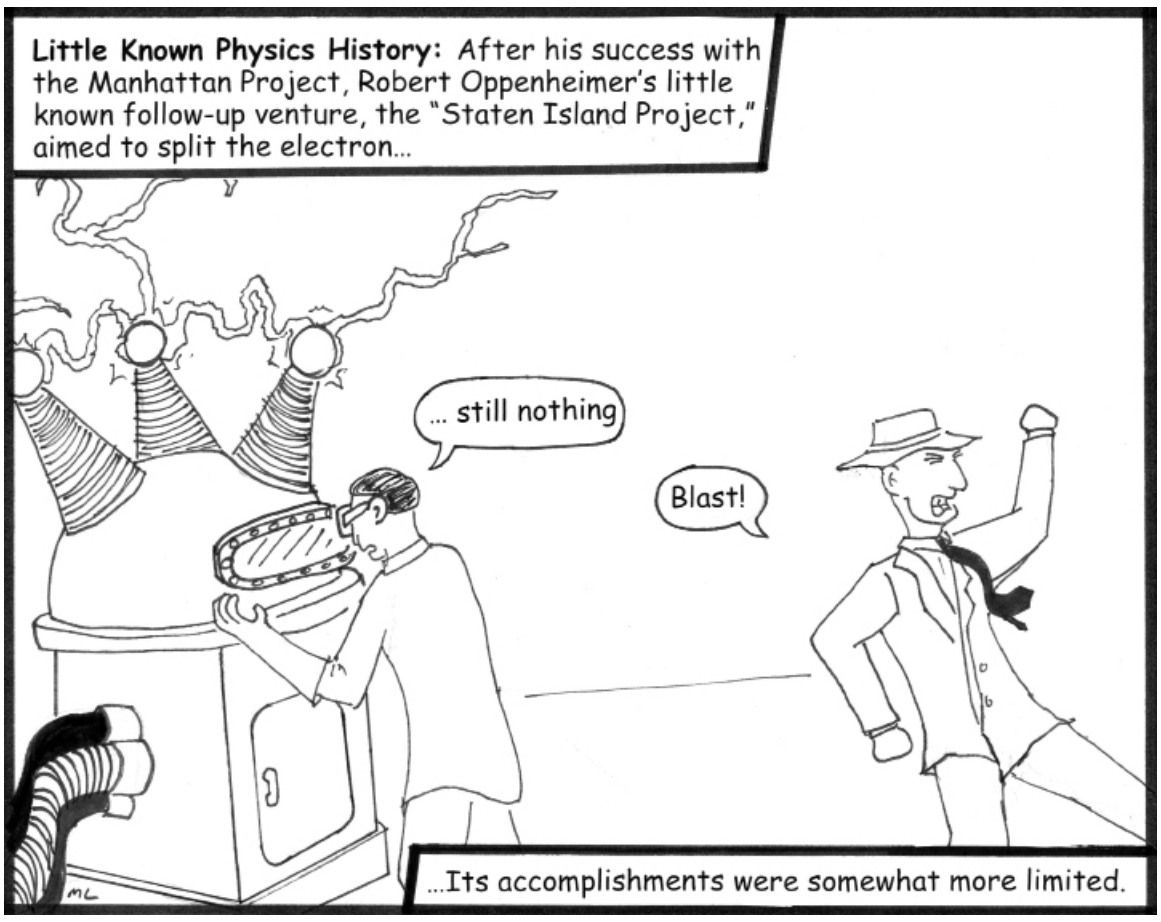
For most of the lame duck session that ended last month, Washington was consumed by dire predictions of what would happen to the American economy if the Bush era tax cuts expired on December 31 and sequestrations mandated by the Budget Control Act took effect on January 1. Left almost unsaid throughout the escalating angst was the fallout of a possible impasse over the debt ceiling, which Congress will have to raise to avoid yet another threat of default.

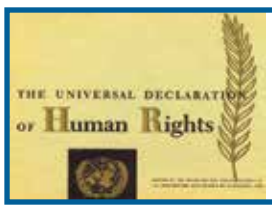
With few arrows left in their political quiver, Republicans have threatened to hold the nation's credit worthiness hostage unless the White House agrees to reductions in discretionary spending, which they say are needed to assure the nation's solvency in the long term. It is far too soon to predict how the budgetary wrangling will play out, but science, along with all non-defense discretionary spending, may be in for a period of austerity.

Just over two years ago, the bipartisan Simpson-Bowles Commission on fiscal responsibility, which President Obama had established by executive order in early 2010, provided a 10-year blueprint for deficit reduction. The commission's plan, which failed on the altar of partisanship, called for one dollar of new revenue for every three dollars of spending cuts. But, recognizing the significance of science in spurring economic growth, it declared that research and education should be exempt from the discretionary budget scalpel.

By all accounts, the White House has accepted that proposition. It is time for Congress to do the same.

By Michael Lucibella





APS Committee on International Freedom of Scientists

CIFS Briefs: Highlighting the Connection Between Human Rights and Science for the Physics Community

Since its creation in 1980, the APS Committee on International Freedom of Scientists (CIFS) has advocated for and defended the rights of scientists around the globe. In this column, CIFS describes some of the issues that the Committee is monitoring as well as the Society's other human rights activities.

Russian Physicist Valentin Danilov released from prison

Valentin Danilov, the former head of the Thermo-Physics Centre at Krasnoyarsk State Technical University, was released from prison on parole in November 2012. In February 2001, Danilov was arrested for passing classified information to a Chinese company. Danilov and scientists with whom he had collaborated had noted that he was working under a legal contract between his university and the company and that this collaboration would be considered routine scientific cooperation. In fact, the information Danilov was accused of passing had been available in the open scientific literature for years.

While Danilov was acquitted of spying by a jury in December 2003, the Russian Supreme Court overturned this acquittal in June 2004 and ordered a retrial. A second (non-jury) trial began the following September, and Danilov was convicted of espionage and embezzling funds–charges that he has always denied. He was sentenced to 14 years in jail.

CIFS is pleased to see that Danilov is finally free after spending more than a decade in prison.

Science and Human Rights Coalition

In 2007, the United Nations began a process to define Article 15 of the International Covenant on Economic, Social and Cultural Rights (ICESCR), which states that everyone has the right to "enjoy the benefits of scientific progress and its applications." This process was launched without input from the scientific community. To ensure that the voices of the scientists are brought to this process, the American Association for the Advancement of Science (AAAS) is leading an initiative to involve the scientific community.

Part of this initiative includes the organization of focus groups with members of scientific societies that participate in the AAAS Science and Human Rights Coalition, of which APS is a member. On 12 November 2012, seven APS members from the Washington, D.C. area took part in a focus group session at AAAS. The attendees were guided through a series of questions to obtain their perspectives on the contributions of physics to society, how to ensure that members of the physics community can undertake their research freely, and identify areas of physics research that may have human rights implications. Their discussions will feed into a report that the Coalition will present to the United Nations in 2013.

Omid Kokabee

Dr. Arash Alaei and Dr. Kamiar Alaei, two Iranian HIV/AIDS researchers spoke, on the campus of the University of Texas at Austin, on the evening of 14 November 2012 on the general subject of freedom of scientists in Iran and specifically on the case of APS member Omid Kokabee. As *APS News* readers may know, Kokabee was a graduate student in optics at UT Austin at the time of his arrest in February 2011 in Iran. Kokabee was sentenced to 10 years in prison in May 2012 for conspiring with foreign governments against Iran. The event at UT Austin was held under the joint sponsorship of the APS Committee on International Freedom of Scientists, the UTA organization Austin for Iran-Student Chapter, Amnesty International, and the Working Group for the Welfare of Scientists of AAAS Science and Human Rights Coalition.

The Alaei brothers had previously been imprisoned for two to three years from 2008-2011 on charges quite similar to the conspiracy charges of which Kokabee has been declared guilty. The brothers stated that there was absolutely no cause for these charges in either Kokabee's or their cases.

Arash Alaei's imprisonment at the Evin prison coincided with the beginning of Kokabee's imprisonment, where they interacted closely with each other. The Alaei brothers had successfully organized prisoners to spend time teaching each other their personal skills and organizing hygienic practices among the prison workers when the brothers were told they needed to work in the prison kitchen. Kokabee has been continuing this instruction tradition by teaching physics and foreign languages to fellow prisoners.

Unfortunately, Kokabee's health is now a factor as he has recently been suffering from kidney stones and has lost significant weight. There is concern that he is not being given proper medical treatment. In addition, his ten year prison term has been extended an additional 91 days for alleged illegal earnings from his instruction of fellow prisoners.

The brothers suggest that the best way to advocate for Kokabee is to maintain international pressure on the Iranian government, especially as Iran has responded to pressure in the past, as attested to the freedom the Alaei brothers finally achieved. They are now working with representatives of Amnesty International to promote this advocacy. They are featured speakers for Amnesty International's Global Write-A-Thon that took place at AAAS on 7 December 2012 Washington D.C. This event was a public protest demanding justice for Kokabee and other scientists unjustly imprisoned by the Iranian government.

Washington Welcomes Newest Nobelists

Photo by Jodi Lieberman

No, that's not the King of Sweden standing beside 2012 Nobel Laureate Dave Wineland (right) of NIST, Boulder. Wineland did receive his Nobel Prize from the King in Stockholm on December 10, but, as shown in the photo, on November 29 he was one of the guests of honor at a reception for American Nobel Laureates held at Blair House, across the street from the White House, sponsored by the Department of State Office of Protocol. Standing next to Wineland is NIST Director Patrick Gallagher.

UNC Physics Professor is Convicted of Drug Smuggling in Argentina

After months of languishing in a prison in Argentina, on November 19 Paul Frampton, a University of North Carolina physics professor, was convicted in Buenos Aires of drug trafficking.

Last January, he had been found with two kilograms of cocaine hidden in his checked luggage. He claimed he was duped by drug traffickers into carrying the case for a swimsuit model, Denise Milani, whom he thought he had met over the internet. Despite his insistences that the drugs did not belong to him, the Argentinean court sentenced him to four years and eight months in prison.

At the same time, Frampton has also been fighting against the UNC administration over the suspension of his salary since March.

Mark Williams, a mathematics professor at UNC, has been spearheading the efforts in the US to raise awareness about Frampton and secure funds for his defense. As reported in the August/September *APS News*, Williams helped launch the website HelpPaulFrampton.org, which attracted the support of many UNC faculty members, academics in the United States and Europe and a Nobel laureate.

"We were really surprised. We thought he had a really good chance of being acquitted," Williams said. "We were shocked and disappointed."

Williams spoke to Frampton briefly after the verdict was handed down. He said they planned to appeal the decision but it is unclear how long the process would take.

"On the surface he was taking it very well. He didn't break down or anything like that," Williams said. "Maybe it takes a while for it to sink in."

Frampton was held at Argentina's Villa Devoto prison for nine months before being transferred to house arrest for health reasons. The judge has allowed his sentence to be served under house arrest as well.

Frampton's defense was that he had been tricked by drug traffickers into carrying the suitcase for them, and had no idea what was hidden in its lining. The prosecutors at the trial emphasized text messages Frampton sent to whom he thought was Milani saying that he was "worried about the sniffer dogs," and "looking after your special little suitcase."

Williams said that there was little context presented for the messages. In emails Frampton wrote to another friend in Canada, he made similar comments about the dogs. However he claimed he was joking in both instances.

"Only one side of the story has come out," Williams said. "These reports are almost entirely from the point of view of the prosecutor… so far we've really only heard one side of the story."

While the appeals process slowly moves forward in Argentina, Frampton and his supporters have also been fighting to get the university to reinstate his salary after it was cut off in March.

The provost of the university suspended Frampton's salary because he would be unable to teach his class during the spring semester; however, Frampton contends that the class was canceled before he went to Argentina. He and his supporters maintain that the university superseded its own regulations when it suspended his salary without holding a hearing beforehand.

Frampton filed a complaint with the school's grievance committee who in turn filed a report supportive of Frampton to the provost in late September. The provost decided against reinstating the salary. That decision was then appealed to the chancellor of the university, who also decided against Frampton. The decision was appealed again to the school's board of trustees, the highest level of appeals, who will likely render a decision by the end of January.

"This whole issue is completely independent of whether Paul was convicted," Williams said, explaining that the university acted before he was found guilty.

There is also a lawsuit pending against the university, on hold until after the decision from the board of trustees. The university is also considering whether it should fire Frampton; however, it will likely not take any action until after his appeal goes through in Argentina.

Leading the Search to Find ET is No Gamble to this Physicist

By Alaina G. Levine

Gerry Harp hates the film "The Day the Earth Stood Still." The physicist, who took over the reins of the SETI Institute in July 2012 from its longtime leader Jill Tarter, thinks the movie about aliens attacking Earth doesn't do much to enhance the reputation of the beings he is hoping his team will find. But he views part of his role, as Director of the Center for SETI Research, as playing PR Rep for both the Institute and its potential extraterrestrial collaborators.

"We haven't done a good enough job of getting the word out about the science behind SETI," Harp acknowledges. "SETI has a hard enough time getting respect in the public," let alone the scientific community. "There's a reputation aspect. It's undeniably true."

Part of the challenge, he notes, is that SETI, whose mission is "to explore, understand and explain the origin, nature and prevalence of life in the universe," is too often considered to be a research and career gamble.

"Ask undergraduates if they want to join SETI and they answer

Gerry Harp

in the affirmative," he explains. But towards the end of college, if

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detectors, the LBNE commission recommended building the next-generation liquid argon detectors at the surface of the Homestake mine to keep the project under its $850 million budget.

"The issue is that the cost is higher if you build things deep underground than if you build them on the surface," said Jim Siegrist, Associate Director for High Energy Physics in the Department of Energy's Office of Science. "Surface construction is so much cheaper."

The review essentially changed the experiment into a multi-staged project. The first phase would be built above ground, and future phases would be built below, using the first phase's infrastructure.

However building the detectors on the surface puts limitations on the science. Project managers were able to save the project's experimental next-generation liquid argon detectors, though they were reduced from 34,000 gallons to 10,000. The DOE wanted to keep argon, with its potential to be more sensitive than established water Cherenkov detectors, to push the boundaries of current technology. But because the detectors won't be shielded by nearly a mile of solid rock, they will be susceptible to cosmic rays and other background radiation. This shouldn't be enough to affect the hunt for the mass hierarchy of neutrinos, but will likely eliminate the ability to find rarer particle events.

"The chance to look for astrophysical supernovae or the decays of protons is precluded," Siegrist said. Proton decays, if they take place at all, are extremely rare and their signature would be totally lost amongst the background of cosmic ray interference. Scientists had also hoped to look for neutrino spikes that corresponded with supernovae.

The project's administrators remain hopeful that there might still be a way to move the detectors down into the mine below.

"One of the reasons to choose the Homestake site is to keep the possibility open for putting the detector underground," said Milind Diwan, a physicist at Brookhaven and spokesperson for LBNE. "It is certainly our desire to have the first-phase detector put underground. But that desire requires additional funds."

The additional cost to locate the detectors underground in the mine is estimated to be between $130 and $140 million, which would have to be raised in about two years.

"Things are arranged so that there is time for foreign contributions to come in," Siegrist said. "We're some years away from construction… it has sort of a long lead time so we can get these issues figured out."

He added that they had already been in talks with several foreign partners in hopes of bringing them on board. He said that the CD-1 approval shows the DOE's commitment to the project, and would help encourage investment from abroad.

"There's some interest from Asia and we're trying to get our European colleagues interested," Siegrist said.

He noted that the DOE's flat budget over the last three years has forced the agency to make tough choices about priorities.

"If we're going to raise the amount we're putting into construction, then we have to lower the amount we're putting into research and facility operations," Siegrist said. "Our operations costs aren't spiraling out of control while we're building these other projects, so that's a good thing."

Scientists working on LBNE fought hard to keep funding for the underground detectors in the project's budget. At the August High Energy Physics Advisory Panel meeting, scientists strongly urged the Department of Energy to spring for the underground detectors. Many voiced the concern that the US might miss out on important discoveries by not locating the detectors underground.

The shielded underground detectors offered scientists the best hope of detecting decaying protons for the first time. If the United States doesn't build underground detectors until a later phase of the project, some years from now, another country could in the interim make the discovery.

However Diwan said that because proton decay was part of the original design of the detectors, the United States is far ahead of any other nation that might be hunting for the elusive process.

"I do not think we have competition for quite some time," Diwan said. "Compared to other regions we are quite far ahead. That is because we have a team in place. That is very important. We have a design for a project that is generally accepted as a sound design by everyone and we have a site selection."

Japan right now is the leader in neutrino detectors, but would still need to upgrade. In addition, CERN has the particle beams, several potential sites and has commissioned studies to look into the possibility of hunting for proton decays.

"They certainly could do this," Diwan said, "It's a question of priorities and funds."

The next step in the process is for Fermilab to reconfigure its beamlines, which should start around 2015. LBNE is expected to pass CD-2, its next round of approval, the following year which will settle on a final cost estimate and construction schedule. If all goes according to plan, the experiment should start taking data in 2023.

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Next on the list is international engagement. When you look at the journals, you see that US authors account for only one third of the papers. There's nothing wrong with that–science is a global activity. But APS has to make sure that it is engaged globally and internationally, and to figure out what its role is. I don't think its role is to be the World Physics Organization. We are the American Physical Society, but we have to be globally engaged.

Last but not least on this list is diversity, and that's been a really stubborn one for physics. When I was a graduate student, if you looked at law, medicine and business, those careers were dominated by white males and law, medicine and business have largely transitioned to being much more diverse occupations, and physics has not. Physics flourishes on a diversity of ideas, and I think our survival depends on physics becoming more diverse. APS has to be an agent for change.

What will be your main focus during your presidential year? What approach will you take towards achieving these goals?

My overarching goal is making sure that physics is as rewarding and exciting for young physicists as it was for myself and others. And I think if that's our north star, watching out that physics is still that exciting adventure for our younger scientists, we'll be fine.

Specifically, this next year is going to be important for advocating for basic research, science and physics, and making sure that the public understands the value of science. Science makes so many things happen; people don't even recognize the invisible hand of science. Making the public realize that science really matters, whether it's medicine or electronic devices, or jobs–science makes a big difference. I think this year, a continuing focus is to make sure that we transition to this digital publishing age where our journals are still number one, are on a financially strong footing and, as our objective states, are advancing and diffusing the knowledge of physics.

How well do you think the Society is serving its members? Are there any areas where you think APS programs could be enhanced?

I think so. One of the things that strikes me is the good will that our members have towards our Society. There are other societies where their members grumble about the society, or don't like what their society is doing, and our members feel really really good about the APS and what it does. My two predecessors, Barry Barish and Bob Byer, helped develop a strategic plan for the Society to look forward, to make it better and to better serve the members. The running joke in APS is "Our members love us, and the reason they love us is *Physics Today*" and of course *Physics Today* is published by the AIP. But the good news is that our members love us, and we need to better serve them. I'll just give one example of where I think we can better serve them. We hold big meetings where we bring physicists together, and everybody I know who attends the March Meeting feels that it is a must-attend meeting. The attendance is growing, and probably this year we'll break 10,000. However, I think at the moment people would not view the April Meeting as a must-attend meeting. So one way that we can better serve our members is to improve our meetings, starting with the April Meeting. The second bullet of the strategic plan is better serving physics, and the meetings come into play there. The third bullet is better serving society, giving advice to the government. I mentioned that the problems facing our nation and the world require solutions that are scientific, and many of them involve physics. The last bullet is one that everyone will benefit from in the end, but in the short term may cause people to doze off–improving the organizational excellence of APS. In 2019, APS will celebrate its 120th birthday, and all organizations have to change with time. I think that it's incumbent on those who serve as President to ask how the organization can improve so that it serves everyone better.

What do you see as the Society's role in public policy?

It's really two-fold. First is looking out for physics and looking out for basic research. Second is giving advice to the government. You couldn't pick a better example than energy. I think physicists invented the idea of energy, so we know a lot about it. What is this country going to do to satisfy its energy needs? For example, one issue that I think our Panel on Public Affairs will be considering is the lifetime of nuclear power plants. This country has more than 100 nuclear power plants and some of them are reaching their original planned age. Can they be extended, or can they not be extended? That is an area where we can provide advice to the government. I believe we want a country whose decisions are fact-based and science-based and that is where APS can play a role.

What do you see as the Society's role on international issues?

Increasingly science has become a global activity. Thomas Friedman is famous for saying "the world is flat," and I think science is pretty much there. There is roughly equal scientific activity in the three geographic regions of Asia, the Americas and Europe. The era of American dominance that we have all been familiar with for the last 50 years is gone, but not the era of American leadership. So an important aspect facing APS is how we operate in this more global science world. I don't see us becoming the world's physics society, but I see us becoming an American Physical Society that is globally engaged. There will be lots of areas where we can work more closely together with other physical societies, such as public policy, meetings, and publishing, in service to physics and science.

In recent years, APS has been increasing its focus on education and outreach. What do you think of these efforts and how will you guide them?

I think APS really plays an important role in physics education. Let me just take one example, PhysTEC, where we're acting as a coordinator and a convener to help solve a national problem, which is the lack of well-trained physics teachers. APS can't solve this problem alone, APS is not going to train teachers, but we have the power to convene and bring the physics community together, and PhysTEC is really starting to make a dent on this important problem. There are other areas in terms of physics curriculum and physics education, and we have a role in doing this because the physics community needs to shape its own future and make sure it's a bright one, and we need to do this for the nation.

How will you guide APS through the current difficult economic times?

First of all, in mid-December [then APS President] Bob Byer sent out an action alert asking our membership to contact Congress and urge them not to go over the fiscal cliff and to find a solution. APS is a respected voice in Washington and we have to recognize that the nation does have fiscal problems. We can't continue with deficits at the level we have now, but if we're going to move forward and have a bright future we have to keep investing in science. I believe that our Washington office is the best public affairs office of any of the societies, so we're going to be playing an important role in a rapidly changing and difficult environment.

How did you become interested in physics?

The number one thing had to do with teachers, teachers in high school. I went to public school, so I'm a big advocate for public education. Then, as I went to college, at Caltech, one of my mentors was Barry Barish, who just recently served as APS President, and another was Richard Feynman. It was really teachers and mentors who got me into it. Of course, what keeps you in physics is the big exciting problems that physics addresses. The ones that are of the most interest to me involve cosmology, but if you look across the board in physics, the problems that physicists are addressing, the physics of living systems, energy, new materials and particle physics, among others, it's even more exciting today. Ultimately that is what gets people really hooked on physics–the kind of questions that we are able to address.

Why did you choose to run for the APS Presidential Line?

It has to do with the last question–getting into physics and realizing that it involved people and mentors. This is a way to give back and to make sure that physics is as exciting for the next generation as it was for me. I feel that the only way I can pay back my high school teachers and the physicists who mentored me and everyone else is to make sure that a career in physics or in science is as exciting and rewarding as it was for me.

It's easy to look at the problems that we face, the budgets and some people having negative attitudes towards science and all of that, but this is really a great time for physics. There are opportunities for discovery and contributing to solving the nation's and the world's problems, the number of physics majors is growing, the number of PhDs is growing, new scientific facilities are being built, this really is a great time for physics. That's the number one thing I don't think we should forget when we look at all the challenges ahead. It's easy to get bogged down in the weeds when you see that funding may go down a little bit and not everybody appreciates what science is doing, but this is a great time for physics.

ANNOUNCEMENTS

APS Congressional Science Fellowship 2013-2014

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

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

TERM OF APPOINTMENT is one year, beginning in September of 2013 with participation in a two week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

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

APPLICATION should consist of a letter of intent of no more than two pages, a two page resume, with one additional page for publications, and three letters of reference.

All application materials must be submitted online by January 15, 2013, 5:00 pm. EST.

http://www.aps.org/policy/fellowships/congressional.cfm

Biruni Award Nominations

The Iranian American Physicists Network has put out a call for nominations for its "Biruni Award" for graduate student research. The organization is looking for senior level graduate students of Iranian descent in either a masters or PhD program in the United States. The organizers hope to highlight research excellence amongst students of Iranian descent. **More information, including nominating information can be found at www.irapnetwork.org.**

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sity of Colorado and JILA will discuss her work on ultracold atoms and Bose-Einstein condensates. John Preskill of Caltech will highlight the promises and challenges of building a workable quantum computer.

Geoffrey West from the Santa Fe Institute will speak at an evening symposium titled, "Universal Scaling Laws from Cells to Cities; A Physicist's Search for Quantitative, Unified Theories of Biological and Social Structure and Dynamics." His talk will focus on how complex biological, sociological and economic systems seem to follow similar, almost universal scaling laws. West's work indicates that physics can offer new insights into the structure, dynamics and organization of these kinds of systems.

Lisa Randall, Harvard physicist and author of several popular physics books, will give a public talk at a session organized by the American Institute of Physics. She will be speaking about her career and the future of science.

The recipients of many of APS's prestigious prizes and awards will be honored at a special ceremonial session on Sunday evening.

Students attending the meeting have a variety of events just for them. On Friday, APS will host a career panel focused on non-academic careers students can pursue. Also during the meeting will be a panel where graduate students will share their experiences and answer questions about graduate school.

The Society for Physics Students will be holding a series of special sessions at the meeting for undergraduate research presentations. Students will share their research through posters and lectures. Following the sessions, awards will be given out to the top presenters in each category.

Exhibitors from a range of publishers and other vendors will have booths set up around the hotel to display their products.

Meeting attendees will have the chance to stop by the APS Contact Congress booth to send letters to their elected officials about the importance of continued Congressional support for scientific research.

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ible. Then physicists Jean Bernard Leon Foucault and Armand Fizeau improved the process sufficiently to photograph the Sun in sufficient detail that sun spots could be seen for the first time.

Several inventors experimented with glass as a basis for negatives, but the silver solution wouldn't stick to the shiny surface. By 1848, Abel Niépce de Saint-Victor (a cousin of Nicéphore Niépce) came up with the idea of coating a glass plate with egg white mixed with potassium iodide, and then washing it with an acid solution of silver nitrate. The result was fine detail and vastly higher quality, but–yet again–it required prolonged exposure.

Three years later Frederick Scott Archer introduced the wet collodion process, coating glass plates with a viscous liquid, which reduced exposure time to a few seconds. However, there were tradeoffs: It was still a "wet" process, requiring that all the equipment be on-site at the time the picture was taken. In 1871, Richard Maddox found a way of using gelatin instead of glass as the basis for the photographic plate, and developed a dry plate process that could produce photographs much more quickly.

Eventually, all these innovations caught the attention of American inventor George Eastman, who founded his own company based on a machine he invented to coat photographic plates with an emulsion, automating the process so photographs could be made much more quickly, in greater numbers. In the early 1900s, the Eastman-Kodak Company collaborated with several astronomical observatories, using that input to improve their emulsion technology to make a process that was even more sensitive to light.

The photographic plate dominated astronomical imaging for much of the 20th century, boosted by the use of color filters, until the advent of digital photography and CCD cameras made such labor-intensive processing obsolete. Daguerre died of a heart attack on July 10, 1851, just outside of Paris, but he undeniably left his mark not just on astronomy, but the world at large. His name is among 72 inscribed on the Eiffel Tower.

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you inquire again, they'll say no, he says, because they view SETI science as potentially "high risk," and they think "if we don't find the signal in my career, my career will go nowhere."

But "this endeavor is not as long a shot as people think," he says. "The technology is growing exponentially, especially signal processing, as computers are getting faster. Every six years our search speed is increased by a factor of 10. It's not like we're looking at star after star after star at the same rate." As the telescopes have improved, so has their ability to find new worlds which may be candidates for inhabitability of some form of life. Currently, many hundreds of exoplanets have been confirmed. And yet, "even though we're experiencing all this exponential improvement, we're looking at billions of star frequencies at one time," he notes. "There are so many stars in the galaxy, that that is a drop in the bucket, equivalent to one cup of water from the ocean."

SETI does have its fans among the lay community. Over 240,000 of them follow the Institute on Twitter. "SETI is a very interesting topic for the US public at large," he says. "We have an overwhelmingly large number of people who think this research should be pursued."

Harp didn't begin his career with extraterrestrial aspirations. As a physics graduate student at the University of Wisconsin-Milwaukee, he specialized in quantum mechanics, and in particular electron holography. He invented a new type of photoelectron microscope and composed new computational methods able to provide 3D images of atoms. After he graduated in 1991, he soon found a tenure-track position at Ohio University where he stayed for six years.

It wasn't until 2000 that Harp joined SETI, initially as a Senior Software Scientist, and later as a Senior Astrophysicist. He realized that the work he had done as a doctoral student could be applied in astronomy to look for alien signals in new ways. "The difference between a hologram and a regular photograph is that holography preserves information about the particles' (electrons' or photons') direction of arrival at the photographic plate," he explains. "In radio astronomy, this direction of arrival information (encoded as the signal's phase) can be directly digitized from the radio antenna." His research led to a technological breakthrough in which the Allen Telescope Array (ATA), the principle SETI observatory, could detect noise coming from Earth and use something like holography to determine the direction from which a signal arrives and rule out potential signals that are not coming from space.

Now, as Director, he plans to implement new techniques that will "greatly enhance the number of different signal types we can be sensitive to, including conventional carrier waves (think, AM radio) as well as various wide-bandwidth signals like those used for satellite communication on Earth," he says. "We shall test for literally billions of signal types never probed before." .

Harp hopes to attract more talented scholars to SETI. "We find the best people to bring in are mid-career scientists who have already established themselves," he says. Given all the technical enhancements, this is a great time to step up recruitment, he indicates. He is furthermore encouraging more publications relating to SETI research. "SETI scientists should be writing more papers and getting the kind of attribution they deserve," he says.

This PR push is vitally important given their uphill battle. "We once thought there was a possibility of civilization around every star," notes the physicist. "Now we can say no–life is rare, even bacteria…As we gain more and more knowledge about ourselves, we realize how special we are compared to the rest of the universe."

Yet he is optimistic. "If I had to bet, intellectual extraterrestrial life is in this galaxy. It's way too big for it not to be." Moreover, "they won't look like humans. [But] their radio technology will be similar to ours because the physics is the same."

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The Back Page

The Benefits and Risks of Laser Isotope Separation

Editor's Note: *Last summer, the Federation of American Scientists (FAS) hosted a debate on its website (www.fas.org) between Mark Raizen, Professor of Physics at the University of Texas, Austin, and Francis Slakey, Associate Director of Public Affairs at APS. The subject of the debate was* "The Benefits and Risks of Laser Isotope Separation." *The text of their debate, reprinted with permission from FAS, follows below.*

Mark Raizen

Our planet contains vast natural resources, still largely untapped. These resources hold the promise of detecting and treating cancer, saving energy, making new materials, and advancing basic science. What are these valuable resources? Where can they be found? How can we make them available?

The answer to the first question is that the resources are rare isotopes of the elements. The answer to the second question is easy: these isotopes are literally in our midst, within the elements that make up our planet. The third question is the crux of the matter; isolating rare isotopes of elements has been extremely difficult because they have nearly the same physical and chemical properties as other, more common, isotopes of the same element. This is the reason that many rare isotopes are the most expensive commodity on Earth,whose prohibitive cost severely limits the exploration of new applications and therapies.

Here are just two examples of rare isotopes that could be widely used if only they were less expensive : Nickel-64, a stable isotope with a natural abundance of only 1 percent. It can be converted in a medical accelerator to Copper-64, which is a short-lived radio-isotope with great promise for PET scans and cancer therapy. Calcium-48 is a stable isotope with a natural abundance of 0.2 percent. It is used as a diagnostic for osteoporosis in women, bone development in children, and for a basic physics experiment that may determine the mass of the neutrino.

The only general method for separating such isotopes dates back more than eighty years. This method, known as the Calutron, is today only operating in Russia, with an obsolete technology that is facing imminent shutdown. Without an alternative approach, most rare isotopes will not be available in the future at any price. The looming shortage of crucial isotopes is a national priority. As discussed in a 2009 report of the Nuclear Science Advisory Committee to the Department of Energy, "Isotopes for the Nation's Future," one alternative is laser isotope separation. Although isotopes are almost identical in every manner, the wavelengths of the atomic transitions of different isotopes are slightly shifted from one another.

This "isotope shift" makes it possible to excite only one isotope with a narrow-band laser, leaving the others unaffected. The common wisdom until now has been that one must use lasers to selectively ionize the desired atoms. However, it turns out that in order to have a large probability for ionization, very high laser power at multiple colors is required. The scale is so large that it required a government effort, with one dedicated goal: laser isotope separation of uranium. This effort was ultimately terminated in 1999, mainly due to the high cost and complexity of the lasers, and to the best of my knowledge is not being pursued. Laser separation of a molecular compound of uranium is still being pursued commercially by GE-Hitachi. I have followed this work from a distance, and always felt there must be a solution which would be simple and cost-effective for the many smaller-scale isotopes that are needed. It came from an unexpected direction.

Over the past few years, my research has focused on developing general methods for controlling the motion of atoms in gas phase. The successful realization of these methods uses single photons to control the magnetic state of each atom, followed by magnetic manipulation. This work is reviewed in an article that I wrote for *Scientific American*, published in the March 2011 issue. I realized that these very same methods can also be used for efficient isotope separation with low-power solid-state lasers, a paradigm shift from ionization. We are pursuing this avenue with a proof-of-principle experiment, soon to be completed. This will then be applied commercially towards production of important medical isotopes, where the need is most urgent. In fact, this could save your life!

A Primer on the Technical Issues

Uranium enrichment is a step in the process to convert uranium ore into either fuel for nuclear reactors or material for nuclear weapons. Mined uranium ore is made up of roughly 99.2% U^{238} and 0.72% U^{235}. Only the latter isotope is fissionable, and so in order to make reactor fuel or weapons material, the U^{235} concentration must be increased.

Over the last 60 years, enrichment technologies have shown exponential improvements in efficiency, which could benefit the world by providing somewhat cheaper nuclear energy, although fuel cost has never been the primary driver of the cost of nuclear power. Those improvements can also come with increased security risks.

The proliferation risks of an enrichment technology can increase as the technology becomes more efficient. In general, if the enrichment facility occupies a very small space, its construction may no longer be observable through satellite surveillance. And, if it operates on very low power, it may no longer require an observable dedicated power source or have a detectable heat signature. An extremely efficient enrichment facility could be below the detection limit thereby creating substantial global security risks.

APS has petitioned the Nuclear Regulatory Commission to require applicants for an enrichment or reprocessing license to provide an assessment of the potential proliferation risks that construction and operation of the facility might pose.

We live in exciting times, as we learn to control the physical world on the atomic and molecular scale. These are powerful developments that can bring many benefits to mankind, but can also be intimidating to some. In particular, the topic of efficient isotope separation can evoke a fear of nuclear proliferation, but is that really true?

In fact, our methods will actually be used to reduce the risk of proliferation. How can that be? Consider Technecium-99m (Tc-99m). This short-lived radio-isotope is used for medical imaging and is a major tool in nuclear medicine. Today, all Tc-99m is produced using weapon-grade uranium as a target in a nuclear reactor. The need to use such weapon-grade uranium poses a serious risk of proliferation, and the US has led a worldwide effort to halt this mode of production by 2016. An alternative is to enrich a stable isotope, Molybdenum-100, which can be converted to Tc-99m by a clean nuclear process. You can read more about this topic in an excellent article by Tom Ruth (published in the October, 2009 issue of the newsletter of the APS Forum on Physics and Society and available online–Ed.). Our method of laser isotope separation can be used to produce enriched Molybdenum-100, and will therefore be an important tool in stopping nuclear proliferation.

Could our method be used for enrichment of uranium? That is a valid concern, and we should certainly pause and reflect, as suggested by Francis Slakey. My best guess is that the application of our method to uranium is unlikely to be competitive with existing methods.

The basis for our approach is laser activation of the magnetic state of an atom, requiring a relatively simple atomic structure. Uranium has a very complex structure, which may not be amenable to this new process. It is perhaps tempting to say that a method for enriching one isotope could also be applied to another. However, each element is unique in its physical and chemical properties. For example, the starting point for most atomic laser separation projects is to heat the solid material and vaporize it, forming an atomic beam. According to unclassified documents on the laser uranium separation project, it took years to find materials that do not react chemically with hot uranium metal. In contrast, many elements, such as calcium or ytterbium, are routinely used in atomic beams in research laboratories and do not have those problems. Similarly, the atomic structure and required lasers are unique to every atom.

With so many evident benefits we should not fear the future. We should look instead to the past and be inspired by the words of the great Marie Curie who said: "I am one of those who think like Nobel, that humanity will draw more good than evil from new discoveries."

Francis Slakey

Over the last 15 years I've criss-crossed the globe and witnessed its full range of stories. And when you see dust kick up from the bare feet of a tribeswoman walking 5 miles to get water, you realize that we face enormous global challenges, including climate change, pandemics and access to clean water, to name just a few. Regardless of our individual views on any of those issues, I'm sure that we can all agree on one thing: let's not add more challenges to the list. We have enough to deal with.

So, when the research that we carry out has the possibility of creating significant risks, then we should pause, reflect, and make sure that we don't add yet another burden to an already challenged world.

Biologists did just that–pause and reflect–in exemplary fashion a few months ago when they confronted the H5N1 issue. Concerned about potential security risks associated with publishing particular work on airborne transmission of avian flu, the relevant community of biologists put a self-imposed pause on research to consider the implications and challenges. It was thoughtfully done, with only modest reluctance from some scientists, and with benefit to all.

We are now at a moment when it would be fruitful for the relevant members of the physics and engineering communities to carry out a similar examination of the risks and benefits of some areas of isotope separation research.

So far, we've gotten lucky in uncovering when countries are developing nuclear weapons programs. However, new isotope separation technologies are emerging that are smaller, more efficient and harder, if not impossible, to detect. The technologies are in various phases of development, from basic research to commercialization. Consider this:

Global Laser Enrichment, a joint venture of General Electric-Hitachi, is constructing and evaluating a laser-based method of uranium enrichment (SILEX) that is substantially more efficient and could leave little prospect for detection if stolen and acquired by a rogue group.

Mark Raizen has developed a method of single-photon isotope separation using a magnetic trap and low-power laser excitation for a more efficient method to develop much-needed medical isotopes. His technique isn't intended to enrich uranium, although the potential may well be there.

These developments raise the same issue: the on-going push for greater efficiency in isotope separation carries associated proliferation risks.

These risks of more efficient isotope separation are well known to the US government. For example, the SILEX technology under development in North Carolina was the subject of a multi-agency proliferation-assessment report, which conceded that "Laser-based enrichment processes have always been of concern from the perspective of nuclear proliferation…a laser enrichment facility might be easier to build without detection and could be a more efficient producer of high enriched uranium for a nuclear weapons program."

The report ominously stated that it seemed likely that the technology would "renew interest in laser enrichment by nations with benign intent as well as by proliferants with an interest in finding an easier route to acquiring fissile material for nuclear weapons."

So the risks of enrichment technology are well documented, and the consequences of the proliferation of the technology are clear and present, most immediately in Iran.

Of course, the easiest path for our research community would be to claim that these risks are someone else's responsibility–we are scientists after all, not police. Yet, the biologists didn't take that easy path. They broadened their sense of responsibility outside of the lab. They paused, considered, deliberated. And there is a practical reason for doing this. If scientists don't consider the risks, we leave it to others to decide. And we may not like what they conclude.

What would we conclude from pausing and carrying out our own "stress test"? I can't predict the outcome. In the case of the biologists, they strengthened their system with a centerpiece called the National Science Advisory Board for Biosecurity that monitors "dual-use research of concern" and it has received enthusiastic endorsements from scientists. The biologists came out of the process stronger. So can we.

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