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Focus on Northwest Section
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Physical Review X Out of the Gate

The premier issue of *Physical Review X*, the new APS open access journal, hit the virtual newsstands on September 30th. *PRX's* first twelve papers, in what will be a quarterly journal, span a broad spectrum of fields and are all of high scientific quality. Unlike other APS journals, which are mainly supported by subscription revenue, *PRX* is supported by an article-processing charge of $1500 for papers of less than 20 standard *Physical Review* pages, with small incremental charges for longer papers.

According to the editors of *PRX*, not only are articles being submitted from fields in which APS usually publishes; but the new journal is also deliberately and actively giving attention to subject matter that goes beyond the traditional coverage. For example, the first paper in the first issue, by proposing and exploring a physical model that incorporates natural human-mobility patterns, challenges established models for the spread of epidemics, and has, since its publication, received attention in several national media. Another paper comes from the area of electronic-devices research, reporting the fabrication of new nanowire-based electronic diodes and demonstrating their ultrafast operating speeds and controllability. A third paper, also covered with a Synopsis in *Physics*, brings acoustic levitation and x-ray diffraction techniques innovatively to bear in processing pharmaceutical drugs into desired, highly soluble amorphous forms–an increasingly important goal for the pharmaceutical industry.

"We are also striving to set a high standard for *PRX's* editorial

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APS Helps Deconstruct the iPad on Capitol Hill

By Mary Catherine Adams

Congressional staffers gathered at the Rayburn House Office Building in Washington on Sept. 21 to learn about how basic science research was integral to the development of the iPad–a tool many on Capitol Hill use daily.

In an effort to persuade Congress to invest in scientific research, the APS, participating with the Task Force on American Innovation (TFAI) and several other organizations, hosted an event called Deconstructing the iPad: How Federally Supported Research Leads to Game-Changing Innovation, which specifically targeted conservative freshman members of the House.

"Our goal was to inform members of Congress on how technologies in the iPad are rooted in early-stage scientific research," APS press secretary Tawanda Johnson said before the event. "We're advocating for investment and for support for scientific research." There wouldn't be an iPad for

Photo by Brian Mosley/APS

Luis von Ahn, of Carnegie Mellon University and founder of ReCAPTCHA, moderated the briefing. To his right are Martin Izzard, of Texas Instruments; William Phillips, Nobel Laureate from NIST; and Benjamin Bederson, of the University of Maryland and Zumobi, Inc.

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Nobels Honor Discoveries of Accelerating Universe, Quasicrystals

Three astrophysicists, two of them US-based, were awarded the 2011 Nobel Prize for physics for "the discovery of the accelerating expansion of the Universe through observations of distant supernovae", and, in an unusual twist, this year's chemistry prize was awarded to research first published in *Physical Review Letters*.

The Nobel Prize Committee awarded half of the physics prize to Saul Perlmutter at Lawrence Berkeley National Laboratory, while the other half was split between Brian Schmidt at the Australian National University and Adam Riess at Johns Hopkins University. The chemistry prize was awarded to Dan Shechtman of the Technion–Israel Institute of Technology for his discovery of quasicrystals.

In the mid 1990s, the two research teams that were headed by Perlmutter and by Riess and Schmidt respectively, examined the redshifts of distant supernovae to measure the expansion of the universe. They both independently published findings in 1998 announcing the unexpected conclusion that the universe appears to be accelerating as it expands. The discovery came as a complete surprise to the field, and its cause remains one of the biggest mysteries in cosmology.

"Not only do we not know what dark energy might be, that would be making the universe expand faster and faster, we don't even know whether really the answer will turn out to be a new energy in the universe," Perlmutter said in an interview with Nobel Media following the announcement. "It's possible that we've just discovered an extra wrinkle in Einstein's Theory of Relativity, and that that would be the real final result. But at this point, the job is really back in our court again as observers, and we have to come up with more data that will help narrow in on what the answer is."

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Redesigned Website Merges *Physics* and *Focus*

The APS online publication *Physics* recently underwent a redesign and merged with another online APS publication, *Physical Review Focus*. With the newly upgraded website, readers can more easily navigate through the articles and find links to related content.

Physics was started about three years ago as a resource for physicists to keep up with the latest research developments across all fields covered by APS journals. The articles and commentary are written by current researchers to highlight important *Physical Review* papers to other physicists working in other fields.

"It is really targeted at those who are interested in what's going on inside the journals but don't have time to read the 20,000 pages per year," said *Physics* editor Jessica Thomas.

Focus has traditionally had more of a journalistic feel to its articles. Since it was created in 1998, it has highlighted new and exciting research coming out of the journals, with an eye to appeal to a broader audience, including students, scientists in other fields,

WEBSITE continued on page 7

Fermilab Plans to Up the Intensity

By Michael Lucibella

When Fermilab's Tevatron shut down for good on September 30, it was in part acquiescence to the fact that the United States had for the foreseeable future ceded to Europe its place at the cutting edge in high energy particle colliders. When brought to its full potential, the Large Hadron Collider at CERN will be able to create particle collisions seven times more energetic than the Tevatron could ever hope to achieve. The Tevatron had been the centerpiece of Fermilab for 28 years, but with its shutdown the lab has begun a process of reinventing itself to probe questions about the nature of neutrinos, matter-antimatter asymmetry and other new physics at the intensity frontier.

Long the leader at the energy frontier with the Tevatron, Fermilab is now looking to explore the intensity frontier, in hopes of detecting very unusual interactions that hold clues to new physics. The transition from one focus to the other is a gradual one, as there is still much to take care of after the Tevatron shut down.

"The energy frontier is still going to have Fermilab participation. Many of our staff are engaged in the CMS experiment at the LHC, so we're continuing in that sense on the energy frontier as collaborators," said Bob Tschirhart, a researcher at Fermilab. "For the next few years we're going to aggressively analyze our own data and collaborate with CERN."

There are mountains of information left over from the final run of the Tevatron. It could be as many as two years before the last of its collisions have been analyzed. In addition, the lab will help analyze data coming out of the LHC and even has a remote operating room to keep the LHC beams running when it's night in Geneva.

Over the next couple of years, neutrinos will take their place at the forefront of the lab's research. They've been one focus already, but as time progresses their share of the experimental activity will increase.

"Neutrinos will be one of the flagships," said Sam Zeller, co-coordinator of the MiniBooNE experiment.

The neutrino projects that Zeller and other researchers are working on are part of a long-term plan to build bigger and more sensitive detectors that can probe questions like the hierarchy of neutrino masses and neutrino mixing angles.

FERMILAB continued on page 6

Philly Fellow-fest

Photo by Darlene Logan

On September 15, APS hosted a reception in Philadelphia for APS Fellows from the area. In addition to conversation and refreshments, the Fellows who attended heard from APS past President Curtis Callan of Princeton, and from Executive Officer Kate Kirby, Treasurer/Publisher Joe Serene, and Editor in Chief Gene Sprouse. They were also brought up to date on political issues by APS Director of Public Affairs Michael Lubell. In the photo are (l to r) APS Fellows Marsha Lester of the University of Pennsylvania, Elizabeth McCormack of Bryn Mawr, and guest Jeff Bush.

Members in the Media

"Physics is a true canary in the mine, so to speak, of judging America's capabilities in terms of science… If you let physics go, it's symptomatic of the fact that something has eroded in the intellectual capacity of academic institutions."

***Carlos Handy**, Texas Southern University, on proposed program cuts throughout the public universities of Texas,* The New York Times*, September 15, 2011.*

"Until now, most faculty members thought their role was to do research and teach courses they were assigned…Now, researchers at institutions in Texas are going to have to take responsibility for students graduating successfully."

***Michael Marder**, University of Texas at Austin, on proposed program cuts throughout the public universities of Texas,* UPI*, September 26, 2011.*

"This is ridiculous what they're putting out… Until this is verified by another group, it's flying carpets."

***Drew Baden**, University of Maryland, on faster than light neutrinos,* The Associated Press*, September 23, 2011.*

"If it's correct, it's phenomenal… We'd be looking at a whole new set of rules."

***Robert Plunkett**, Fermilab, on OPERA's claim of faster than light neutrinos,* The Washington Post*, September 23, 2011.*

"Probably not. But Maybe! Or in other words: science as usual."

***Sean Carroll**, Caltech, quoted from his blog post talking about whether neutrinos really do travel faster than the speed of light,* USAToday.com, *October 9, 2011.*

"I don't think you're going to ever kill Einstein's theory. You can't. It works."

***Alan Kostelecký**, Indiana University, on OPERA's faster than light neutrino claims,* The Associated Press*, September 23, 2011.*

"There were all these wizards walking around, which was exciting for someone who didn't get to get his hands on anything… There's no way the LHC exists without the Tevatron."

***Christopher Quigg**, Fermilab, reflecting on the technical wizardry that went into building the Tevatron,* The Washington Post*, September 29, 2011.*

"High energy physics in the States has never fully recovered from the loss of the SSC."

***Roy Schwitters**, University of Texas,* The Washington Post*, September 29, 2011.*

"The idea is to look for things that happen very rarely, and the way to find them is to create lots of examples and see if you find something."

***Steve Holmes**, Fermilab, on the future of the laboratory at the intensity frontier,* CBSNews.com*, September 29, 2011.*

"It was a very interesting machine to work on in the first place, because we knew we were building something that had never been built before… It definitely has a personality, and that started right away."

***Roger Dixon**, Fermilab, reminiscing about the Tevatron,* NPR*, September 30, 2011.*

"Dark energy is incredibly strange, but actually it makes sense to me that it went unnoticed, because dark energy has no effect on daily life, or even inside our solar system…We know there is gravity because apples fall from trees. We can observe gravity in daily life. If we could throw an apple to the edge of the universe, we would observe it accelerating. Until the 1990s, there were few reliable observations about movement at the scale of the entire universe, which is the only scale dark energy affects. So dark energy could not be seen until we could measure things very, very far away."

***Adam Riess**, Johns Hopkins,* The Atlantic*, October 4, 2011.*

"Which of course is the only reason to win a Nobel Prize, to be able to park on campus."

***Saul Perlmutter**, Lawrence Berkeley Lab, on the perks of winning a Nobel Prize,* The Associated Press*, October 4, 2011.*

This Month in Physics History

Nov. 19, 1711: Birth of Mikhail Lomonosov, Russia's first modern scientist

***Ed. Note:** This month's column has been contributed by guest author APS Fellow Vladimir D. Shiltsev, Director of the Accelerator Physics Center at Fermilab.*

Mikhail Lomonosov was born November 19, 1711 into the family of a relatively free "state peasant"-turned-fisherman in a Northern Russian village near Archangel. In pursuit of opportunity he escaped from home at the age of 19 with just two of his favorite books of *Grammatica* and *Arithmetica*. After 800 miles and 5 weeks of snowy and frosty roads as part of a sleigh convoy with frozen fish, he ended up in Moscow, where, after telling a lie of necessity that he was a son of nobleman, he was admitted to the Slavic-Greek-Latin Academy of the Spassky Monastery. Half-starving on a stipend of 3 kopeks a day, in just 4 years he finished an 8 year course in Latin, Greek, Church Slavonic, geography, history, philosophy and the Catechism. From there he was sent to Sankt Petersburg Academy of Sciences ("the Academy") to continue his education among the 12 best students in 1736.


Mikhail Vasilyevich Lomonosov

In the fall of 1736, the Academy sent Mikhail to Germany. At the University of Marburg for three years he studied mathematics, chemistry, mining, natural history, physics, mechanics, hydraulics, and humanities with Christian Wolff (1679-1754)–a renowned encyclopedic scientist and philosopher, and a key follower of Leibniz–who came to highly regard Lomonosov's abilities. After spending 1739 in Freiburg studying practical mining with Johann Henckel, Lomonosov married Elizabeth Zilch and returned to Russia in 1741. There, on the merits of his numerous excellent study reports regularly sent from abroad and a glorious poetic ode to Empress Anna, he received an appointment as an Adjunct of Physics in the St. Petersburg Academy. He was the first native-born Russian Academician elected in 1745 and served as a member of Academy's Chancellery, in charge of all scientific and educational activities and departments, from 1757 till his death on April 15, 1765. Lomonosov was elected an honorary member of the Swedish Academy of Sciences (1760), the St. Petersburg Academy of Arts (1763), and a member of the Bologna Academy of Sciences (1764).

Sankt Petersburg Academy of Sciences was founded in 1724 by a decree of Peter the Great (1672-1725) who was advised by Leibniz. Though being totally dominated by foreign-born scientists, the Academy started off very well, attracting such notable scientists as Daniel Bernoulli (1700-1782) and Leonhard Euler (1707-1783). At the time of Lomonsov's return from Germany, the Academy had lost almost all of its talent, including Euler and Bernoulli, due to poor governance and budget inconsistencies. Lomonosov fiercely fought the situation, trying to get it back on the track set by Peter the Great. He succeeded in this challenge by increasing the number of scientific publications in Russian (in addition to Latin and German), and by insisting the Academicians deliver regular lectures in Russian. The result was a significantly increased number of Russian academicians as well as interns and students in the Academy's Gymnasium. In 1755 he founded Russia's first University in Moscow, now named after him.

The polymathic nature of this titan of the Russian Enlightenment can be gleaned from the content of his *Complete Works:* vols. 1-4–works on physics, chemistry, astronomy; vol. 5–mineralogy, metallurgy and geology, vol. 6–Russian history, economics and geography, vols. 7-8–philology, poetry, prose, vols. 9-11–correspondence, letters and translations. The depth of his insights is even more remarkable. Just in natural sciences alone, Lomonosov performed by himself more than 4000 chemical tests in Russia's first national laboratory and championed explanations of all physical and chemical phenomena on the basis of corpuscular mechanics in a continuous ether; he coined the term "physical chemistry" in 1752 and thought of absolute cold as a condition where the corpuscles ceased their linear and rotational motions. Seventeen years prior to analogous results by Lavoisier, Lomonosov experimentally proved the law of conservation of matter by showing that lead plates in a sealed vessel without access to air do not change their weight after heating (1756); based on the results of the first quantitative experimental studies of electricity in 1744-1756–which were quite dangerous as his colleague Georg Richmann was killed by ball lightning and Lomonosov himself "miraculously survived"–he proposed an original theory of atmospheric electricity that went beyond Franklin's, and explained with it lightning and the polar lights. Looking for a way to send meteorological instruments and electrometers aloft, he designed and built the first working helicopter model (1754). This used two propellers rotating in opposite directions for torque compensation and, powered by a clock spring, managed to lift itself slightly. During the transit of Venus on May 26, 1761 Lomonosov discovered the atmosphere of Venus by observing a bright aureole around the planet at the ingress and egress, and gave a detailed optical explanation of the effect by refraction. Thirty years before Herschel, in 1762, he invented and built a practical reflector telescope of a new type with the primary mirror tilted by 4 degrees so he could view the formed image directly in a side eyepiece; later that same year he invented a siderostat mechanism which allowed tracking of the stars by tilting a flat mirror in front rather than the entire 40-foot telescope.

Widely recognized as the foremost name in the history of Russian science, Lomonosov was, however, not well known in the West because among his contemporaries, the enormous breadth of his achievements, e.g., his works in grammar, mosaic art and especially poetry, outshone his work in Natural Philosophy. The lack of awareness was also due to the weak national scientific community till the late 1800's, to the lack of personal contacts with the West (except Euler), and, partly, to his relatively short life. His tercentennial is being celebrated statewide in Russia in 2011.

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Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: Budget and Authorization Environment

Fiscal Year 2012 Appropriations
Congress stepped back from the brink of a government shutdown for the third time this year and, following last minute histrionics, agreed to a temporary continuing resolution that would keep departments and agencies funded at Fiscal Year 2011 levels through November 18th. Senate and House appropriators passed separate bills that would fund science activities for Fiscal Year 2012 (FY12), but to date, no conferences have been held. It is widely anticipated that Congress will roll most appropriations for the new fiscal year into a series of "minibus" bills instead of passing twelve separate bills or rolling them all into one large omnibus. Congress will also use the ceiling of $1.043 trillion established in the Budget Control Act for discretionary spending instead of the $1.019 trillion cap provided in the House (Ryan) budget resolution. The higher ceiling should allow lawmakers to avoid making sharp reductions in support for science, as the latest versions of appropriations bills already suggest.

Energy and Water Appropriations: The FY12 bill passed by the Senate Appropriations Committee would fund the Department of Energy's Office of Science (SC) at the FY11 level of $4.84B, significantly less than the $5.42B presidential request. The bill would also provide $1.80B for Energy Efficiency and Renewable Energy (EERE), the same level as FY11 and $1.40B below the request, and $250M for ARPA-E, $70M above FY11 but $300M below the request. The House-passed bill would fund SC at $4.80B, EERE at $1.30B and ARPA-E at $180M.

The SC subprograms would receive the funding at the following levels:

- Advanced Scientific Computing Research (ASCR) [$422M in FY11]–$442M (Senate) and $427M (House);
- Basic Energy Sciences (BES) [$1.68B in FY11]–$1.69B (Senate and House);
- Biological and Environmental Research (BER) [$612M in FY11]–$622M (Senate), $527M (House);
- Fusion Energy Sciences (FES) [$376M in FY11]–$335M (Senate), $405M (House);
- High Energy Physics (HEP) [$796M in FY11]–$780M (Senate), $797M (House);
- Nuclear Physics (NP) [$540M in FY11]–$550M (Senate), $552M (House).

The Senate would provide no funding for FermiLab's Long Baseline Neutrino Experiment (LBNE), while the House appropriations report cautions DOE not to provide any construction funds for the Deep Underground Science and & Engineering Laboratory (DUSEL). With FermiLab's future at stake, Rep. Randy Hultgren (R-IL 14th) and Judy Biggert (R-IL 13th) held a roundtable discussion on DUSEL at FermiLab on September 28th, with participants Michael Turner, William Brinkman, Milind Diwan, Andy Lankford, Kevin Lesko, Jay Marx, and Pier Oddone. Both Hultgren and Biggert expressed strong concern about the appropriations restrictions on DUSEL and LBNE and pledged their support for FermiLab.

The Senate bill also eliminates funds for the $300M Argonne's Advanced Photon Source upgrade, pending DOE's decision on proceeding with expansion of the Linac Coherent Light Source facility at the SLAC National Accelerator Laboratory.

Commerce Justice Science Appropriations: The House and Senate CJS Appropriations bills, which fund the National Science Foundation (NSF), the National Institute of Standards & Technology (NIST) and NASA, would provide the following levels of support for FY12:

- NSF (Total) [$6.8B in FY11]–$6.70B (Senate), $6.86B (House).
  - Research and Related Activities (RRA) [$5.56B]: $5.44B (Senate), $5.61B (House).
  - Major Research Equipment and Facilities Construction (MREFC) [$117M in FY11]: $117M (Senate), $100M (House).
  - Education and Human Resources (EHR) [$861M in FY11]: $829M (Senate), $835M (House).

- NIST Core [$578M in FY11] – $560M (Senate), $571M (House).
  - Scientific and Technical Research and Services (STRS) [$507M in FY11]: $500M (Senate), $516M (House).
  - Construction of Research Facilities (CRF) [$70M in FY11]: $60M (Senate), $55M (House).
  - NIST Technology Innovation Program (TIP) [$45M in FY11]: $0 (Senate and House).

- NASA Science [$4.94B in FY11]–$5.10B (Senate), $4.50B (House). The Senate bill would restore funding for the James Webb Space Telescope, zeroed out in the House bill, and would bump JWST support $150M above the presidential request in order to achieve a 2018 launch. It would also cap the project cost at $8.00B.

The Senate reductions for both NSF and NIST were unexpected, given past support for these agencies by CJS Appropriations Chair Barbara Mikulski (D-MD).

Defense Appropriations: The House and Senate appropriations bills would both increase support for basic (6.1) and applied (6.2) research. For the 6.1 programs, funded at $1.95B in FY11, the Senate would provide $2.10B and the House, $2.08B. For the 6.2 programs, funded at $4.45B in FY11, the Senate would provide $4.73B and the House, $4.66B.

Labor, Health and Human Services Appropriations: The Senate appropriations bill would fund NIH at $30.50B for FY12, compared to $30.69B in FY11. The House appropriations subcommittee has yet to "mark up" its bill.

Be sure to check the APS Washington Office's Blog, Physics Frontline (http://physicsfrontline.aps.org/), for the latest news on the FY12 Budgets.

ISSUE: POPA

Several POPA Subcommittees proposed ideas for studies and related activities at the October 2011 meeting. The Subcommittee on National Security is in the early stages of planning a joint workshop/study in partnership with the Center for Strategic & International Studies (CSIS) on the downsizing of non-strategic nuclear weapons. The Subcommittee on Energy & Environment presented a revised proposal for an educational component associated with the Direct Air Capture Technology Assessment, which will now be sent to the APS Executive Board for approval. They are also researching the future of nuclear energy as a possible study topic. The Subcommittee on National & International Research Policy is considering a report on the issue of science-backed standards.

Since early May 2011 there has been considerable legislative activity associated with the Energy Critical Elements report; there are bills, both in the House and in the Senate, that support recommendations made in the report.

If you have suggestions for a POPA study, please send in your ideas electronically to http://www.aps.org/policy/reports/popa-reports/suggestions/index.cfm.

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Apker Finalists Get Together

Photo by Jay Pasachoff

Each year APS gives two Apker Awards for outstanding research by an undergraduate, one to a student in a PhD-granting institution, and one to a student in an institution not granting the PhD in physics. This year there were seven finalists, who met in Washington in early September to be interviewed by the Apker selection committee. The finalists each received $2000, with an additional $1000 going to their departments. After the interviews, the committee chose the two recipients to be recommended for approval to the APS Executive Board.

In the photo, left to right, are: Neal Pisenti (Harvey Mudd College); Alex R. Howe (Ohio Wesleyan University); Ruffin Evans (rear, University of Virginia); Bethany Jochim (front, Augustana College); Ken Van Tilburg (MIT); Yichen Shen (Johns Hopkins); and Djordje Radicevic (Princeton).

Science Journalism Can Save Lives

By Helen Chappell

Ed. Note: *Each year, as part of a program run by the American Association for the Advancement of Science, APS sponsors two media fellows, who spend the summer at a media outlet, learning the craft of science writing. Sometimes this leads to a career in journalism; sometimes it produces a scientist with a more nuanced understanding of how the media operate. In the following article, one of the 2011 APS media fellows, Helen Chappell, recounts her experience. An article by media fellow Sophie Bushwick appeared in last month's issue (available online).*

Most people who complete a summer fellowship can tell you that it taught them valuable skills, but not many can tell you that it saved their life.

For me, it's not much of an exaggeration. My summer as a science reporter at the *Raleigh News & Observer* certainly taught me valuable lessons, but one story I wrote helped me to figure out what triggered a dangerous allergic reaction.

The story's focus wasn't very glamorous: ticks. A community organizer wanted us to help raise awareness about Lyme disease in the state, and my editor agreed that an article informing readers about tick-borne diseases would be both interesting and in line with the paper's public service mission.

As I began researching the story, I found that the state legislature had just passed a set of budget cuts dismantling a program to study the population of disease-carrying tick species. My story morphed into an obituary for a research program. As a scientist, it frustrated me to be writing about valuable research only as it was ending. I interviewed the state's medical entomologists as they were literally packing up their laboratory.

Fittingly, while they spun out horror stories of tick bites and bizarre illnesses, I was scratching a tick bite I had received on a weekend walk in the woods.

One of their strangest tales was the story of a forest ranger who'd eaten meat his whole life, until he got a tick bite and suddenly couldn't eat beef. He wasn't

Helen Chappell

alone, they told me; an immunologist in Virginia had discovered that certain tick bites triggered a severe allergy to a sugar found in mammalian meat. Though it was fascinating, the meat allergy never made it into my final story.

The story's focus on budget cuts propelled it onto the front page and into our sister paper, the *Charlotte Observer*. Though it wasn't my best work, readers responded in droves. Some were grateful that I had highlighted an important research program; others saw it as an attack on the legislature. One woman even called asking for medical advice about a tick bite.

The huge response made me realize in a concrete way just how much our society depends on the media. Science journalism provides an especially critical service, connecting the public with information that would otherwise be inaccessible. But with print journalism's recent struggles, that information is vanishing from view.

Many papers can't afford to cover science–I was the only sci-

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Letters

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

Political Left-Right Asymmetry Explained

Like F. Smith and H. D. Greyber (August-September Letters) I was interested in Michael Lubell's July column, which reported on the Pew Foundation's poll that found that 55% of scientists considered themselves Democrats while only 6% were Republicans –leaving 39% on the fence.

Long ago at the University of Wisconsin I noticed faculty political differences during a period of political turmoil. Using the familiar, if simplistic, left-right scale, I found the humanity and social science faculty at the left, the science faculty center-left, the engineers center-right and the Ag-school faculty at the right.

Those who dealt with the spiritual were on the left, those who worked with the material were on the right.

In the interests of full disclosure, this physicist is registered on the voter's roll in Connecticut as an Independent–thus one of the 39% on the fence.

Robert K. Adair
Hamden, Connecticut

Consumers Have a Right to the Incandescent Bulb

Physicist-turned-Congressman Rush Holt supports legislation banning conventional incandescent light bulbs (Back Page, August/September *APS News*). His statements about the legislation are misleading. Worse yet, his support of the ban embodies an elitism that supplants people's right to choose with authoritarian dictates of a technocratic ruling class.

To the *Wall Street Journal's* claim that "Washington will effectively ban the sale of conventional incandescent light bulbs," Holt replies, "This was, of course, untrue. No type of light bulb was banned." Sure, the legislation does not ban all incandescents, but it does ban conventional ones, as the *Journal* claims. The legislation will "make current 100-watt bulbs obsolete and such bulbs will "disappear from store shelves," reports the *New York Times*.

To justify the ban, Holt narrowly defines efficiency to mean only energy efficiency. But the most "efficient" light bulb best achieves the user's purpose. Energy efficiency is important, but so are an appealing color spectrum, quickly reaching full brightness, low-cost dimming, and tolerance to vibration and heat.

The Congressman also decries proposals to repeal the bulb ban, as it could undermine Congress's "tradition of supporting innovation." But when companies spend money to satisfy government demands, they invest less on innovation to satisfy perceived customer demand.

Businesses in relatively free markets innovate just fine. Consumer electronics is an obvious example, but product packaging has also become more efficient. Soda cans use less metal, while bottled beverage manufacturers advertise bottles using less plastic or petroleum-free plant-based plastics.

Meanwhile, the bulb ban exemplifies "innovative" ways for bulb makers to increase profits through political pull. Conventional bulbs are a "ubiquitous commodity" with a "negligible" profit margin, the *New York Times Magazine* recently noted. "No amount of subsidy or 'green' branding has managed to woo consumers away from Edison's bulb." So the lighting industry endorsed new efficiency standards that force consumers to buy more expensive products.

"We are taking away a choice that continues to let people waste their own money," quipped Energy Secretary Steven Chu, a Nobel laureate in physics. Even if this is true, wasting one's own money is every person's right. Moreover, if a consumer has good reasons to prefer conventional incandescent bulbs, buying them is not wasteful. What's wasteful is being forced to buy less desirable alternatives.

A physics PhD and a high-profile government job is not a moral sanction to violate consumers' right to choose.

Brian T. Schwartz
Boulder, CO

Physics of Climate is Inherently Political

The new Topical Group on the Physics of Climate (*APS News*, June 2011) has a most unusual charter. In the statement of its objective and areas of interest on the APS website (http://www.aps.org/units/gpc/index.cfm) we are reminded (4 times) that it is outside, not intended, or not concerned with societal issues and that it is entirely within the domain of natural sciences. No other unit of APS has any such pretense.

Physics in this country and elsewhere is largely supported by the state and has been in the lifetime of every physicist living today. It is always political.

Nothing is of greater human importance and generality than climate. States and individuals all over the world are interested in it, and always have been. So are corporations. The campaign of two years ago to revise the very sensible APS statement on climate change (adopted by the Council of the APS on 18 November 2007) was quite properly refuted. That campaign was a highly ideological political event in physics.

Solid knowledge of the physics of climate will be vital if we are to make good choices in light of the ongoing (as the APS statement noted) climate change, deal with its consequences and causes, and, for example, protect people from the dangers of ill conceived "climate engineering" schemes. Physicists are contributing greatly to solving these problems. On the other hand, the charter of the APS Topical Group on the Physics of Climate is false and polluted.

Donald H. McNeill
Pittsburgh, PA

Past Presidents Don't Define Their Parties

Howard Greyber (letter in August/September *APS News*) explains scientists' liberal preferences as a result of "naive prejudices" and "willful ignorance about politics." In his view, American science and technology will be helped when science and math education are reformed by the Republican Party, which he refers to as "the party of Lincoln, Theodore Roosevelt, Eisenhower and Reagan."

Greyber may have meant this reference as no more than a rhetorical flourish. On the other hand, he believes that physicists suffer from "willful ignorance about politics," so he may have expected us to believe that the policies of the current Republican Party match those of these past presidents.

However, political parties evolve over time. For example, the current Republican party rejects out of hand any tax increase, while Ronald Reagan increased taxes when he concluded that it was necessary.

Abraham Lincoln did likewise. During his administration, the US had its first income tax, intended to pay for the Civil War.

Current Republican thinking emphasizes the great importance of capital in creating opportunities for labor. Contrast this with Lincoln's view of labor and capital, as expressed in his 1861 State of the Union speech: "Labor is prior to and independent of capital. Capital is only the fruit of labor, and could never have existed if labor had not first existed. Labor is the superior of capital, and deserves much the higher consideration."[1]

In his speech at Osawatomie, Kansas in 1910, Theodore Roosevelt echoed Lincoln's statements about labor and capital. He went on to say that corporations should not be allowed to contribute to political parties. He stated that government should supervise the capitalization of corporations. He also proposed an inheritance tax on large fortunes.[2]

Roosevelt had implemented similar progressive policies when he served as president. He was known as a trust-buster. The Hepburn Act, passed during his administration, allowed the Interstate Commerce Commission to regulate many aspects of railroads including rates charged for passengers. The Pure Food and Drug Act put federal regulators in charge of many aspects of food and drug manufacture.

As a trust-buster and regulator, Roosevelt would not fit with the Republican party of today. Even in his day, he may have been too progressive for the other party. In 1912, he broke with the Republicans and ran for president in the Progressive Party.

I would be happy if the 2012 presidential election would be won by a party that deserved the title of "Party of Theodore Roosevelt," but that could not be the present-day Republican Party.

Brent Warner
Greenbelt MD

1. Abraham Lincoln, State of the Union 1861, downloaded 2011/09/21 from http://www.presidency.ucsb.edu/ws/

2. Aida Donald, *Lion in the White House*, Basic Books, New York, 2007, p 240-242.

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and review processes in several ways," says Jorge Pullin, Editor of *PRX*. One is to be selective and prompt throughout, starting with the stage of initial editorial review. Manuscripts that report solid results, but are judged to be incremental in originality and/or marginal in significance, are "returned" to the authors, and those that pass the initial editorial review are sent out to expert referees for anonymous review. "The editors work collectively, and are able to make an initial assessment and act on it within a few days after the receipt of a submission," according to Ling Miao, *PRX* Associate Editor. As of September 15, close to 60% of the submissions have been returned without external review. "This effort on our part not only allows authors to pursue other publication options quickly, but also permits the editors to pay more attention to each manuscript that receives external review. Throughout a review process, we interact actively with referees and authors and discuss with each other often so that our decisions can be as well informed and balanced as possible–another key to a high editorial and publication standard," continues Miao, "and we will do all we can to continue such efforts."

One of *PRX's* unique features is the popular summary that accompanies each paper, along with the traditional abstract. A collaborative effort between the authors and editors, the summaries help make complex research accessible to non-specialist scientists as well as the general public, including the media. Also, the table of contents includes a brief descriptive sentence that should draw readers to view the whole article. "We believe both authors and readers benefit from these," Pullin remarked.

The editors have seen very positive responses from authors to the new journal. Even before the authors of a paper knew its fate, after the first round of reviewing, they told the editors, "...we would like to continue submitting our best works to *PRX*. Your professional assistance and the referees' detailed and fair reviews certainly give us more confidence in PRX." The advantages of open access and unrestricted length in combination with the high standards attract authors, too: "....we truly appreciate the unique avenue to publish high quality research without length restriction that *PRX* aspires to provide....as much as we'd like to contribute to this endeavor through our present work, we wish you the best of success regardless of your final decision!" "We certainly appreciate that you are trying to maintain very high standards for the new journal; this is precisely why we chose the forum," wrote the authors of a paper the significance of which the editors had initially questioned, and who had then gone to considerable lengths to address the editors' specific concerns. "The authors made a very persuasive case in response to our questions, and as it has turned out, they were right! Both they and *PRX* benefitted from such a productive interaction based on substance," reflected Miao with satisfaction.

PRX's second issue will close at the end of the year and will include about 25 papers. A number of papers in this issue have already been published, and one of them, reporting a combined experimental and theoretical study of the exotic quantum spin liquids, has been highlighted with a Viewpoint in Physics. "We are seeing from the more recent submissions an increase in quality. We expect the breadth and the caliber of *PRX* to grow as more and more researchers come to recognize *PRX* as a high-quality journal, both in its publications and in its editorial service to authors, and where published papers will acquire a good degree of visibility across physics," Pullin remarked.

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ence reporter at the *News & Observer*–but at the same time, the public can't afford to lose access to it. Scientists and science journalists both must work to keep science in the public eye.

About a month after my story ran, while I was hooked up to an IV in the emergency room, I realized I hadn't done that as well as I'd hoped. I'd had a potentially life-threatening allergic reaction, and from my tick research, I was able to pinpoint a hamburger and my earlier tick bite as the cause. I avoided a second reaction, but my readers, who never heard the story that I did, wouldn't have been able to connect the dots so easily.

This is why it scares me to see science fade from print media. Knowledge of science can change lives–it may well have saved mine–but if that knowledge isn't accessible, we are all at risk.

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Further investigation showed that this mysterious force, dubbed "dark energy," makes up about three-quarters of the known universe. Dark matter makes up about 20 percent of the universe, leaving only 5 percent of the universe as normal matter.

"I think that the idea of the accelerating universe, indicating that there was some other big thing in the universe, other than things that have normal gravity, meant that a lot of the problems that existed in cosmology back in 1998 were suddenly solved if this stuff existed," Schmidt said in an interview with Nobel Media. "So there were a lot of people, especially theorists, who wanted the universe to be geometrically flat, which means it had to have a lot of stuff in it that we just didn't know was there. And this stuff solved that problem. It gave the extra matter in the universe that needed to be flat."

Many have compared dark energy to Einstein's "cosmological constant," which he introduced to explain the then-current belief that the universe was static. In 1999, Michael Turner of the University of Chicago, who is currently APS vice-President, coined the term "dark energy" in a paper published in *Physical Review D*.

In 1982 Dan Shechtman discovered that certain alloys of aluminum and manganese if cooled rapidly produced a diffraction pattern hitherto believed to be impossible. Up to that point it had been thought that crystals could only form in regular repeating patterns; however, the diffraction pattern that Shechtman saw was evidence that crystals were forming in a pattern that couldn't be precisely repeated, reminiscent of the tiling patterns of mathematician Roger Penrose. Shechtman's finding was highly controversial, and at one point he was asked to quit his research group. It took nearly two years of persistent effort to get his research published.

"The discovery of quasicrystals was so revolutionary," said APS Editor in Chief Gene Sprouse in a press statement, "that Shechtman initially had trouble getting a peer-reviewed science journal to publish his research. However, by the time he submitted it to *Physical Review Letters*, some experts had become aware of its importance and it was quickly accepted and published, and is now one of the ten most cited articles in the history of the journal." [***Ed. Note:*** APS News *published an interview with Shechtman in the January 2003 issue (available online) as part of its* PRL *"Top Ten" series.*]

Soon after the publication in *PRL*, crystallographers the world over started seeing the pattern in other materials and Shechtman's discovery forced scientists to fundamentally reassess long held assumptions about the molecular structure of matter.

APS was quick to congratulate the winners of the prestigious awards.

"The discovery of cosmic acceleration and dark energy provided the last piece in the current cosmological model and at the same time gave us the most profound mystery in all of science–what is dark energy, the source of the repulsive gravity that is causing the universe to speed up?" Turner said in an APS press statement.

"On behalf of the American Physical Society," APS Executive Officer Kate Kirby said in a statement, "I offer our warmest congratulations to each of the 2011 Physics Nobel Prize winners. Their work has profoundly impacted our view of the universe and has challenged us with new questions."

In a separate statement, she recognized the achievements of Shechtman as well, "I extend warmest congratulations to Professor Shechtman for his pioneering discovery of quasicrystals, which has given birth to a rich field of study at the intersection of physics, chemistry, and materials science."

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ISSUE: Media Update

The issue of how science funding would fare under the newly passed Budget Control Act was the topic of an Aug. 12th story in *Science* in which Michael S. Lubell, APS Director of Public Affairs, was quoted about possible across-the-board cuts in 2013. He was also quoted on the matter in *Bloomberg* and *Nature* on Aug. 5th and 9th, respectively.

The fate of the James Webb Space Telescope was the subject of an Aug. 9th blog post on MSNBC.com. The post referenced the APS statement on the issue, which called for Congress to fund the telescope. APS Vice President, Michael S. Turner, discussed the issue on NPR's *Science Friday* program on July 15th.

The New York Times published an Aug. 20th front-page story on the APS petition to the Nuclear Regulatory Commission regarding risk assessments for laser enrichment technology. The story was picked up in numerous publications throughout the U.S. and abroad.

Log on to the APS Public Affairs Web site (http://www.aps.org/public_affairs) for more information.

INTERNATIONAL News

...from the APS Office of International Affairs

China, Sputnik, and American Science

Zuoyue Wang

As the US struggles to deal with a severe economic recession and other challenges, China and its scientific and technological progress have often been at the center of American national attention. In his state of the union address on January 25, 2011, President Barack Obama, for example, pointed to the rise of China and India as indication that "the world has changed," especially in the global competition for jobs. As evidence, he cited China's achievement in producing "the world's largest private solar research facility" and "the world's fastest computer." Declaring that "this is our generation's Sputnik moment," he called for the US to increase its investment in science, technology, and education, vowing to "out-innovate, out-educate, and out-build the rest of the world.

As a historian of science and technology who has studied the history of US-China scientific relations as well as the US responses to the Sputnik crisis, I see both advantages and disadvantages in deploying the Sputnik-China analogy. It is true that the US faces a serious challenge to its leadership in the world today as it did at the time of Sputnik, and President Obama has wisely followed President Dwight Eisenhower in characterizing it as one in science, technology, and education, not as a direct military threat. The analogy is also appealing because few events in American history have had the galvanizing effect of the Sputnik shock, which resulted in dramatic increases in federal support in the above fields, as well as reinforcement of a bipartisan consensus on broad national policy.

Yet, the present US-China relations, marked by close ties across many areas, are vastly different from the tense US-Soviet Cold War rivalry. Consequently, I want to share some historical perspectives on US-China scientific relations that I believe have shaped our current relationship and will influence future opportunities for cooperating on meeting our mutual challenges.

About sixty years ago, on September 20, 1951, Xie Jialin (Chia Lin Hsieh), a Chinese physicist who had just received his PhD from Stanford, boarded the ship President Cleveland at San Francisco for China. Even though the US had tightened restrictions on Chinese students returning home after the establishment of the People's Republic of China in 1949 and the outbreak of the Korea War in the summer of 1950, the door did not close completely, especially for those determined to go home for family reunification. Xie, who had left his wife and child behind when he came to the US in 1947, was excited at the prospect of returning home but his dream was shattered at Honolulu where US authorities prevented him and several other Chinese students/scientists from continuing their journey, citing a new presidential order banning certain aliens from departing the US.

Thus came down the American "iron curtain" which, in an effort to deny technical talent to its Cold War rivals amidst rising McCarthyism, resulted in the *de facto* detention of many Chinese scientists in the US purely for political reasons. Even though Xie and several dozens of Chinese students/scientists were eventually allowed to return home following US-China negotiations in Geneva in 1954 and 1955, this episode embittered many in China and elsewhere who might have otherwise been disposed positively toward the US. As a group of Asia scholars in US universities pointed out in a letter to the *New York Times* in 1954, the detention of Chinese scientists was "incompatible with American principles of justice" and created more harm to the US in terms of "the ill-will created, here and abroad" than the technical knowledge they might bring back to China.

Wolfgang Panofsky and Xie Jialin in Beijing, 2002 (source: http://news.sciencenet.cn/htmlnews/2009/3/217175.html, accessed in September 2011)

The next dramatic moment that brought American-educated Chinese scientists and US Cold War calculations together occurred in 1957, when the country was first alarmed by the Soviet launching of Sputnik, the world's first satellite, on October 4, and then, just weeks later, delighted by the awarding of the Nobel prize in physics to Chinese American physicists Tsung Dao Lee of Columbia University and Chen Ning Yang of the Institute for Advanced Study at Princeton. Under the headline "These Chinese Choose," *Newsweek* celebrated Lee's and Yang's allegiance to the US in the shadow of the Sputnik shock. If Xie represented the more than one thousand Chinese students (about 60% of them in science and technology) who returned to China from the US in the 1950s (the "returnees") and who helped "Americanize" Chinese science, Lee and Yang symbolized the presence and prominence of about four thousand "stayees" in the American scientific community.

The paths of returnees and stayees would cross again when the US and China reopened relations in the early 1970s, and they played an especially active role in promoting US-China scientific exchanges and collaboration. In the 1980s, for example, Xie worked closely with Lee and Wolfgang "Pief" Panofsky of SLAC to design the SLAC-inspired Beijing Electron-Positron Collider, which would draw physicists from the US and elsewhere to conduct research. On his part, Panofsky, beloved in China for his work on BEPC and his devotion to international science, used his scientific connections to push effectively for Chinese participation in international nuclear arms control, including non-proliferation.

Perhaps most importantly, the returnees and stayees have helped to bring a new generation of Chinese students to the US who have themselves become an important part of the American scientific community. The latter in turn have promoted scientific collaboration across the Pacific on wide-ranging topics from global warming to public health.

Today, many of the challenges facing the world, such as climate change and a restructuring of the global economy, require joint actions by both the US and China. Indeed, President Obama has been careful to call the rise of China and India a positive development in the world and a constructive challenge to the US, and his administration has continued the post-Nixon bipartisan tradition of pursuing US-China scientific collaborations. Others, however, take a more negative view of such endeavors. Declaring that China had stolen technology from the US, that it behaved like Stalinist Russia, and that "we have nothing to gain from dealing with them," a congressman, for example, succeeded in inserting a ban on all scientific and technological interactions with China involving NASA and the White House Office of Science and Technology Policy in the 2011 US federal budget passed in April 2011.

While it's important to guard US national interests in international relations, there is a danger of defining them so narrowly that we lose sight of values and ideals, such as the free movement of scientists and international scientific collaboration, that have been long cherished by the American and international scientific community. American science and technology thrive on international exchange and collaboration and indeed have benefited enormously from the large-scale scientific migration from China and elsewhere during the last century. Furthermore, as Professor Xu Liangying, dissident Chinese physicist

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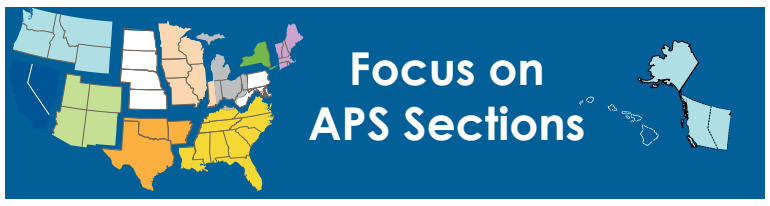

Northwest Section Links US and Canadian Physicists

By Mary Catherine Adams

Before free long-distance and the Internet connected people, physicists in the Pacific Northwest established a way to keep in touch despite the geographical separation of mountains and the political separation of an international border. In the 1960s, physicists from the University of British Columbia in Vancouver and the University of Washington in Seattle organized an annual meeting which rotated between the universities as a way to keep up with what their peers were doing.

"To some extent, the Northwest [section] is a revival of that spirit," but with more modern communication, said former section Chair Erich Vogt. A founder of Canada's TRIUMF national laboratory for particle and nuclear physics, Vogt was the section's first chair-elect when it was created in 1998 and is back for another round, now serving again as chair-elect.

The Northwest section is unique for being the only cross-border section. In fact, the first meeting was held at UBC, said the University of Washington's Ernest Henley. A former executive committee officer and former APS president who, along with Vogt, was instrumental in creating the section, Henley called the cross-border relationship "appropriate" because about a fifth of APS members are foreigners.

"They claim we should call this the Southwest [section]," Brian Milbrath, the section's vice chair, said of its Canadian members. Comprising the US states of Alaska, Idaho, Montana, Oregon, Washington and Wyoming, as well as the Canadian provinces of Alberta and British Columbia, the Northwest section has over 1200 members.

"It's been a very strong collaboration between larger and smaller schools," said Thomas Olsen, the section's secretary and treasurer. Meetings have been held at large state schools and also at smaller colleges, like Lewis & Clark in Portland, and Whitman College, in Walla Walla. The section has also been good for students from smaller schools that might not have graduate programs, said Janis McKenna, a former executive committee officer from the UBC.

Still, the region's vast size sometimes makes it hard for students to attend. Reaching a meeting in Wyoming, for example, is a challenge for those in northern British Columbia and Alaska. The executive committee encourages professors and students to pile into vans and make a road trip out of attending a meeting.

The section also provides $100-per-person travel grants and inexpensive meeting accommodations for students. Undergraduate and graduate students have taken advantage of the opportunity, outnumbering non-student attendees for at least one meeting.

"Students have been pretty creative and keen to come," McKenna said. She remembers one group of about six students who applied for something like $80 in travel grants for the group. "They were going to camp," and asked for enough money to cover the campsite fees, the former officer said. "We gave them some more." Other officers told similar stories of driving over mountain ranges with a car full of physics students bound for the meeting.

Last year, the section moved its annual meeting from the spring to the fall because spring meetings can conflict with the larger APS annual meetings and with graduation schedules. Having a meeting in the fall, though, is also problematic. This year, the organizers had to wait until the PAC-12 Conference announced their schedule before setting the date.

"You cannot have a meeting the same weekend as a football game," Past Chair Michael Miller said. "Every hotel within 50 miles is full." The section will host its thirteenth annual meeting Oct. 20 –22 at Oregon State University when the Beavers will be out of town challenging the Washington State University Cougars in Seattle.

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people to use, Johnson said, if it weren't for federally-funded scientific research.

Bill Phillips, a Nobel Laureate at the National Institute of Standards and Technology (NIST), explained that federally-funded research was critical in developing the global positioning system (GPS) that enables commonly-used navigation apps on the iPad.

Federal funding in the 1950s enabled the creation of the world's most accurate timekeepers–atomic clocks–without which GPS systems would not work.

Benjamin Bederson, co-founder of Zumobi, Inc. which develops apps, explained how a graduate student at the University of Delaware who had a disability that made using a standard computer keyboard too painful helped develop capacitive sensing–the thing that makes touch-screens work–in the 1990s thanks to a National Science Foundation (NSF) fellowship and an NSF grant. Martin Izzard, a scientist and researcher at Texas Instruments, spoke about the history of the integrated circuit, which is used in nearly all electronic equipment today.

Luis von Ahn of Carnegie Mellon, who moderated the event, told the staffers that because industry primarily funds projects with obvious profit potential, scientists rely on the federal government to fund things that don't have clear outcomes but that do result in important discoveries.

Meeting Briefs

The Division of Laser Science held its annual meeting in conjunction with the Optical Society of America's Frontiers in Optics annual meeting in San Jose California from October 16 through the 20th. John Pendry of the Imperial College of London delivered one of the plenary lectures on Monday about new theoretical methods to achieve microscopic resolutions smaller than the wavelength of visible light. Ferenc Krausz from the Max-Planck-Institut für Quantenoptik delivered the other plenary lecture, about new laser pulse techniques that can capture electron motion over tens of attoseconds.

The Division of Nuclear Physics held its fall meeting at Michigan State University from October 26 through the 29th. Wednesday afternoon's plenary talk featured four speakers highlighting the career of Dennis Kovar, recently retired Associate Director of Science for High Energy Physics and former Associate Director of Science for Nuclear Physics in the Department of Energy, as well as remarks from Kovar himself. Thursday afternoon's panel on trends in nuclear physics featured Kai Hebeler of Ohio State University discussing how renormalization group methods have offered new insights into the structure of neutron stars and nuclear many body forces. Helen Caines of Yale University presented on Wednesday morning the first results from the ALICE experiment at the LHC showing data largely consistent with RHIC and SPS results that matter created in high energy collisions behaves much like a strongly interacting perfect liquid.

The Texas Section held its meeting at Texas A&M University-Commerce in conjunction with the American Association of Physics Teachers from October 6 through the 8th. Mustapha Ishak-Boushaki from the University of Texas at Dallas delivered the unexpectedly timely plenary session outlining theories governing the expansion of the universe just three days after the Nobel Prize for physics was awarded for the discovery of cosmic acceleration. Texas A&M professor Robert E. Tribble's talk on Saturday outlined efforts around the world at different locations and facilities to better understand the origin, evolution and structure of the visible matter in the universe.

The New York Section similarly met jointly with the New York section of AAPT at SUNY College at Oneonta on October 7 and 8th. Its overarching topical theme was "Superconductivity and its Applications." Gianfranco Vidali from Syracuse University and Matthew Sullivan from Ithaca College both gave talks on Friday morning going over the history of superconductivity. Britton Plourde of Syracuse University gave a talk on Saturday morning about the future possibility of superconducting circuits and quantum computing.

The Ohio Region Section held its annual meeting at Ball State University in Muncie, Indiana, on October 14 and 15th. The meeting's theme was "Applied Physics." Carl Brune from Ohio University described in his talk how nuclear physics has found many applications at the National Ignition Facility. Ron Kaitchuck from Ball State University highlighted what he found to be some of the most beautiful and breathtaking images produced by the Hubble Space Telescope.

The Southeastern Section held its meeting in Roanoke, Virginia from October 19 through the 22nd. On Friday, Patrick Huber looked past current experiments at Double Chooz, Daya Bay, T2K and NOvA towards the next steps needed to probe the nature of the neutrino mass hierarchy. On Thursday, Thomas Handler gave an overview of the role that physicists have historically played in policy making and what that role may be in the future.

The Northwest Section held its meeting at Oregon State University from October 20 through the 22nd. On Friday, Jose Reyes outlined the design of a new type of nuclear reactor by NuScale Power that has been gaining attention after the Fukushima disaster for its inherent resistance to meltdown. Andrei Kounine from MIT presented a report on Saturday of the performance of the Alpha Magnetic Spectrometer recently installed on the International Space Station to measure high energy particles.

The Four Corners Section met at the University of Arizona in Tucson on October 21 and 22nd. The Friday night banquet session featured a talk by Peter H. Smith from the University of Arizona looking back at the controversy about the claims of fossilized life on the infamous Martian meteorite in 1996.

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MiniBooNE uses an 8 GeV neutrino beam that is directed through 800 tons of mineral oil. Inside, 1280 photomultiplier tubes lining the spherical detector look for the signature flashes of light produced when neutrinos strike atoms in the mineral oil. The experiment studies neutrino oscillations over short distances from their source. The booster neutrino source referred to in the "BooNE" is actually the main injector that used to feed into the Tevatron, dubbed the NuMI.

"Just the main ring [of the Tevatron] has been decommissioned, but the whole front end is still running," Zeller said.

MiniBooNE has been collecting data since 2002, and construction on the next generation of detector has already begun. Dubbed MicroBooNE, it will be made up of 100 tons of liquid argon to look for neutrino signals along the same beam line. Researchers have been eyeing liquid argon detectors as the next iteration of neutrino detectors, and MicroBooNE will be the largest liquid argon detector ever built.

Around the same time that MicroBooNE starts up next year, the two-part NOvA experiment should fully come online as well. Its smaller 222-ton "near detector," located at Fermilab, has been running since the end of December, while the much larger 15-kiloton far detector, located in northern Minnesota, should start taking data in 2013. Researchers will compare the neutrino composition of the beam over the 513 mile distance to detect muon neutrinos turning into electron neutrinos. NOvA will use the existing NuMI beam, which already shoots neutrinos into the MINERvA detector in Fermilab and the MINOS detector in the Soudan Mine in Minnesota.

Right now researchers working on MINOS are looking into the recent announcement by the OPERA experiment in Italy, claiming evidence of neutrinos traveling faster than the speed of light. Tschirhart said that he expected an announcement supporting or refuting the OPERA findings sometime in the next one to three years.

The lab will keep its focus on neutrino research well into the next decade. The facility is preparing a second, higher intensity beam of neutrinos dubbed the Long Baseline Neutrino Experiment aimed at the Homestake Mine in Lead, South Dakota. Starting out, the experiment will use the main injector accelerator, which used to feed into the Tevatron, to produce an intense beam of muons that will decay into muon neutrinos. At the same time, Fermilab will be working to upgrade its proton beam by building a powerful next-generation linear proton accelerator. Colorfully dubbed Project X, the linear accelerator will shoot a continuous 3 GeV proton beam that can be modulated and split up for proton-, muon- and kaon-based experiments as well as the production of intense neutrino beams.

"It's a real game-changer," said Brendan Casey, currently part of the Tevatron's DZero collaboration. "With Project X it's a continuous [beam] so we can do anything we want downstream."

In the very long term, the lab has its sights set on a Neutrino Factory, a muon accelerator fed by Project X that could produce neutrinos for detectors located thousands of miles away. Development and planning for the factory has only just begun, and construction likely won't begin until at least late in the 2020s.

Two muon experiments are in development as well. The first that is scheduled to come on line is the G-2 experiment which brings in Brookhaven's old muon storage ring and combines it with the former antiproton source for the Tevatron. It will look for violations of lepton-flavor symmetries. Mu2e, which is scheduled to come online by the end of the decade, will look for muons converting to electrons.

In addition the laboratory is working on research at the cosmic frontier, looking for clues coming from deep space about the makeup of the universe. Researchers from Fermilab will participate in the upcoming Dark Energy Survey and the Joint Dark Energy Mission. The lab will also continue to be a partner in the Pierre Auger cosmic ray observatory as well as the CDMS, COUPP and DarkSide dark matter searches, while continuing to develop more sensitive detectors.

"It's absolutely the best time to be a particle physicist," Tschirhart said. "There's lots of great opportunities at CERN, and there's lots of great opportunities here in the US at the intensity frontier."

ANNOUNCEMENTS

Ig Nobels May be not so Crazy After All

By Michael Lucibella

In keeping with its 21-year tradition, this year's Ig Nobel prizes honored research into some of the most pressing questions in science. Research ranging from yawning turtles to the ideal concentration of wasabi spray was honored at this year's award ceremony on September 29.

The winners of the Physics prize got to the bottom of an issue that's been plaguing the sports world for millennia. In the Olympics, discus throwers are often beset by dizziness after launching their projectiles while hammer throwers are exempt from this affliction, and now for the first time scientists know why. Winners Philippe Perrin, Cyril Perrot, Dominique Deviterne and Bruno Ragaru from France and Herman Kingma of the Netherlands interviewed athletes and analyzed slow-motion video of the athlete's different throws. They found that while the two throws appear similar, hammer throwers keep their eyes focused on their seemingly stationary hammer while discus throwers don't have the same visual anchor point to focus on.

"We are very happy to accept the Ig Nobel prize. As we understand it is something that deals with research that at first glance seems funny. We accepted it to show that our research is not funny at all. We are very serious researchers who are trying to figure out how the balance system works," Perrin said in a video statement at the ceremony (they were unable to attend in person).

Perrin's somewhat tongue in cheek speech alludes to the motto of the Ig Nobel Prizes, which "honor[s] achievements that first make people laugh, and then make them think." The idea is to highlight scientific research that on the surface might sound wacky or trivial, but on further investigation gets at something more serious.

Such is the case with the wasabi spray that won the chemistry prize, which was shared by seven researchers from Japan. After much experimentation, they perfected the ideal concentration of five to 20 parts per million of pungent horseradish spray that is needed to wake up a sleeping person.

"We examined 50 subjects including deaf people," Imai said, "We sprayed an odorless compound at first, and we confirmed that they maintain sleep. Second we sprayed out the real stimulant and observed their arousal level and movement. They wake up within three to four minutes."

The reason; they wanted to develop a new smoke alarm that can wake up people with hearing disabilities. Current techniques use bright flashing lights or vibrating beds, which work sometimes, but not always.

Safety also had been on the mind of John Senders of the University of Toronto on whom was bestowed the Public Safety award. In the 1960s he developed a technique to determine how long one can safely drive without actually seeing the road. He did this by painting over the clear visor of a motorcycle helmet so the driver can't see through it. The visor is connected to a servo that flicks it up and down over the driver's eyes, and that times how long someone keeps the visor down.

For decades Senders's research was largely forgotten. However, after the invention of cell phones, GPSs and other electronic devices that often distract drivers, his method to time how long someone can drive while distracted took on new importance. The International Standards Organization now uses a variation of his technique, termed the occlusion method, to set a standard for how long an in-car device can distract a driver.

Anna Wilkinson, Natalie Sebanz, Isabella Mandl and Ludwig Huber shared the Physiology Ig Nobel for proving that red-footed tortoises aren't subject to contagious yawning. Many biologists thought that contagious yawning is a sign of intelligence, because it is a subtle way of learning. The team showed that while tortoises are very intelligent creatures that can solve mazes and puzzles, yawning was not a good measure of their intelligence because they are completely asocial creatures and cannot teach things to each other.

The Peace Prize was awarded to Arturas Zuokas, mayor of Vilnius, Lithuania for "demonstrating that the problem of illegally parked luxury cars can be solved by running them over with an armored tank." Two Australian researchers, Darryl Gwynne and David Rentz won the Biology Prize for their research into why a particular species of beetle mistakenly tries to copulate with empty beer bottles. The Psychology Prize was awarded to Karl Halvor Teigen of the University of Oslo for his investigations into why people sigh. John Perry of Stanford received the literature prize for his book "How to Procrastinate and Still Get Things Done," but he was unable to attend the ceremony because he had too much work piled up.

The Medicine prize was split between two teams for research that showed in certain circumstances, having to go to the bathroom makes people make better decisions, but in other circumstances it makes them make worse decisions. The Mathematics Prize was likewise shared amongst Dorothy Martin, Pat Robertson, Elizabeth Clare Prophet, Lee Jang Rim, Credonia Mwerinde and Harold Camping, all of whom predicted the world was going to end, for "teaching the world to be careful when making mathematical assumptions and calculations." No one came to collect that prize.

The theme for this year's award ceremony was "Chemistry" and featured a mini-opera about chemists in a coffee shop and several renditions of Tom Lehrer's "Elements Song." The award given to the Ig Nobel winners was a miniature Periodic Table table.

Image courtesy of Improbable.com

Master of ceremonies and co-founder of the Ig Nobels Marc Abrahams shows off this years prize, a miniature periodic table.

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and influential translator of Albert Einstein's work into Chinese, stated (through his son) when he received the APS Sakharov Prize in 2008, it's important for the international community, especially the scientists, to keep engaged with China in order to improve human rights there.

Whether we live in another Sputnik moment or not, the Cold War world is gone and internationally-minded scientists like the Xies and Panofskys of today should be encouraged, and not blocked, to collaborate across national boundaries to advance science and work on global problems facing all of us.

Zuoyue Wang, who studied physics and the history of physics (under Xu Liangying) in China, is a professor of history at the California State Polytechnic University, Pomona. Author of In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America *(2008), he is currently conducting research on "Chinese/American Scientists: Transnational Science during the Cold War and Beyond," with partial support from the National Science Foundation under Grant No. SES-1026879. Any opinions expressed in this material are those of the author and do not necessarily reflect the views of either NSF or APS.*

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and engineers. That being the case, the two publications have a significant amount of reader crossover.

"We think current readers of *Focus* and current readers of *Physics* would be interested in reading the other publication," said *Focus* editor David Ehrenstein. "It will allow *Focus* to be visible to a whole new readership."

In October of last year, the editors of *Physics* took a survey of its readers looking for ways to improve the new website. The editors say that the new layout is easier to navigate between the Features, Trends and Synopsis sections of the website, and has a space to highlight important articles. The developers have updated the homepage and links to old *Focus* articles to redirect users to the article's new home on *Physics*.

"I think this will expand the readership of *Physics*," Thomas said. "Overall the idea is that for those who like to read the whole spectrum of content that the APS is offering, they can find it now on one website."

The Back Page

A Framework for K-12 Science Education.

By Helen Quinn

Former APS President Helen Quinn of Stanford chaired the committee of the National Research Council that produced the document "A framework for K-12 Science Education." She has written this article to explain the document's purpose and roles to APS members.

Photo by Dan Quinn

Context

In schools across the US state standards define what students are expected to learn, and thus affect not only instruction, but also what is "covered" in textbooks and tests. Over fifteen years ago the National Academies published the "National Science Education Standards" (NSES). Together with the Benchmarks for Science Literacy from AAAS the NSES catalyzed development of state science standards across the country. This process resulted in fifty separate and varied documents. The standards in other subject areas likewise varied state to state. More recently a movement toward common standards, that is, standards shared by multiple states, has taken shape. Today 48 states and the District of Columbia have adopted the "Common Core" standards in math and language arts, and are working toward implementing a system of common assessments. Watching this process, the Carnegie Corporation of New York recognized the need for a similar common effort in science (see their report "The Opportunity Equation"). To fill this need, Carnegie funded the development of a next generation of science standards as a two-step process. The first step was a study conducted by the National Research Council to produce the document "A Framework for K-12 Science Education", released in July 2011. The framework defines the core content that all students should learn in science in the K-12 years. It also emphasizes that students with a strong interest in science should have opportunities to go beyond this "all students" base level. The second step, the development of a set of standards based on this framework, is being led by Achieve Inc, working in partnership with 20 or more states who have elected to join the project. This intensive work, which will include multiple review stages and opportunities for public input, is expected to produce "Next Generation Science Standards" by the end of 2012. States, including those not yet in the partnership, can then decide whether or not to formally adopt these standards.

The NRC's framework articulates a vision for effective science education, based on research on learning and teaching and the input of scientists from across the disciplines. The NRC committee that developed it included recognized scientists from the target disciplinary areas (members of NAS or NAE) and a roughly equal number of members with a range of expertise and experience in science education at the K-12 level. A draft of the central section of the document was presented for public comment in July 2010, and many revisions were made based on the input received. Like all NRC studies, it also benefitted from a rigorous internal review process that led to further revisions before its release.

Three Dimensions

The Framework describes three dimensions of science learning, with the idea that lessons must form a solid structure in this three dimensional space. The three dimensions are defined as 1. Scientific and Engineering Practices, 2. Crosscutting Concepts and 3. Disciplinary Core ideas. The practices are both a definition of what scientists and engineers do and a statement of what students need to do in order to develop their understanding of the core ideas and of how scientific theories are developed. Crosscutting concepts are common to all fields of science and engineering and provide students with ways to connect knowledge from the various disciplines into a coherent and scientific view of the world. The disciplinary core ideas include ideas in the physical sciences; life sciences; earth and space sciences; and engineering, technology and the applications of science. Engineering, technology and applications of science is included as a disciplinary area to reflect the importance of understanding the human-built world and to recognize the value of better integrating the teaching and learning of science, engineering and technology. In addition, we include engineering practices in parallel to science practices to highlight the large areas of commonality, and to ensure that students have the chance to apply their emerging scientific understanding in design projects.

Learning Progressions

The framework is designed to help realize a vision for education in the sciences and engineering in which all students, over multiple years of school, actively engage in the practices and apply the crosscutting concepts to deepen their understanding of the core ideas. A fundamental principle of the framework is that students should develop their understanding of core ideas in a coherent and connected way across multiple years. This requires integration of the three dimensions in a carefully designed plan of study. The framework provides an initial "sketch" of how the core ideas could be developed across K-12, but it is not a curriculum or course guide. This progression is laid out in "grade band end points", that is, the targets for what students should understand by grades 2, 5, 8 and 12. The development of the endpoints was guided by research about what experiences and activities can help students toward an understanding of accepted scientific explanations of phenomena. To the extent possible, decisions about grade band endpoints were based on research, but in many cases we did not have specific research to guide us. In such cases we made "best guess" decisions based on the patterns we abstracted from the existing research studies.

Practices

The eight practices described in the framework are intended to better define what scientific inquiry and engineering design look like, and to ensure that students are asked to engage in all parts of the process. These are

1. Asking questions (science) and defining a problem (engineering); 2. Developing and using models; 3. Planning and carrying out investigations; 4. Analyzing and interpreting data; 5. Using mathematics and computational thinking; 6. Constructing explanations (science) and designing solutions (engineering); 7. Engaging in argument from evidence; and 8. Obtaining, evaluating and communicating information.

The view of scientific and engineering practice here goes beyond doing a lab or a hands-on activity. It also moves away from a single definition of "scientific method". It includes multiple interpretive and discourse practices that tie the investigation of phenomena to the process of developing new understanding about them. Notably, six of the eight practices are common for engineering and science. The two practices where science and engineering differ relate to the primary goals of each discipline (Constructing explanations and designing solutions) and the beginning stage of approaching such a goal (asking questions and defining a problem). Scientists can play an important role in helping teachers and teacher educators understand these practices and find ways to implement them at the appropriate level in science classrooms.

Asking students to develop explanations does not mean to develop for themselves the modern theories of science. Rather we expect them to incorporate what they are learning about these theories into their models for and explanations of phenomena or systems.

Crosscutting concepts

The concepts selected for emphasis in this dimension are those that can help students connect science learning across topics and disciplines, and provide them with tools for asking appropriate questions regardless of discipline. The list includes

1. Patterns; 2. Cause and effect: Mechanism and explanation; 3. Scale, proportion and quantity; 4. Systems and system models; 5. Energy and matter: Flows, cycles and conservation; 6. Structure and function; 7. Stability and change.

For this audience I think the list needs little explanation, since each of these is a topic that plays out in important ways across the disciplines. Making this commonality explicit, and describing these concepts with common language across the disciplines, along with a common view of and language for science practices, helps students understand how the wide variety of topics that they learn as "science" are interconnected.

Disciplinary core ideas

Descriptions of the core ideas are a major part of the framework report which can be downloaded from www.nap.edu. We used a set of criteria to define what was important to include as a core idea. To merit inclusion an idea should at least meet two or more of these. The criteria were:

- Has broad importance across multiple science or engineering disciplines or is a key organizing concept of a single discipline.
- Provides a key tool for understanding or investigating more complex ideas or solving problems
- Relates to the interests and life experiences of students or can be connected to societal and personal concerns that require scientific or technical knowledge
- Is teachable and learnable over multiple grades at increasing levels of depth and sophistication.

These criteria are not only about what is important to the discipline but also about what is important for all students to understand to inform their own personal and political decisions in the future, as well as to stimulate and underpin their further learning. Thus some of the core ideas are included because of their importance for motivating students to learn science and engineering. The last criterion specifies the scale of an idea that we define as a core idea; it is a major idea that subsumes and connects many individual lesson topics, and hence merits attention across the K-12 grade span.

Next steps

To implement the framework's vision requires further steps. Development and adoption of the "Next Generation Science Standards" has begun and will involve several further opportunities for input and public comment. Anyone wishing to be informed about draft releases can sign on for email updates at www.achieve.org. In addition, as the framework report discusses, other factors, such as curriculum materials, teacher preparation and in-service professional development, science assessments, and science teaching resources (space, time, materials and equipment) all need to be aligned to the vision in the framework in order for it to be realized. All these areas need further work. In my opinion, these efforts need input from scientists, so there will be many ways that interested APS members can get involved.

How to Get Involved

Many physicists have asked me what roles they can play in advancing K-12 science education. First and foremost, educate yourself about research on learning and about the context in which teachers work. Become better informed about the issues in your state and local school district and then volunteer. For example, state bodies decide issues such as criteria for teacher certification, or for adoption of textbooks, and you can get engaged in these decisions. The Forum on Education sessions at APS meetings and its newsletter provide information and ideas. The APS, together with AAPT, supports a network of universities known as "PhysTEC" devoted to exploring how physics departments can be effectively engaged in teacher education; have your department join the network and attend its meetings. NRC studies provide another useful source of information. Key to the development of the framework were two prior studies "Taking Science To School" (2007) and "Learning Science in Informal Environments" (2009). Each of these reports comes with a more practice-oriented volume, "Ready Set, Science" (2008) and "Surrounded by Science" (2010) respectively. These are also available at www.nap.edu. If you work with teachers, adopt the terminology of the framework around practices and cross-cutting ideas as it fits into what you are doing, to help teachers develop their understanding of them. If you teach introductory science courses, think about these ideas in that context. The science courses, as well as the science education courses, that prospective teachers take in college need to be designed to enable them to understand, and eventually to be able to teach, science and engineering practices and crosscutting concepts as well as the disciplinary core ideas. Carrying the arguments of the framework beyond the K-12 realm, it is my conviction that introductory science courses that are so designed would also better serve students who do not plan to become teachers than courses that focus only on conveying scientific knowledge.

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