Atlanta Hosts 2012 APS April Meeting

Physicists from all over the world will soon be converging on the Peachtree State as this year’s April Meeting is being held at the Hyatt Regency in Atlanta, Georgia from March 31 through April 3. The meeting will draw more than 1,000 physicists to share the latest results in particle physics, nuclear physics, astrophysics and plasma physics research. There will be 234 invited speakers and a total of 165 sessions as well as three poster sessions. In addition, the Sherwood Fusion Theory Conference will take place in conjunction with the meeting.

This year marks the 100th anniversary of the discovery of cosmic rays, and in celebration the meeting’s theme is “100 Years of Cosmic Ray Physics.” The meeting will kick off on Saturday morning with the Kavli Foundation Keynote session about the history and current research into cosmic rays. Leading off the session, Alan Watson from the University of Leeds will take the audience through the 100-year history of cosmic ray research and how it has impacted numerous fields of physics. Ellen Zweibel from the University of Wisconsin-Madison will highlight current research into the understanding of cosmic ray plasma physics. Nobel laureate Samuel C.C. Ting from MIT will bring an ATLANTA continued on page 6

Fukushima’s Legacy Debated

By Michael Lucibella

A year after the meltdown at the Fukushima Daiichi power plant, its legacy still divides scientists over the future of nuclear power. At this year’s March Meeting, a special session on the Future of Nuclear Power will be held in Condensed Matter Physics International Physics and the Division of Condensed Matter Physics brought the two sides to the forefront.

Stephen Kuczynski, CEO of Southern Nuclear Operating Company, defended his industry. His company recently received the first new construction license to build a new nuclear power plant in the United States as it is in Japan, “It’s the safest industry that you can work in. The workers at our power plants are the safest in any industry,” Kuczynski said. “We also have layers of oversight. There are multiple layers to detect if there is a change or degradation in the safety culture, and we can act on them.”

However, concerns about safety persist. On the same panel, following Kuczynski’s remarks, Edwin Lyman from the Union of Concerned Scientists laid out his organization’s reservations about the safety of nuclear power in the United States. “The question does come up: ‘Can it happen here?’ There’s been a lot of debate on this issue, whether it was a Japan-specific event, whether the US was better prepared than Japan to deal with this kind of contingency. In our view, compliance is as prevalent here in the United States as it is in Japan,” Lyman said. “US nuclear plants were not designed or intended to survive such natural disasters, multiple system failures or terrorist attacks.”

Following the crisis at Fukushima, leaders of the US nuclear industry put together a study titled “The Way Forward” to review what happened in Japan and prevent such an accident in the United States. The document that emerged included a strategy for coping with potential accidents, which the industry referred to as its FLEX.

FUKUSHIMA continued on page 4

APS President Condemns Wave of Iranian Scientist Assassinations

Over the last two years, being a physicist in Iran has become a dangerous profession. Four scientists have been assassinated under suspicious circumstances. The most recent incident took place in January of 2012. In response to these attacks, APS President Robert Byer released an open letter on behalf of the Society, condemning the killings.

“The American Physical Society finds the recent wave of killings of Iranian scientists extremely troubling and welcomes the United States’ condemnation of this type of violence,” the letter reads. “The American Physical Society condemns acts of violence against scientists everywhere and reaffirms its commitment to international collegiality among physicists and its belief that science can be used to promote international peace.”

No nation or organization has thus far come forward and claimed responsibility for the attacks. Many analysts have surmised that because they have been targeting physicists, the campaign is part of a concerted effort to slow or stop Iran’s suspected clandestine nuclear clear weapons program. The most

Free Benefit Brings the News Home to Members

The APS Weekly Newbrief has been gaining popularity since its inception in April of 2009. The weekly emails, to which more than 2,300 physicists subscribe, deliver a condensed summary of the week’s physics news circulating throughout the mass media. “It’s a compilation of news about physics that appears in the popular press,” said James Riordon, the Head of Media Relations at APS, “It’s to tell physicists who subscribe what the news is reporting about physics.”

The news briefs cover all fields of physics, and don’t exclusively focus on stories with an APS angle. Each email contains a link to the original story, plus a brief synopsis, as well as a link back to the original journal article when it stems from an APS journal. Riordon said the idea is both to keep members abreast of the latest news, and also to give the scientific community insight into how the public perceives science and physics.

“I think it’s important for us to know what they think about what we’re doing,” Riordon said.

The Newbrief is a benefit that is free to APS members, who can subscribe either by clicking on “Weekly Newbrief” on the Member Services page on the APS website, or by emailing the APS membership department at membership@aps.org

March Meeting Session Highlights

LGBT+ Issues for Physicists

By Calla Cofield

At the 2012 March Meeting, APS hosted the first-ever session at a major physics conference on sexual and gender diversity issues. Six speakers and a very vocal audience shared a discussion about the state of the LGBT+ community in physics. [LGBT stands for lesbian, gay, bi-sexual, and transgender, while the plus sign includes other sexual orientations or gender identities including intersexed, queer, questioning, asexual or pansexual. Some organizations also list straight and cisgender (anyone who identifies as male or female and does not question its assigned sex at birth).] LGBT+ people in physics and in academia, providing some of the first data on subject.

Speakers presented results from two national surveys gathering information about the experiences of LGBT+ individuals in physics. [LGBT+ stands for lesbian, gay, bi-sexual, and transgender, while the plus sign includes other sexual orientations or gender identities including intersexed, queer, questioning, asexual or pansexual. Some organizations also list straight and cisgender (anyone who identifies as male or female and does not question its assigned sex at birth).] LGBT+ people in physics and in academia, providing some of the first data on subject.

Susan Rankin, Associate Professor of Education and Senior Research Associate at the Center for the Study of Higher Education at Penn State University, co-authored the first study, published in 2010, LGBT continued on page 7

March Meeting Prize and Award Recipients

At the March Meeting in Boston, at a special ceremonial session, APS President Robert Byer presented 17 prizes and awards to a total of 20 individuals, and one additional prize was presented by the American Institute of Physics (AiP). In the front row in the photo are (l to r): Dimitri Bascov, Lauraera W. Molenkamp, Songcheng Zhang, Charles L. Kane, Nadya Mason, Mukulega Balseke, Richard Wilson, APS President Robert Byer, Matthew Tirtel, Ka-Ming Ho, David S. Hult, and Ian Afflick. In the back row are (l to r): William A. Eaton, Giovanni Jona-Lasinio, Stuart Parkin, Sijun (Steven) Wang, Andreas Mandelis, Robert Cava, Justin Weis, Rachel Segalman, Eric Fullerton (AiP), and Thirumalai Venkatesan.

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Focus on Advocacy

See page 6
“Their approach is extremely powerful… This is at least a 10-year effort to make very tiny electrical wires and combine them with the placement of a phosphorus atom exactly where they want them.”

Andreas Heinrich, I.B.M., on research by physicists at Purdue and the University of New South Wales making single atom transistors, MSNBC.com, February 23, 2012.

“…and the instruments to measure them were crude and unreliable, so that early readings in a brilliant leap of scientific intuition, the bizarre behavior of latent heat was unmistakable. A modern scien
tist, Joseph Black, 1728-1799, who discerned a profound truth hidden in poorly understood and seemingly unrelated observations. Black came to the realization that was drawn to the latent heat puzzle by an observation on supercooled water, made by physicist Gabriel Daniel Fahrenheit, [of the Fahrenheit temperature scale.] Fahrenheit reported the well-known fact that water could be supercooled, or chilled below the freezing point, without turning to ice. When shaken, however, the supercooled water turns instantly to ice, and the temperature rises to the freezing point.

Black meditated on Fahrenheit’s experiment, and on his own observations of the slow melting of ice. Taken together, his two suggested that a large quantity of heat was absorbed as ice melted, and a corresponding quantity released by the freezing of water. Starting from this simple insight, he soon realized that a form of heat must exist that mysteriously disappears and reappears as water changes phases. Black based his reasoning in part on the fact that something expected to happen did not happen. The steam holmes used similar logic to solve a puzzle case by noting that a dog at the crime scene had not barked, but it was expected to. More Black’s work, scientists expected that if one warned a cold ice piece to the freezing point, a minute quantity of additional heat would melt the ice entirely. Black showed that the expected thing did not happen. In lecture demonstrations he showed that equal weights of ice and water, both at 0°C, warmed equally by the air of the lecture hall, behaved very differently. Over a period of time, the water warmed by many degrees. The ice did not melt as expected, but most remained, along with a little water at 0°C. He used the same example, an expected effect, “the dog that did not bark”, to argue the case. He pointed out an important effect of latent heat on the melting of snow and ice in nature. “If the complete change of ice and snow into water required only the further addition of a very small quantity of heat, the mass of cold snow in a measurable size, ought alike to melt in a few minutes or seconds more. West this the case, the con
sequence would be dreadful. Even as things are present, the melting of great quantities of snow and ice occasions violent torrents. But were the ice and snow to melt, suddenly… the torrents would be incomparably more dreadful.” The latent heat that Black discovered greatly slows the melting of snow and ice. He gave the first account of this work on April 23, 1762 at the University of Glasgow.

Having established the existence of latent heat in the melting of ice, Black turned to the vaporization of water. In a letter to the lecture notes: if a small quantity of heat added to boil

ing water could convert it all to vapor, “the undeniable
ability of this would be an explosion of all the water with a violence equal to that of gun
powder.” Since this does not happen, he concluded that a large quantity of heat is needed to changes phases, even though there is no change in temperature, “and gave it the name, latent heat.”

The concept of latent heat was soon applied to industrial practice. James Watt was a student of Black and cooperated with him in his work. Watt’s early knowledge of latent heat enabled him to man

age heat in the steam engine, improving it from a crude and inefficient machine into the powerful engine of the industrial age. With ice, recognition of latent heat allowed one to design ways to use heat insulation, so that the steam engine could be run for months without melting, even in the warmest climates. An industry arose in the US, shipping ice cut from northern lakes in winter to Cuba, India and other warm countries. The question of how to store and ship ice was one of the most important US exports, exceeded only by cotton. Writer Henry David Thoreau, a re

lentless critic of technology, in 1854 expressed his disdain for both the ice export and the steam en

gine in a single sentence: “Men think it necessary to do

...disdain for both the ice export and the steam en
gine… not. [Sherlock Holmes used similar logic to solve a puzzle case by noting that a dog at the crime scene had not barked, but it was expected to.]…”

Joseph Black was born on April 16, 1728, one of twelve children. Pressed by his father to study medicine, he enrolled at the University of Glasgow, then went on to receive his medical degree in 1754
Congressional Fellow Combines Research and Communication

By Michael Lucibella

Scientific research can take on a whole new perspective when seen from the halls of Congress. APS Congressional Fellow Laura Berzak Hopkins said that working in the House and Senate gave her valuable insights as to how the law-making process works, and how scientists can get involved.

Hopkins did her doctoral thesis work at the Princeton Plasma Physics Laboratory. There she worked on diagnostic systems for Tokamaks, data acquisition systems and data analysis. When finishing up her thesis, she heard about the APS Congressional Fellowship, which intrigued her because it seemed like a good way to combine her interests in science research and communication. From the start, working with lawmakers proved to be wholly unlike working with ionized particles.

“It was a different experience from research,” Hopkins said, adding that she found there was a much greater variety of work in Congress. “One day I might be accompanying my boss to do a speech or give an interview, and the next day I might be going to meetings with different interest groups.”

Hopkins spent the first half of her year in Congress working at the House Foreign Relations subcommittee on terrorism, nonproliferation and trade. “I do a lot of work currently on nuclear cooperation agreements and the current status of what some of the legislation on that is. After the midterms elections, the leadership of the House changed, along with all of its staffing, so she went to work for the office of Sen. Kent Conrad (D-ND). She found her background in scientific research was put to use on energy issues like nuclear credits, comprehensive energy legislation and nuclear disposal regulations.

In March, after the earthquake in Japan, she was able to rely on her training as a plasma physicist to write some of the bills on the unfolding Fukushima disaster. “I was primarily explaining the background of what is a nuclear power plant, is it a nuclear weapon, what is a spent fuel pool,” Hopkins said.

“A lot of the issues related to nuclear energy were right in line with my work.”

She added also that not only was her technical training itself a boon while on Capitol Hill, but the habits of a plasma physicist also proved to help in communication. “It sounds trivial but I think it’s a skill that scientists really hone up on. If you are addressing daily research activities, Hopkins said.

Pointed to issues that she worked with on the Hill, including energy and pollution, as areas where scientists can have a lot of meaningful input. However she said she was a bit dismayed that more scientists and researchers don’t get involved in the law-making process.

“I wish I saw more scientists involved in policy,” Hopkins said, adding that many scientists are willing to engage the public about their research. “But what I am seeing is much less frequently is scientists coming to their local representatives and their local senator… I wish more scientists would come and talk to us.”

Bringing scientific expertise to lawmakers is one thing, but Hopkins is also as passionate about sharing science with the public. Throughout college she gave pub-

“Since I’ve always been interested in not only doing the science, but… in showing people why I’m excit-

She’s kept up her passion for bringing science to the public. This year, Hopkins received an APS Outreach Grant to set up a website to get scientists to show off their research to the public. The website, called “WhySci,” will host short explanations of the work done by scientists. Written by the researchers themselves, Hopkins will help edit the de-

She’s still weighing her options for the future. She’s at Princeton’s Woodrow Wilson School of Public and International Affairs program on Science and Global Security. She said she’s thinking about getting back into physics research, but hasn’t made any concrete deci-

Can Science and Politics Coexist?

by Michael S. Lubell, APS Director of Public Affairs

Can Science and Politics Coexist?

"It would be a triumph of the theory to actually see that it happens." Gary Feldman, Harvard Uni-

Laura Berzak Hopkins

“Nothing,” Hopkins said. “I wish I saw more of that.”

Associate professor at the University of California, Berkeley, on stepping down as chancellor of the school, The Los Angeles Times, March 13, 2012.

“Secretary of Energy Steven Chu, Nobel Laureate, National Academy member, APS Fellow and former Lawrence Berkeley National Laboratory director, is discussing with Washington how the Solyndra furor had barely died down after months of hearings and accusations, when Chu’s own support of solar energy technologies requiring less silicon to produce solar power. If the price of silicon had continued to increase, they would have had investors knocking down their doors to buy a piece of their companies. But the price collapsed, and their balances sheets completely went sour.

Chu was carrying out an ad-


"I will see more scientists involved in policy," Hopkins said, adding that many scientists are willing to engage the public about their research. "But what I am seeing is much less frequently is scientists coming to their local representa-

"We had this idea that you could use this kind of trick to probe the structure of molecules… And they could use this kind of trick to probe the structure of molecules…" Chii-Dong Lin

"Although challenges still remain, I am confident that we have put into place a clear pathway for the years ahead and strategies that will support Berkeley’s ongoing excellence and its impact on the world." At Kennedy, I am confident that we have put into place a clear pathway for the years ahead and strategies that will support Berkeley’s ongoing excellence and its impact on the world. At Kennedy, Chii-Dong Lin

Laura Berzak Hopkins

At Kansas State, we don’t have the probe the structure of molecules… They know it comes with the term of service. Laura Berzak Hopkins

"I've always been interested in not only doing the science, but… in showing people why I'm excited about it and doing so in an election year," Hopkins said.
In the “Bill to Kill Open Ac- cess Mandate” story in the March APS News, Michael Lucibella wrote that “the people who have had to walk a fine line be- tween supporting the mission of greater dissemination of science, while at the same time hewing to their institutions and intellectual property.” My response: “What intellectual property?” For ex- ample Elsevier demands all rights be given to them on pub- lication, and conveniently “al- lows” you personal use of your own work, all for the laughable claim that your scientific record must be clear and unambiguous.” Let’s be very clear and unambigu- ous here: we are TRIPLE pay- ing in this case. First to publish, second to access, and third in taxes! —Michael Lucibella

Robert Rosner, a physicist at the University of Chicago, said “This technology has been deployed at Exelon at each site.”

At Fukushima, the US nuclear industry has had to deal with dozens ofPresses, hoses and equipment to prevent them from overheating. The designs of reactors were also the subject of contention. The New York Times reported that Southern Nuclear’s new plant are the first to use a much touted, third generation nuclear reactor, the Westinghouse AP1000. It’s been designed with a number of pas- sivity features built into it that are designed to prevent the system from going critical for three days without intervention. Let’s just assume that’s not smart enough to know that single possible external event; let’s develop strategies to deal with it, Lyman said. “It’s really not effective for power plants, and be able to turn a profit for the government. From Peter to take care almost entirely on the government’s philosophy can work in private ing, the goal is not making money. It is “to advance humanitari- an good physics.” And this policy has one hundred percent director and who supports. Presumably there are numerous other or- ganizations that feel the same way. Buck was right.

Dudley Buck Remembered

Dudley Buck was a very early advocate of nuclear fuels. Prior to the disaster at Fukushima, nuclear fuel in cooling pools at all the reactors failed. As the crisis at the Fukushima Daiichi nuclear power plant un- folded, “the Washington” cohort dan- gers of radiation exposure came not from the reactors but from the fuel storage pools. These gasesinclude radioisotopes, spend nuclear fuel rods while the rods cool to manageable levels. After the tsunami engulfed the facility, the power was knocked out, and the pumps that kept water flow- ing into the pools were disabled. Ultimatey, after a day of protective suits and brave and dangerous levels of radiation to run water hoses into the pools, keepers of the pools were unable to hold away all of their protection.

A recent proposal from the American Academy of Arts and Sciences recommends a new way to mitigate the dangers of these onsite spent fuel pools. It proposes an international plan to collect spent fuel from multiple nations and consolidate them at a single safe facility. We are not recognizing that a nuclear accident anywhere is consequential to us all,” said Robert Rosner, a physicist at the University of Chicago, who helped develop the new idea. The proposal recommends that instead of storing spent nuclear fuel in cooling pools at each plant, multiple countries ship their spent fuel to a single gargantuan holding facility in the US. The fuel would be stored in dry cask storage while it cools off at these facilities under the auspices of the Inter- national Atomic Energy Ag- ency. The team says this system would be easy technologically, if implemented, safer than pools at every power plant, more cost effective for power plants, and be able to turn a profit for the country itself. Nobodies would bid to host the site, and the one selected would pay rent from nations whose waste it’s storing.

James Malone, current chief of nuclear fuel development at Lighthouse and former president of nuclear fuels at Ex- on Corporation, said that the biggest challenge would be getting countries to partici- pate, rather than any technical challenge. We’re not doing anything new on the tech side,” Malone said. “This technology has been deployed at Exelon at each site. The primary concern that spent nuclear fuel is safe in dry storage than in water. Each of the proposed sites (storage continued on page 7) In the March APS News did an excellent job in cap- turing some of these broad ideas. Because the concept is complex, I just want to add a few comments to amplify my remarks that were quoted in the article.

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Wor...
take long for Republicans to realize they might have a potent campaign issue. They blasted the President for pursuing policies they claimed exacerbated the price at the pump: limiting offshore drilling, delaying approval of the Keystone pipeline that would carry oil from Canada’s tar sands to U.S. Gulf Coast refiners and pushing for removal of tax incentives for oil and natural gas exploration. But although polls showed Obama’s approval rating eroding, they also showed the public didn’t completely buy the Republican charges. The Obama administration gave Republicans the ammunition they needed. Before Obama had tapped him for a Cabinet post, Chu, in an off-the-cuff remark, had said, “We have 50,000 miles of pipe at speeds around 500 miles per hour more than 30,000 feet above Earth. And you are doing it relatively safely and efficiently because of the principles of physics and the many principal physicists who work in various wings of the aviation industry.

From designing and building the avionic technology that ensures the plane’s sensors know where it is, to managing and analyzing air traffic systems, to flying the jets themselves, physicists make more of an impact on this multi-billion dollar industry than you may first realize. Brad Ng is just one example of a physicist working behind the scenes to make your flying experience more friendly. As the Vice President of the Air Traffic Division of CNA, the umbrella company for the Institute for Public Research in Alexandria, VA, Ng leads a team of 26 scientists, including six physicists, to examine air traffic problems relating to managing and controlling air traffic for the FAA. He was recruited by CNA 23 years ago after earning a Master’s degree in astrophysics from UC Berkeley and a PhD in Chemistry from UCLA. "At that time, there was a push towards developing a navigational system for military purposes, the FAA declared as the mandated temperature level for safety, says Nathaniel. "But if I go one degree over, you don’t fly or you may end up in jail." Nathaniel observes the problem as either you can fly or you can’t, depending on temperature or load weight, whereas the FAA policy adds gray to the issue by circumventing the science. Ng notes a similarity in how his team approaches problems in air traffic control management. "The physicists are the most 'black and white' of the staff," he says. "When they look at a problem they look at it as yes or no. But the government has a lot of gray." This can be a challenge for the physicists, he continues. "The squishiness of it makes the physics guys uncomfortable," says Ng. "The policy analysts may add grayness, and ‘black and white’ doesn’t play...You have to realize that the answer you give is the best one you can but there may be gray... (physicists) are used to looking at a problem, getting a result and that’s it. They look at benefits and achievements. But here, (the solution) may not be..."
Focus on Advocacy

Ed. Note: With this contribution, APS News begins an occasional series on members’ activities in public advocacy. John Mergo is a PhD student at Cornell University, where he studies colloidal molecular systems used to model atomic systems. Although his research in soft matter is his priority, he finds time to participate in outreach and advocacy to impact science policy. A native of southern Ohio, he grew up with a passion for science. But he recognizes that not everyone understands the relationship between innovations such as the iPad and GPS and basic scientific research. His goal is to help people comprehend the connections. In addition to participating in Congressional Visits Day (CVD) every April, he is an op-ed that appeared in the Chillicothe Gazette (Ohio) detailing the choices young scientists face when considering whether to stay in the United States as they advance their careers. “I’ve been happily surprised by the positive feedback that my op-ed has generated in the community,” says Mergo.

Read the op-ed: http://www.aps.org/policy/resources/opeds/index.cfm

For more information about getting involved in outreach and advocacy, contact Tyler Glombo, government relations specialist at glombo@aps.org or 202-662-8714.

SKIES continued from page 5 implemented for other reasons.”

With all this inside knowledge about the aviation and airline industry, do these physicists still enjoy flying? Nathaniel, who was an airline instructor for 10 years before becoming a commercial pilot in 2006, clearly loves it—he does it every weekend as he manages his dual-career. When Ng flies, he likes to listen in on the conversations between flight crew and controller to understand the working environment of the pilots. “I’ve been happily surprised by the positive feedback that my op-ed has generated in the community,” says Mergo.

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BLACK continued from page 2 from the University of Edinburgh. He joined the faculty at Glasgow and then in 2006 moved his discoveries there. He published very little in his work. What is known about him comes from occasional public appearances and scattered lecture notes made by his students. In addition to the discovery of latent heat of vaporization, liquid helium, and specific heat, and showed how it varied from one material to another. He also discovered carbon dioxide, and showed how it was related to other gases and to mineral carbonates. Finally, he joined the faculty at the most prestigious University of Edinburgh. His lecturing skills were legendary, mod- ular orders of precision, with small changes in the various searches as well as efforts to further refine the measurements, with demonstration experiments, always successful, attracting many students from different fields. He died peacefully in 1799.

Uncertain Looms Over Federal Science Spending

By Michael Lubell

In the Obama administration’s proposal for the fiscal year 2013 budget, science and engineering overall received a modest boost, with programs in environmental research and technology receiving funds increase. However, there are areas with potentially painful cuts. Overshadowing the proposed budget is looming presidential election and possible across-the-board spending cuts, causing a great deal of uncertainty over the future of federal science funding.

According to the President’s budget, funding for research and development is up about 1.2 percent. This puts the increase below the expected rate of inflation over the next year, but dramatically better than the proposed 2.4 percent cut in federal discretionary spending overall. Nonetheless, research and development will be getting a 5.1 percent boost while defense R&D, which usually makes up about half of federal R&D expenditures in the federal government, will shrink by 1.5 billion or 1.9 percent.

“Administration has already put a lot of money into a lot of programs,” said Matt Hourihan, director of the R&D Budget and Policy Program at the American Association for the Advancement of Science. “However just as there are a number of signs of continu- ing support, there are a number of signs of the limitations they’re facing.”

Energy research is one of the big losers, with the Bush Administration’s three miss- ing-angle of neutrino oscillations will be presented in session G10. 

Gravitational Waves. The hunt for gravitational waves continues, and session L6 will bring focus on new developments in the various searches as well as efforts to further refine the general relativity. Nicholas Yunes from Caltech and Joseph Taylor will give an overview of his work de- veloping new devices to look for evidence of gravitational waves around the world. Latham HUGHES from MIT and colleagues at San- dia National Laboratories have developed what they call “solar glinters” a new way of creating photovoltaics made from crys- talline silicon that uses much less semiconductor material, but maintains its efficiency (Session H8). The second session of the series looks at power generation at an industrial scale. Chris Lyons from Solar Turbines Incorporated will talk about how to generate electricity using solar already existing biomass and other wastes. Truly Forsyth from the National Re- newable Energy Laboratory will talk about the promise that wind pow- er holds for the future of renewable developing nations (Session J12).

Nuclear Detection. Warren Stern from the De- fense Threat Reduction Agency will focus on other critical issues, such as the new nuclear threat from the United States. The National Reactor Testing and Analysis Center in Idaho has been making a concerted effort to reduce the threat of nuclear ter- rorism and proliferation. Michael Larson will describe the history of the Nuclear Emergency Support Team, a team trained to respond to any kind of nuclear incident in the country (Session Q5).

how much of the proposed budget makes it through Con- gress is an open question. Budget proposals reflect an administra- tion that is dramatically altered by Congress during the appropriations pro- cess. This administration and the current leadership of the House of Representatives have had a particularly acrimonious relation- ship over federal spending; however, they also have a generally receiv- ed bipartisan support.

The House Republicans are not expected to accept the bare bones of [the proposed budget]. They’re going to pull this thing apart completely,” said Michael Lubell, APS Director of Public Affairs. “I don’t believe there is going to be any budget whatsoever.

If no budget is passed by Con- gress, it is likely that they will pass some kind of continuing res- olution in order to operate at 2012 spending levels until a final budget is passed. The Budget Control Act of 2011 is the biggest wildcard facing federal budgets at all agencies. According to the administration, the act would set in starting January 2nd of 2013. The cuts include $85 billion in defense and $20 billion in non-defense programs; $1.2 trillion in cuts over the future of federal science funding levels.

Since the “Super Committee” was set up with the hope of finding a way to reduce the deficit, significant across-the- board cuts, called sequestration, would set in starting January 2nd of 2013. The cuts include 8 percent reductions in non-defense spending and 4.5 percent cuts in defense spending. This is sequestration—that is an ab- solutely open question,” Hou- rihan said. “There are real risks for science and engineering fund- ing across-the-board spending cuts, introduced in the Senate. It is also possible that Congress can opt out of its own mandate for cuts. The Senate passed a 4.5 percent cut in the R&D budget as part of an increase, and NIST’s scientific and technical research services would get a 13.8 percent boost.

Related to other gases and to min- nerl carbonates. Finally, he joined the faculty at the most prestigious University of Edinburgh. His lec- turing skills were legendary, mod- ular orders of precision, with small changes in the various searches as well as efforts to further refine the measurements, with demonstration experiments, always successful, attracting many students from different fields. He died peacefully in 1799.

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“Administration has already put a lot of money into a lot of programs,” said Matt Hourihan, director of the R&D Budget and Policy Program at the American Association for the Advancement of Science. “However just as there are a number of signs of continu- ing support, there are a number of signs of the limitations they’re facing.”

Energy research is one of the big losers, with the Bush Administration’s three miss- ing-angle of neutrino oscillations will be presented in session G10. 

Gravitational Waves. The hunt for gravitational waves continues, and session L6 will bring focus on new developments in the various searches as well as efforts to further refine the general relativity. Nicholas Yunes from Caltech and Joseph Taylor will give an overview of his work de- veloping new devices to look for evidence of gravitational waves around the world. Latham HUGHES from MIT and colleagues at San- dia National Laboratories have developed what they call “solar glinters” a new way of creating photovoltaics made from crys- }
Radioactive decays at limits of nuclear stability

M. Pfützner, M. Karrny, L. V. Grigorenko, and K. Rilaiser

Nuclear physics began with the discovery of radioactivity. Several different forms of nuclear disintegration have been identified very early, starting with the familiar alpha, beta, and gamma rays. In 1938, nuclear fission process was discovered. Since then, many different nuclear decays, often with exotic particles, have been discovered. In the last decades, have demonstrated quite a bit of skill and ingenuity in releasing its binding energy by spitting various particles out. This review is devoted to the traditional and unusual forms of nuclear radioactivity observed at the limits of nuclear stability.

http://rmp.aps.org

ANNOUNCEMENTS

Reviews of Modern Physics

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LGBT continued from page 1

The American Physical Society is conducting an international search for the current Editor of Physics Review E (PRE). The position is that of the Senior Editor of the journal, responsible for editorial standards, policies and directions of the journal, and leadership of the staff of about 15 editors. Physics Review E is a highly interdisciplinary journal specializing in statistical, non-linear, and soft matter physics.

The ideal candidate should possess many of the following qualifications: stature in a field of research within the scope of PRE; stature in the physics community; experience with scholarly journals; mentorship and interaction with faculty and other academic faculty, staff, administrators, undergraduates and graduate students. In her abstract for the session, Rankin demonstrated how that climate can have a negative impact not only on the individual, but on the entire academic community. “It has long been understood—evidence that institutional “climate” has a profound effect on any academic community’s ability to carry out its mission. This mission includes teaching, research, and service,” wrote Rankin. “The research also suggests that a challenging campus climate for LGBTQQ students, faculty and staff. Based on the literature, a challenging climate leads to decreased productivity, decreased sense of value to the community, decreased retention, and negatively influences educational outcomes.”

Overall, the study evaluated how comfortable LGBT people feel in academia, how negative behaviors can affect them (physically, psychologically and careerwise), and then used that data to identify strategic initiatives to improve campus climates.

At the APS session, Eric Patrick, a postdoctoral fellow at Yale University, said that “many LGBT students, faculty and staff, and also the founder of OSUM” ("Out in Science, Technology, Engineer ing and Mathematics), an "LGBT-affirming corporation" that offers support and resources for STEM students and professionals.

Among the non-transgendered faculty who responded to the survey, the highest number of LGBT students (open about their sexual identity) came from the STEM fields. But because sexual orientation and gender identity factors are not reported, and because there are no substantial data sets to which to compare the new results, there is no way to know how the number of LGBT+ people who completed the surveys corresponds to the actual number of LGBT+ people in academia. What is notable about the high number of STEM respondents is that we do not have data from another anonymous study from 2003, which Rankin says received negligible responses from LGBT+ STEM faculty members.

The survey results showed a negative correlation between STEM faculty members’ level of comfort and their “outness,” or how open the person is about their sexual identity. “Meaning,” said Barthelmy, “the more out the faculty members were, the more uncomfortable they were.” LGBT+ STEM faculty members who felt uncomfortable in their department were 14.3% more likely to leave their institution.

Elena Long, a graduate student at Kent State University and past Member at Large on the Executive Committee of the APS Forum of Graduate Student Affairs, reported results from what appears to be the first survey to collect data specifically on the LGBT+ community in physics. The survey, conducted in 2011 and not yet published, was open to anyone working in or retired from physics in academia, with an equal number of graduate students. It asked respondents to identify various aspects of their identity including gender and race, as well as sexual orientation and gender identity. The survey received just under 600 responses, nearly 100 of which identified as LGBT+. The study provides a different insight into the effects of the STEM community by analyzing overlapping identity factors. For example, gender identity ranked as a top reason for feeling uncomfortable in the STEM fields is something that many Thomson-Reuters, APS Career & Diversity Committee of the APS Forum of Graduate Students have discussed.

In 2009, Long had searched for resources for LGBT+ people in physics and found next to nothing. The National Organization for Gay and Lesbian Scientists and Technical Professionals (NOGLSTP) hosts caucuses of chemists and mathematicians, the ACS has a Gay and Transgender Chemists and Allies Subdivision, the American Astronomical Society has the Working Group on Gay and Lesbian Equality, and the LGBT+ community hosts an “Outlist” identifying openly LGBT+ professionals. There is, however, no equivalent group, caucus or list for physicists.

Long founded a resource and networking website called LGBT+ Physicists. Following the 2011 March Meeting, she and some of the initial participants of LGBT+ Physicists came together to organize the diversity session, with help from APS Division of Education and Diversity Ted Hodapp, APS Career & Diversity Programs Administrator Arlene Ecke, and the APS Committee on the Status of Women in Physics, and the APS Committee on Minority Affairs.

As was noted at the session, the APS Policy on Equal Professional Opportunity, adopted by Council in 1994, includes protection for persons based on sexual orientation, but does not explicitly mention gender identity.

Hodapp responded by saying, “Because we’re a member organization and we want to serve the community, we’ve addressed the topics that we think are important.” And say, this is the thing we would like APS to do. We are happy to fa- cilitate that, but we want it to come from the members because we feel that it’s much stronger if it comes that way.

Speaker Michael Ramsey-Musolf, a professor of physics at the University of Wisconsin-Madison and a former member and Chair of the APS Committee on the International Freedom of Scientists, said that it was “a very challenging climate toward LGBT+ people, some- times known as the ‘lavender ceil- ing,’ is also a human rights issue.” Ramsey-Musolf highlighted a sec- tion of the Universal Declaration of Human Rights set out by the United Nations, which states that everyone, as a member of society, has the right to the free development of their personal liberty.

The presence of the lavender ceiling, like the glass ceiling, can mean the difference between promotion and stagnation. Sometimes, Musolf then added, “So if we think about those human rights—the social and cultural rights indispensable for free development of one’s personality—that’s the antithesis of stagnation … So the lavender ceil- ing is an impediment to that basic human right.”

Personal action and support for the LGBT+ community has al- ready had an impact on the growing number of LGBT+ physicists who are willing to step up and share their stories. For as much has been done, most of the speakers also expressed hope moving forward.

“In my own career,” said Ramsey-Musolf, “despite many moments when I was ready to leave, had it not been for key allies who are not sexual minority mem- bers, but who understood my sci- entific potential and were willing to stand up for it, to put themselves out there, I don’t believe I would be here.” And so this gives me a lot of hope and optimism about the future in our field, that people who recog- nize good science are not willing to let prejudice and stereotypes stand in the way.”

http://www.aps.org/about/governance/let- ters/assamissions2012.cfm
Thinking Seriously about Doctoral Education in Physics

Geoff Potvin

The Back Page

Worrying Trends

Despite having an exceptional history of producing world-leading researchers, graduate physics in the US faces stiff challenges. While the number of PhDs awarded has increased since a historic low around 2000, overall growth in physics PhDs has been stagnant since the great boom of the postwar era and has not kept up with the growth in many other STEM disciplines. Compounding this problem is the fact that the number of PhDs awarded to US-born citizens has been stagnant or declining for decades. This is a significant problem for physics and those concerned with long-term US economic prospects. For our community, the decline in physics interest among domestic students and the consequent drop in persistence through PhDs is concerning. In the graduate education system, research faculty, and, effectively, educational and institutional-level factors certainly do (such as required coursework, time to degree, etc.) contribute why and how they influence graduate education, and help to alleviate some of the representation hurdles (for example, the GRE, inadequate undergraduate preparation, comprehensive exams, etc.) despite having the potential to be exceptional physicists.

What is the future of doctoral education in physics? Will our community take advantage of these and other opportunities to grow and improve the preparation of future researchers and educators? Only through concerted effort and careful research can we hope to mirror the ongoing successes of reform in undergraduate physics education. However, with a growing number of researchers taking doctoral education seriously and with the weight of professional societies like the APS behind this work, we can be cautiously optimistic that these efforts will begin to transform graduate education.

Geoff Potvin has been an Assistant Professor in the Department of Engineering & Science Education at the University of Virginia and held a postdoctoral position in science education at the University of Toronto. He received his PhD in Engineering & Science Education. Previously, he completed a doctorate in theoretical physics at the University of Toronto and held a postdoctoral position in science education at the University of Illinois. His research focuses on preparing minority students for scientific careers, or join large, multiple-institution projects may experience delays for reasons that are completely meritorious.

Looking Forward

While interviewing scientists around the country, one of our observations was that many faculty mentors tend to replicate their graduate school experiences, regardless of whether they reported their experiences to be positive or negative. If their experiences had been positive, then they saw themselves as providing similar benefits to their students; if negative, they often took the position that the experiences were somehow necessary, formative, and/or beneficial ("building character"). This is troubling descriptions of such treatment. This further underscores the need to think carefully about the nature and structure of graduate education in physics. In many respects, graduate students are the engine driving research in many laboratories and research groups. It is therefore important to ensure that they are treated with proper respect and consideration.

Peeling Back the Layers

In our research on graduate education1, we have tried to shed light on some of these concerns. One important finding of our work, which goes to questions about recruiting students and preparing them for research careers, is that students’ motivations matter: the reasons a student chooses to pursue graduate school has a measurable and significant influence over their career outcomes. Specifically, we found that students who go to graduate school primarily because of their intrinsic interest in thinking about science (rather than due to receiving good grades, fellowships, family encouragement, and a host of other motivations) become more productive scientists, as measured by their publication and funding rates. While true scientific productivity is difficult, if not impossible, to faithfully and comprehensively measure, we can interpret publication and funding rates as partial proxies for scientific output. The importance of this finding lies in recognizing the reality that student motivations are often ignored throughout the education system and, especially in graduate school, it is often taken for granted that students have enough of the appropriate drive to succeed. Instead, these results indicate that we should be encouraging and providing mechanisms for students to develop their intrinsic motivations towards physics as this will likely lead to a deeper and more meaningful detachment to learning and discovery.

In addition, external structural factors play a significant role in sustaining engagement. As mentioned, doctoral completion times are important (especially in the minds of currently-enrolled students!) and they have steadily risen in recent decades. These time consequences for students are large. For men, we found that, controlling for a number of factors expected to influence salaries (for example, field, type of employer, seniority, etc.), quick finishers have greater salary prospects. Disturbingly, for women, this is not the case: on average they earn the same salaries independent of their doctoral completion time, which is at the low end of the salary scale for men. On the other hand, surprisingly few student factors significantly influence completion times (for example, gender, motivations for graduate school, prior research experiences, etc., do not affect completion) but departmental- and institutional-level factors certainly do (such as required coursework, teaching loads, etc.). The evidence points to the fact that doctoral completion times are, in large part, out of the control of individual students; however, they do affect the career prospects of men. For some, we propose that gender bias effects have a deleterious effect on their prospects regardless of doctoral completion times.

It is important to consider how this latter finding actually comes about in practice: it may be that potential employers, faculty advisors/mentors, or female students themselves undervalue their potential and, subsequently, do not receive the best offers and/or do not negotiate the employment terms they deserve. To some extent, all of these three factors may have an effect at different times. However, the important aspect to keep in mind is that in our data and elsewhere there are no measurable differences between male and female students. The key differences may be in the scientific merit and productivity through the end of graduate education (and beyond), so these gendered effects require further study and are important in order to eliminate their impact. Furthermore, the link between doctoral completion time and salary for men is also troubling given that doctoral completion time appears to be largely independent of gender. This means that we may need to be more competitive research communities, it will become more difficult to retain the most highly-skilled individuals, especially those who were not born in the US.

As has been discussed before, there are persistent concerns about underrepresentation which are more of an issue in physics than most other STEM disciplines. The representation of women in physics in increasing, albeit quite slowly: in 2009, only 30% of doctoral degrees awarded were to women. Less well articulated has been the continued failure to attract and retain representative numbers of students from traditionally underrepresented racial and ethnic minorities. (a total of 6% of doctorates are awarded to African-American, Hispanic, and Native American students combined) Further- more, these numbers are not appreciably changing; they may, in fact, be declining slightly. Additionally, there is a propor- tionately larger drop in minority student enrollment between undergraduate and graduate school-a drop from about 10% to 6%. This “gap” in participation promises to become in- creasingly problematic for physics as the US population be- comes more diverse with a larger fraction of college students coming from currently underrepresented groups. It is also a concern that more and more graduate students have received barriers in physics that limit their access to the social and economic capital associated with being an active participant in the discipline.

The Doctoral Experience

Similar to other STEM fields, the time needed to get a physics doctorate is getting longer on average. This is due, at least in part, to the increasing specialization of most research disciplines. Thus, new researchers must spend more time and effort learning what has been done in the past and getting “new” findings. But this reality also means that students must spend an ever-increasing fraction of their lives getting “new” (i.e., original) research careers. At the same time, the education system, research faculty, and, effectively, educa- tion funding sources must invest greater effort and resources in the education of graduate students. It is difficult to track reductions in the amount of time and resources devoted to any one student. But it appears that approximately 1 in 3 of those who begin a doctorate in physics do not complete it. Some will leave with an MS; others will not. While we should not expect retention rates to be 100%, we should also be col- lumbian or ambivalent about retention rates given the substantial amount of time and resources invested by students, faculty and administrators in graduate education. The dearth of data on what works best should compel investigations into how to organize graduate programs to effectively find and prepare researchers with the least amount of “unnecessary” delay.

Studying graduate education, however, is in some ways more difficult than studying physics education at the K-12 levels. By its very nature, graduate education is more spe- cialized and targeted to its students. At the same time, the thesis or dissertation should be a unique and substantial con- tribution to the scientific corpus. Thus, in certain respects, we should expect the variance in graduate experiences to be greater. For example, while we are concerned about the realities of graduate school. In 2004, APS reported on the findings of a task force that was formed in the wake of a few high profile data falsification scandals. The task force conducted a survey on ethical abuses, and, perhaps surprisingly, found that “unethical treatment of subordinates” was a wide- spread concern among junior members with somewhat dis- tinctive descriptions of such treatment. This further empha- sizes the need to think carefully about the nature and structure of graduate education in physics. In many respects, graduate students are the engine driving research in many laboratories and research groups. It is therefore important to ensure that they are treated with proper respect and consideration.
