Keen Minds Prep for the International Physics Olympiad

By Jessica Orwig

By itself, a flexible, plastic “Hot Wheels” toy car track is pretty mundane. Add a can of racket balls and a team of the top high school physics students in the country, and you have the makings of an intriguing science experiment.

Each year, the American Association of Physics Teachers and a number of member societies of the American Institute of Physics sponsor a two-week competitive training camp held on the University of Maryland campus at the end of May. The purpose is to select five high school students for the International Physics Olympiad team.

Rohan Kodialam, a junior from High Technology High School, Lincroft, NJ, is one of the students who participated in the training camp for the International Physics Olympiad.

“Some of the younger students, who are still in high school, have yet to take a class in physics, but that does not stop them from seeking out physics topics on their own,” said assistant coach, Andrew Lin, who has been part of the coaching team for 14 years, and was a member of the U.S. Physics Olympiad team in 1998 and 1999. “You can tell how thoroughly the racket ball is.” By timing how long the ball takes to roll down the track, students can calculate its moment of inertia and from that estimate the volume of empty space inside.

“The asymmetry appears to arise from 23 agencies. The proposals were reviewed and returned proposals and preliminary drafts and comments went on to say that items like notes, books, physical objects, peer review reports and preliminary drafts and analyses wouldn’t be included. However, pinning down precisely what might be included and what might not be could prove to be tricky. “The agencies are struggling with how to deal with datasets,” said Bonnie Carroll, CEO of Information International Associates. “The problem with datasets is people don’t really have a good definition of what is included and what isn’t.”

Carroll added that because there is no "Open Data" Policy a Cause for Optimism and Concern

By Michael Lucibella

Plans are moving ahead slowly for making public the raw data obtained by federally funded scientists, though how that ultimately might take shape is still unclear. Experts expressed both excitement and apprehension about the final form the new policy might take.

On February 22, 2013, the administration’s Office of Science and Technology Policy (OSTP) released a memorandum stipulating that all federal agencies that fund more than $100 million in research come up with a plan to open up peer-reviewed results and raw data to the public.

“Most of the noise has been around the literature, not the data, but the data is likely going to have the longest term impact,” said John Wilbanks, the chief communications officer at Sage Bionetworks, and who had previously run Creative Commons’ Science Commons project.

In March 2013, OSTP collected, revised, and returned proposals from 23 agencies. The proposals haven’t been released to the public. Over the next several months, OSTP will meet with agency representatives to continue to refine proposals.

“I certainly expect that by the end of this year we’ll see the plans,” Wilbanks said.

More than a year after the memo was first issued, there has been no official word as to how the federal agencies plan on implementing the opening of scientists’ datasets. However, data experts are not worried and have applauded the administration for its deliberative pace.

“They recognize that this is a very difficult problem, far more difficult even than open access for publications,” said Michael Lubell, director of public affairs for APS. “There are several outstanding questions about the policy, including what kind of data is covered and where it will be stored.”

The memorandum defines data generally as “digital recorded factual material commonly accepted in the scientific community” and goes on to say that items like notebooks, physical objects, peer review reports and preliminary drafts and analyses wouldn’t be included. However, pinning down precisely what might be included and what might not be could prove to be tricky.

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By Calla Cofield

At the 2014 APS April Meeting in Savannah, Caltech theoretical astrophysicist Christian Ott presented the first 3D computer simulation of a rapidly rotating, highly magnetized core-collapse supernova. The new work reveals a much more asymmetric picture of these monsters than previous 2D models and may also provide insight into how the collapsing matter becomes a black hole.

“The simulations by Ott and colleagues look specifically at a so-called ‘engine driven’ core-collapse supernova, which is characterized as hyperenergetic, even by supernova standards. These supernovae eject material into space at nearly the speed of light and produce gamma ray bursts in the process. Previous models of rapidly rotating and highly magnetized supernovae assumed symmetry around the vertical axis of the star, thus showing changes in only two dimensions. The ejected plasma forms two symmetric jets along the vertical axis—blossoming out along the pole lines, reaching the same height and forming the same shape.

“Our simulation ... looks fundamentally different,” said Ott at a press conference in Savannah. The new model shows a notably asymmetric explosion. The plasma appears to emerge along the axis once again, but rather than forming jets, it spreads out into two lumpy, asymmetric lobes. Supernovae Explosions Now in 3D

“Open Data” Policy a Cause for Optimism and Concern

Supernova Explosions Now in 3D

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This Month in Physics History

July 19, 1595: Kepler’s Insight Leading to Mysterium Cosmographicum

T
oday, we think of physics and astronomy as being inextricably linked, but this was not the case in the 16th century, when the former was deemed natural philosophy, while the latter was left to the esoteric and liberal arts. One scientist who helped break down that barrier was Johannes Kepler.

Born in December 1571, just west of modern-day Stuttgart, Germany, to an alcoholic father and a young woman, the grandson of a former Lutheran pastor, the young Johannes was just five years old. His mother was a healer and herbalist – a dangerous profession in that superstitious age.

A bount with smallpox crippled his hands and hampered his vision, but Kepler showed a gift for mathematics early on. He fell in love with astronomy at age six, when his mother took him out to watch a comet streak across the night sky. He experienced his first lunar eclipse a few years later. He studied philosophy and theology at the University of Tubingen, where he gained a reputation as a skilled astrologer – still considered an illegitimate branch of astronomy at the time – and embraced the then-relatively-new Copernican heliocentric system for the movement of the planets – and eventually became a math and astronomy teacher in Graz.

On July 19, 1595, while lecturing on the periodic conjunction of Jupiter and Saturn, Kepler had an insight: There might be a geometric underpinning to the universe. He worked out a scheme in which the five Platonic solids – icosahedron, tetrahedron, octahedron, cube and dodecahedron – could be inscribed within spheres and then nested within each other. This produced six layers, which in Kepler’s view corresponded to the six planets known at the time (Mercury, Venus, Earth, Mars, Jupiter and Saturn). He even worked out a preliminary formula connecting the size of each planet to how long each took to complete one orbit around the sun, although he later discarded it in favor of something more precise.

This became the basis for one of his earliest treatises, Mysterium Cosmographicum, among the first defenses of the nascent Copernican system to appear in print. His labors over its publication nearly ended his engagement to a rich young widow named Barbara Müller. Her father initially opposed the match, despite Kepler’s noble birth, because the astronomer was so poor, but eventually relented. Kepler married Müller in April, 1597. The marriage was not a particularly happy one, and Müller died of spotted fever in 1611. (His second marriage, to Trophime Rutgers in 1613, proved more successful.)

Mysterium Cosmographicum was an unusual scientific treatise, given the inclusion of a detailed chapter attempting to reconcile Kepler’s vision of the Copernican system. Those passages were removed before the book was published late in 1596. This work cemented his reputation.

He sent copies to several noted colleagues, including Danish astronomer Tycho Brahe, who initially offered a rather harsh critique of the German scientist’s model. Kepler was keen to address those criticisms and make further progress on his ideas. Since Brahe had amassed far more accurate observational data from his private observatory than that readily available to Kepler, he visited Brahe in Prague early in 1600, staying at Brahe’s data to Mersenne to test the theory laid out in the Mysterium Cosmographicum. The following year, he moved his entire family to the Brahe’s observatory – in part because he had been banished from Graz for refusing to convert to Catholicism. When Brahe died soon after, Kepler succeeded him as imperial mathematician; his Lutheran faith was tolerated in the Prague court. His duties mostly consisted of providing historical accounts of the scientist. Kepler despised much of astronomy, dismissing it as “evil-smelling dung,” but – a creature of his era – he believed a scientific approach to the subject could be useful. He later published a treatise attempting to find missing elements, rather than a new one, to one concurred. Kepler also witnessed a supernova in October 1606, which became the basis for De Stella Nova, published two years later. Kepler also tried his hand at more fanciful writing.

KEPLER continued on page 3
By Alaina G. Levine

On March 31, 2014, France A. Córdova was sworn in as Director of the National Science Foundation (NSF). An astrophysicist with a doctorate in astrophysics from Caltech, she started her educational career as an English major at Stanford University. She served in a variety of administrative and leadership positions in higher education and government, including Chief Scientist of the National Aeronautics and Space Administration (NASA), Vice Chancellor for research at the University of California, Santa Barbara, Chancellor of the University of California, Riverside, and President of Purdue University. These are excerpts from an interview, with the full text available online.

AFL: What was it about physics that attracted you in the first place?

FC: My first real encounter with physics was in the 7th grade and we were doing science fair projects. I saw the Bohr model of the hydrogen atom in an encyclopedia and I was smitten. I just couldn’t believe that scientists could infer something so beautiful, so strange from observations and data. But . . . I had no role models or mentors in science then. I just knew that I really liked literature and poetry and writing. So when I went off to college, I majored in English Literature and it wasn’t until after I graduated and was doing a project back east that I saw a television show about neutron stars which had recently been discovered. And the very next day (I was living in Cambridge), I went down to MIT and asked for a job at the Center for Space Research [now the Kavli Institute for Astrophysics and Space Research] and they hired me and that was my entry into science, so it was a very unusual pathway.

Interview with France A. Córdova, New Director of NSF

APL: You stayed in physics for a little bit and then you moved into service, management in academia and in government. You’re back in government now. What is it about government and more broadly service that really attracts you?

FC: The head of NASA asked me to interview for the [NASA] Chief Scientist position, and I did, and he asked me to join NASA, temporarily leaving Penn State to do that. That was my first policy/governmental position and I just found that I really enjoyed it. I loved collaborating with the other agencies, being a part and [taking] a leadership role in the National Science and Technology Council on their subcommittee on science. Penn State had given me a leave for 3 years—[and] when I was due to go back, I was offered positions in administrative science leadership, and I accepted one at UC Santa Barbara, which was Vice Chancellor for Research. I loved that position because I was close to science and scientists, but I was also able to further a research agenda and move the needle forward, especially in interdisciplinary research, and that really got me interested in and comfortable in the world of administration.

APL: Was there anything particular about 2014 Kavli Prizes

CÓRDOVA continued on page 7

Kavli Astrophysics Prize Winners

Alain Guth, André Linde, Alexei Starobinsky

NSF

France A. Córdova

APL: I love your boldness. You set a good standard and role model for many people.

FC: Well it’s either boldness or obnoxiously. [Laughs]

Four APS members and an APS member winner were among the recipients of this year’s Kavli Prizes.

The Kavli Foundation announced awards for research into the early inflation of the universe and for pushing the resolution limits of optical microscopes. The winners were named during a live online broadcast from the World Science Festival on May 29 in New York City.

Alan Guth of MIT, Andrei Linde of Stanford University and Alexei Starobinsky of the Landau Institute for Theoretical Physics at the Russian Academy of Sciences won for their exploration of the brief period of hyperexpansion, or inflation, in the very early universe. Guth previously won APS’s 1992 Julius Edgar Lilienfeld Prize for his work on cosmic inflation, and Starobinsky is an APS fellow.

Members Stefan Hell of the Max Planck Institute for Biophysical Chemistry and John Pendry of Imperial College London shared the nanoscience award for their work on optical nanoantennas and for pushing the resolution of optical microscopes to less than 200 nanometers, an achievement once thought to be impossible. Pendry previously won APS’s 2013 James C. McGroddy Prize for New Materials. Presented in conjunction with the Norwegian Academy of Science and Letters, the annual awards recognize pioneering science in astrophysics, nanoscience, and neuroscience. The winners in each category share a $1 million cash prize, and each receive a medal and scroll honoring their accomplishment. The Kavli Foundation was established in 2000 by a donation from entrepreneur Fred Kavli, who passed away last late year.

Kavli Nanoscience Prize Winners

Thomas Ebbesen, Stefan Hell, John Pendry.

For photo credits, go to http://kavli.prizes.org, click on “Media” and then “Photo credits.”

Profiles in Versatility

Córdova was sworn in as Director of the National Science Foundation (NSF) in 2014—arguably the earliest work of science fiction, The Dream of Shadows I measure meteor umbras: I measured the skies, now the shadows I measure Skybound was the mind, earth-bound the body rests.
Most of the news we read and hear about the Middle East points only to instabilities and chaos in countries like Egypt, Syria, and Iraq. It is not the only side of history. Scientifically, this part of the world had looked at the most attractive to me is the growth and modernization in all fields. Since then, Doha has become a modern metropolitan city, shining with lights emitted from dense traffic and high-rise buildings.

I was dropped off at my hotel. I was curious to see the night life in the city that looked, as viewed from the plane above, like any other big modern metropolis. Shining, shining, with lights emitted from dense traffic and high-rise buildings.

Doha indeed has become an international city, attracting business from all over the world and mixing its traditions with cosmopolitan life. This was in sharp contrast to the impressions I had during my first trip in 2005. Since then, Doha has been undergoing unprecedented growth, modernizing all sectors of its economy, infrastructure, industry and educational system. Most attractive to me is the massive investment in education and scientific research. Over the last decade, Doha has been investing heavily in higher education, research infrastructure, and national research laboratories and institutions. In the spring of 2005, I was among a group of US scientists who were visiting Doha under the banner “International Conference on Materials and scientific research. Education City is now the home for branch campuses for renowned universities in the US, Canada, and Europe. I was one of these bright minds; the physics program is offered within the department of Mathematics, Statistics and Physics. Education City and Doha's fast growth is driven by the “Qatar National Vision 2030” report, which outlines ambitious goals and strategies aiming at establishing the "Qatar as a knowledge-based economy." This is a document I enjoyed reading: It presents a coherent path to the future to transform Qatar into an advanced country by 2030. One of the four pillars discussed in this document is focused on human resources and education, and the document outlines a set of objectives, some of which are specific to the development of scientific research and higher education. It is refreshing to see that in the midst of economic growth, Qatar started to invest in higher education. The birth of modern physics, between 1905 and 1945, has been defined by the increasing diversity within the department of the recommendations in the report. The organizers are hoping to create a network of college physics departments to share ideas and best practices for building up entrepreneurship physics education.

We want to make entrepreneurship and innovation education as robust in the physics curricula as it has been in the engineering curricula for the last two decades. "Bail- ley said. "Basically the engineers have been doing this for 20 years, so there’s no reason that physicists can’t do the same.

Entrepreneurship education would include non-physics courses about finance, intellectual property, business plans, communication, and presentation. Only about 3 percent of students who earn a physics bachelor's degree go on to become tenure faculty and instead enter the private sector or other careers. "If you go into the private sector, clearly you need to know a whole lot of stuff that isn’t physics," said Douglas Arion, a professor of electrical engineering.

DOHA continued on page 6

Preparing Physicists for Entrepreneurship
By Michael Lucibella

Physicists are pushing to incorporate more business and innovation education into their departments’ curricula. At a meeting at the American Center for Physics in College Park, MD, on June 5-6, professors from across the country and Canada gathered to develop strategies to encourage their home institutions to teach physics students entrepreneurship skills.

“This meeting is intended to seed the movement,” said Crystal Bailey, the careers program manager at APS and organizer of the conference, “Reinventing the Physicist: Innovation and Entrepreneurship Education for the 21st Century.”

“It is not going to be a one-off conference where we write a report and we’re done. This group is going to continue to meet, continue to share ideas, and continue to build a community of practitioners, and this meeting is the first step in the process.”

She added that the organizers are hoping to create a network of college physics departments to share ideas and best practices for building up entrepreneurship physics education.

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MEETING continued on page 7

Report on Graduate Education Released
By Deanna Ratnovsky

Most physics graduate students will end up employed outside of academia, yet few physics graduate programs have adapted in recent years to accommodate more interdisciplinary research and interests. A call to better prepare students for diverse careers, the increasing diversity within the field, and recommendations on how to move forward were outlined at the 2nd Graduate Education in Physics Conference. Organized jointly by APS and the American Association of Physics Teachers (AAPT), this conference took place January 31-February 2, 2013 at the American Center for Physics in College Park, Maryland, with 77 participants from 74 different institutions.

Released this month, the conference report—prepared by Renee Duff (Penn State), Theodore Hopp (APS), Chandrasekha Singh (University of Pittsburgh), Michael Thouvenen (Michigan State), and Lawrence Woot (General Atomics)—emphasized the need for physics departments to define their overall goals in order to develop a coherent program that builds on their specific strengths, rather than seeking a one-size-fits-all solution. The authors recognize that not all of the recommendations in the report may be appropriate for every department, but they can enrich physics graduate programs if implemented in a way that aligns with departmental goals and strengths.

The report highlighted efforts such as developing a departmental identity, adding flexibility to the curriculum, teaching students professional skills, and engaging alumni working outside of academia as

Telling the History of Physics Through Historical Places
By Calla Cofield and Michael Lucibella

Learning the history of physics has for years been centrally focused on the “what,” rather than the “where.” However, recently historians have started talking more about the locations where discoveries were made, especially to people who aren’t historians. “It makes history more much more real by being in a location where physics was done. You can kind of imagine what went on,” said Paul Halpern, a physics historian who put together a physics-themed study abroad trip to sites where scientists worked and lived. "I think it makes history more vivid."

Historians in other areas have long focused on the locations of significant events; science history has incorporated the idea relatively recently. “Civil War courses take their students to Civil War sites all the time,” said Gregory Good, the director of AIP’s Center for History of Physics. “Any way you can get people into real locations and out of the classroom can help.” He added that countries in Europe have been the most proactive about officially identifying and designating historic scientific sites. “We’re slow with this in the US. The Europeans have been paying attention for a long time to historical sites connected to famous scientists,” Good said.

“Civil War sites have a lot to offer, but there’s no reason that physics sites can’t be the same,” said Good. "We’re not sure how to do this, but we should have discussion about it.

Daniel Scheun, Wikimedia Commons

Placements such as Einstein’s house on the Kramgasse in Bern, Switzerland, offer opportunities to touch physics history. 
Since its creation in 1980, the APS Committee on International Freedom of Scientists (CIFS) has advocated for and defended the rights of scientists at home and around the globe. Recent APS and Committee activities include:

Andrei Sakharov Prize

APS presented its 2014 Andrei Sakharov Prize to Boris A. Altschuler and Omid Kokabee at the April Meeting in Savannah. The Prize recognizes scientists who have demonstrated leadership in defending and supporting human rights. Altschuler, of the Budker Institute of Nuclear Physics in Russia, was recognized For his life-long advocacy for democracy in Russia and for his advocacy on behalf of the rights of neglected children. Kokabee, physics graduate student and prisoner of conscience from Iran, was honored For his courage in refusing to use his physics knowledge to work on projects that he deemed immoral, in the face of extreme physical and psychological pressure. Since Kokabee is in prison, his sister Leila accepted on his behalf. For more, see the June issue of APS News: http://www.aps.org/publica-
tions/apnews/201405/sister.cfm

Petition Calling for the Release of Omid Kokabee

Earlier this year, APS, Amnesty International, and the International Committee of Concerned Scientists, and United for Iran co-sponsored a petition calling for the unconditional release of Omid Kokabee. To take advantage of the fact that Kokabee was receiving the Sakharov Prize at the APS April Meeting, CIFS set up a booth at the meeting to educate attendees about Kokabee and ask that they sign the petition. These signatures and others from around the world are being collected by Amnesty International to send to Iran's leadership.

When Kokabee’s family visited him in prison the day after the awards ceremony, they were able to take photos of him with some of the attendees at the booth. Kokabee’s sister reported that they appreciate the support that they are receiving from APS.

Alexander Gorsky

In March, Alexander Gorsky was removed from his position at the Institute of Theoretical and Ex-

Particle Physics Panel: US Needs More Global Partnership

By Michael Lubell

A new top-level government role

urges the United States to be-

come more of an international player in the field of high-energy physics.

The Particle Physics Project Prior-
nitization Panel, referred to as P5, submitted its draft outline for the next decade of science experiments funded by the National Science Foundation, the Department of Energy (DOE) Office of Science, the House Science, Space, and Technology (SS&T) Committee elected to split COMPETES reau-
torization into two separate bills, the “FIRST” Act, which ad-
dresses NSF, NASA, NST, and OSTP, and the “EINSTEIN” Act, which addresses only DOE. Both bills contain policy provisions that would substantially alter NSF and DOE procedures and pri-
orities which many science and technology organizations have spoken against. Although the House SS&T Committee has a long record of blocking major legislation, the FIRST and EINSTEIN Acts have created a substantial rift between the Republican major-
ity and the Democratic minority. Subcommittee and committee votes on the bills and amendments have been largely along party lines.

WASHINGTON OFFICE ACTIVITIES

ISSUE: MEDIA UPDATE

Rolf Cail, a leading newspaper on Capitol Hill, published the latest column by APS Director of Public Affairs Michael S. Lubell on May 12. Titled “America Can’t Afford to Ignore Science,” the piece points out that “science holds the key to increased prosperity for all Americans.”

In other media news, the Speaker–Review newspaper in Wash-
ington published an op-ed on May 24 by Eric Beier, a junior at Washington State University where he is chapter president of the Society of Physics Students. In the piece, Beier makes the case that research should be a priority for the US to ensure that students are prepared for an “increasingly competitive and globalized world.”

ISSUE: APS Panel on Public Affairs (POPA)

POPA continues its review of the APS 2007 Statement on Climate Change. More information can be found on the following webpage: http://www.aps.org/policy/statements/climate-review.cfm

POPA has received Council commentary regarding the POPA-approved wording of APS Statement 08.1 on the Civic Engage-

ment for 2015. The APS Executive Board will now review both the statement and these comments.

POPA approved a proposed statement by the APS Committee on the Status of Women in Physics at its June meeting and will now send it to the Council for comment prior to review by the APS Executive Board at its next meeting.

At its June meeting, POPA also entertained a preliminary pro-
posal for a study to explore incentives that could increase the number of Doctorate candidates in key Sciences: Science, Technology, Engineering, and Mathematics (STEM) shortage ar-
eas. The POPA Physics & the Public Subcommittee will prepare a formal proposal for POPA’s consideration in the fall.

Use the following link to log in to suggest future POPA studies: http://www.aps.org/policy/reports/
sions by the group.

“Some of our students had to read the original 1905 paper, and they kept talking about trains coming and going between trains,” said Kortemeyer. “Well, you look out of [Einstein’s] window and you look out on the main train station of Bern…and you see trains coming by, so that’s what you write.”

Kortemeyer, a native of Ger-
many, says he was turned on to physics history by a colleague years ago. As a teacher, he slowly realized how physics history can help convey the true nature of physics.

“In many respects I think with the undergraduate physics classes…we are doing physics history less as a dissertation,” said Kortemeyer. While physics classes teach the students about mechanisms, formulas and laws, he says they “hardly ever convey what physics is really about.” He fears students will leave the discipline without ever having thought only about putting numbers through different equations to get more numbers out. “And of course that makes them wonder why would anybody study physics?...”

The United States has a wealth of physics history sites that can be drawn from. Although the National Park Service’s National Register of Historic Places does list some related locations, profes-
sional societies in the United States have been the primary drivers for identifying and promoting them. Historic sites related to physics began with the American Institute of Physics in 1980. Since then, the AAPT has worked to encourage schools to develop their own Historic Sites Initiative in 2004. So far APS has installed 34 plaques at locations across the coun-
try, highlighting the locations where researchers made important discov-
ers.

Richard Kremer, a history pro-
fessor at Dartmouth College, has

been using the APS list to create a course that traces the history of US physics by way of its institutions. Dartmouth itself was designated an APS Historical Site in 2011, which first led Kremer to think about using the initiative to explore science his-
tory. “It’s not really a physics course, it’s not really a history course, it’s a writing course,” Kremer said.

This year, he designed a ten-
week freshman writing class, with each week focused on a different historic site. The sites include the Hughes Research Laboratory (now HRL Laboratories), Johns Hopkins University, Harvard University, and Bell Laboratories. The students in the class are the ones in charge of putting together each week’s lesson plans and required readings.

The class is designed for students to develop their research skills, so they’re required to do a little bit of coming up with the class reading each week. Before each class, a different team of students compiles a list of differ-
tent primary and secondary sources to understand both the science of that week’s discovery and the history of the American scientific in-

stitutional context,” or what it was like to work at a particular laboratory.

“This is new stuff for me and I’m learning things myself about the history of physics,” Kremer said.

“At the end of the final exam that these kids are going to write is, ‘Is there really such a thing as American physics based on these ten case stud-
es?’”

Even though the students don’t actu-
ally visit the sites in the course, other than Dartmouth itself, Kremer said that using a site to talk about a discovery gives the students a feel for each location’s historical intellec-
tuality.

“The whole course is sort of a question as to whether location mat-
ters,” Kremer said.

GRAAD ED continued from page 4

DOHA continued from page 4

ways to improve the professional training of students in physics grad-
uate programs. Flexibility in the graduate program and its curriculum is very important, especially for a group of a diverse group of graduate stu-
dents, and several talks at the con-
fERENCE focused on the need to en-
gage more students from underrepresented minority groups.

Meg Ury of Yale provided the keynote address on the future of physics graduate education and the diversity challenge facing the field. She stressed that physics PhD pro-
gression rates are lower for diverse participants if they want to maintain the highest level of qual-
ity. According to Ury, “Graduate education is a career, not a hobby. It doesn’t justify not because of fairness or equal opportunity—even though that’s a concern of ours—but because it’s vital for physics.”

With significant input and feed-
back from graduate students and representatives from all the participating national labs, the report from the 2013 conference builds upon the recommendations of the 2006 APS- AAPT Task Force on graduate edu-
cation in physics and of the 2008 APS Graduate Education in Physics

Conference. For example, this latest report recommends additional changes in the student advising process and student career preparation. The report also suggests that Krull is in the mechanical engineer-
ing department to explore the pos-
sibility of submitting a collabora-
tive research proposal to QNRF. At first I must admit that I was reluct-
tant and wanted to learn more about QNRF before committing myself to such an effort. After all, support for science and basic scientific re-
search in that part of the world, while increasing, has been relatively slow and, wealth, has been lacking for years. It is no secret that the scien-
tific productivity from countries in the Middle East is not abundant. For a very small fraction of global output—it is even among the smallest con-
tributors of the world. However, as I learned about QNRF, I thought that there is something positive about having to turn things around.

Besides QNRF, Qatar Founda-
tion also funds a number of national organizations. During my most recent visit to Doha in the fall of 2013, my long-time friend and colleague Mohammad Khaleel invited me to visit the offices of the newly established Qatar Energy and Environment Research Institute (QERI). This is one of our re-
search institutions being built by Qatar Foundation to fulfill the goals of Vision 2030. Although these in-
stitutions are still in their nascent stage, they are already attracting the best scientists from across the world. Khaleel, a leader from one

of the US national laboratories, opted to relocate to Doha to lead QERI. Under his leadership, QERI is now attracting top-notch scientists from across the globe to work on cutting-edge research projects, and even non-scientists to visit the art research facilities in comput-
ing, materials science and environ-
mental research.

This is only a glimpse of what is emerging in Doha in terms of scientific developments. It seems that the Qatar Foundation is putting the country on the map as a potential hotbed for a potentially successful, sustain-
able, and world-class scientific network. This is rather inspirational.

I have enjoyed visiting Doha and observing its transformation into a modern city. Perhaps on my next visit, I will see yet again new and fascinating developments taking place in that part of the world.

Hassein M. Zbib is Professor of Mechanical and Materials Engr-
ing at Washington State Uni-
versity, and a member of the APS Committee on International Scien-
tific Affairs.
Why me? I bring a different background to this position. I am very interested in how we can broaden our efforts in preparing the next generation of scientists and engineers, and so I’m focused on that. We have terrific pocket efforts all across the agency [but] they don’t always talk to each other in a systemic and scalable way, so I think we’re going to be doing a lot more coordinating and standardizing so that we can get that effort to the next level. There are huge populations of [underepresented] people that we are not tapping into and we’re not reaching them. So, I think we can do much better there, and that one is also one of my reasons for this job. And another goal is to increase public communication about the value of investments in fundamental science and engineering, which clearly has kept the US ahead in innovation and discovery. I think you’ll see more effort in both formal and informal venues that NSF will be looking to use to help improve the understanding of the connection to your work and the impact, its how our daily lives, and why we do what is worth of investment.

AGL: Regarding the research areas that NSF supports, what specific areas of research do you think you’re going to be most interested in after the next 5 to 10 years. What are you excited about?

FC: There’s just so much. One other thing that characterizes me is that I am hopefully interested in everything. It’s just I’m exceptionally interested in the last thing that I happened to hear about [laughs]. That come out of the NASA community [so] I’m extremely interested in everything we find out about the cosmos and all the unique telescopes that we have already built and are doing incredible new observations, and the ones we are involved in that are just starting. A geoscientist will come in to my office and talk about a research area that I am not very excited about. There’s Antarctica and the Arctic and all the polar programs we have. That’s unique. That NSF has the charge of running the polar science facilities for the country and has the leadership position in the entire world. Basically what NSF does it is supports all fields of science and engineering—thats our real strength.

AGL: What can physicists look forward to at NSF under your leadership?

FC: If there’s a message I would ask physicists to help us with, it is to do their part to communicate to the public about the exact importance and impact that science and scientists have on the nation and the world. I hope they’ll be part of what our aim is, which is affecting the next generation of scientists and engineers, and not just the ones that enroll in their classes but all the ones that are surrounding women and people of every race, as an English major, who could potentially be the next director of NSF. How can they reach out to that population? How do they communicate with their colleagues and those that are in an opportunity to fulfill our curiosity and our love for nature and opportunities to be the first person to see something in nature that nobody else has seen before? AGL: You are such a successful woman in science. Do you have any thoughts for women who are in science or being able to excel as a scientist?

FC: A couple of things come to mind. One thing is they are more interesting to solve—they are more interesting to solve. I love mysteries and trying to figure that out. I was in grade school (because I loved mysteries and trying to figure that out)…and I just ignore them. I just don’t deal with things that can bother you, because sometimes you'll find that they are not the ones that are sup- portive. For example Caltech, my graduate school, just said “ok we got an English major here, how do we help her?” and they helped me design a program to fill in my math background. And as long as I was willing to work hard and show that I was very enthusiastic about it they were going to recognize and help me to be a successful one. If you’re not in an environment that is supportive, then you find one that is. So I feel that if you are a potential scientist or engineer and you should be one’s choice to make things worse for yourself: Try to choose pathways that are more helpful. They exist all around you and identifying them and getting on them is really key. I just think it's research, but we've got some people out there who are not supportive, but I haven't heard them [laughs]. I just ignore them.}


cientific and that is the preference of Networking for Nerds (Wiley, 2014) and President of Quantum Success Solutions, a science career and professional development con- sulting enterprise. She can be contacted through alainalevine.com, or followed on twitter @creationofscientists and building their own projects.

DOE charged the panel to come up with recommendations for the next ten years under different budget scenarios: flat for three years, then 2 percent growth over seven years; two percent growth for the first three years followed by 3 percent growth, and an “unconstrained budget” which essentially asked the panel to come up with a program for the U.S. to lead the world in high energy physics.

For more information on the P5 meeting, visit science.energy.gov/hep/hepap/reports.

“I really want to make it a full fledged [Jet Propulsion Lab] in a single building,” Tagg said. “Providing space, technical resources, and on-demand learning enables students, teachers and working sci- entists and engineers to collaborate on innovation that society greatly needs.”

Duncan Moore, who teaches entrepreneurship at the University of Colorado, highlighted how many of his students had gone on to start their own companies, and how that in turn benefits both the school and the local community.

“The mission we have is transforming ideas into enterprises that create either economic or social value,” Moore said. He added that the skills taught in an entrepreneurship program carry over into almost any career, even if only about six percent of his graduates start their own tech businesses. “I can teach you the elements of being an entre- preneur… But I can’t teach you to actually be an entrepreneur. It’s something in your DNA.”
Y ou might assume that young physicists, with their busy and focused lives, have never considered that science could be a tool for protecting human rights, and vice versa. Many graduate students and postdocs, myself included, have limited interaction with the world outside of academic groups or annual research conferences, which seldom discuss issues like human rights. Last summer, when I was offered the opportunity to represent APS at the American Association for Advance ment of Science Student and Postdoc Human Rights Coalition (AAAS SHRC) as a student delegate, I eagerly agreed—despite the fact that I had very little in sight as to what exactly that involved. Although I had dived headfirst into unfamiliar territory, I surfaced with not only a newfound awareness of my own responsibilities as a physicist in regards to protecting human rights, but also with the comforting knowledge that my peers and colleagues were willing to embark on this journey too.

Attending the Coalition’s July 2013 two-day annual meeting themed “The Right to Enjoy the Benefits of Scientific Progress and Its Applications” in Washington D.C., the heart of political activity, was a revealing experience for me. Throughout the plenary lectures and breakout meetings, immersed in the intersection of the social and natural sciences, I gained a deep, critical understanding of complex issues that relate science and human rights, such as research and knowledge through open-access science literature while preserving the viability of peer review, ensuring global access to new technologies, and the rights of all people through science and its applications. A similar meeting in January of 2014, “Disability Rights and Accessing the Benefits of Scientific Progress and Its Applications,” took a different approach to the ways in which science and engineering greatly influence the human rights of persons with disabilities. These sessions, while similar in nature to the 2013 convocation, focused more on access to new technologies, and the rights of all people through science and its applications. While the survey helped to momentarily spark interest in the intersection of the social and natural sciences, I gained a deep, critical understanding of complex issues that relate science and human rights, such as research and knowledge through open-access science literature while preserving the viability of peer review, ensuring global access to new technologies, and the rights of all people through science and its applications. A similar meeting in January of 2014, “Disability Rights and Accessing the Benefits of Scientific Progress and Its Applications,” took a different approach to the ways in which science and engineering greatly influence the human rights of persons with disabilities. These sessions, while similar in nature to the 2013 convocation, focused more on access to new technologies, and the rights of all people through science and its applications.

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“Although I had dived headfirst into unfamiliar territory, I surfaced with not only a newfound awareness of my own responsibilities as a physicist in regards to protecting human rights, but also with the comforting knowledge that my peers and colleagues were willing to embark on this journey too.”

APS has long been an ardent champion of human rights, spearheading many human rights campaigns, projects and informational seminars. In February of 2011, physics graduate student Omid Kokabee, of the University of Texas at Austin, while on a visit home was imprisoned in Iran on accusations of “communicating with a hostile government” and “receiving illegal earnings.” APS has worked tirelessly to bring awareness and support to the Kokabee case, supporting petitions and lodging protests against his imprisonment. When asked if they were aware of the Kokabee case, many survey respondents replied in the negative. Out of the few who recognized the case, a high percentage indicated that they had learned about the incident through APS efforts to bring awareness and support.

Survey takers were then asked to describe, in a few words, how the Kokabee case affected them personally. While replies were mixed, the underlying tone of responses was one of empathy, anger, and concern. In particular, many international students were concerned for their own safety and rights while abroad or in their native country. A large majority of these responses also portrayed a desire and motivation to participate and partner in efforts to sow seeds of human rights awareness among their peers to help mitigate future tragedies. While the survey helped to momentarily spark interest

and awareness in human rights in relation to science, the issue is still widely misunderstood. When asked to describe, in a few words, any individual cases of their fellow colleagues whose human rights have been violated or at risk, a large number of respondents cited complaints that were not applicable—i.e., failing to receive an extension on a research topic, problems with visa renewals, and other miscellaneous day-to-day grievances. It is clear that graduate students and alumni alike must continue to educate themselves and their peers in order to construct a well-rounded view of the issue.

This can be achieved by actively participating and engaging in efforts by organizations, such as AAAS SHRC and APS Committee on International Freedom of Scientists (CIFS), which are working at local or national level, in this field.

There are a variety of ways to get involved in the AAAS SHRC, from attending its meetings, which are free of charge for student and post-docs, to volunteering in their ongoing efforts. The Coalition recently held a competition to connect directly with students by organizing student poster competitions in its annual meetings. This competition, which asks students to submit a poster that should reflect their understanding on a given related topic, is open to undergraduate and graduate students interested in science and human rights.

CIFS, one of many APS advisory committees, is charged with monitoring the rights of scientists. The Committee has been advocating for the release of Omid Kokabee as well as advocating for the rights of other scientists such as Abdaljalil al-Singace, an engineer in Bahrain who has essentially been imprisoned for speaking out about Bahrain’s human rights record. CIFS is also collaborating with the APS Forum on Graduate Student Affairs to ensure that APS student members are aware of CIFS initiatives, so that if they experience any violations of their rights, they would see it as a platform for assistance.

To connect the hectic lives of graduate students to current APS awareness efforts, I feel it is important to bring human rights campaigns directly to campuses and curriculums to more successfully bridge the gap. With the insight gained from the survey responses, APS plans to develop activities, such as educational seminars at its upcoming annual meetings, aimed at engaging APS members in issues related to physics and human rights.

As my tenure comes to an end, I realize more acutely than ever that I have had an amazing opportunity to become part of a community with a laser-like focus on promoting a view of science inseparable from basic human rights. I would like to thank both APS and the AAAS SHRC for allowing graduate students, such as myself, exposure at such an early stage in their careers to the vibrant level of thought, of science inseparable from basic human rights. I would like to thank both APS and the AAAS SHRC for allowing graduate students, such as myself, exposure at such an early stage in their careers to the vibrant level of thought, of science inseparable from basic human rights. I would like to thank both APS and the AAAS SHRC for allowing graduate students, such as myself, exposure at such an early stage in their careers to the vibrant level of thought, of science inseparable from basic human rights.

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