APS NEWS

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

January 2010
Volume 19, No. 1
www.aps.org/publications/apsnews

Meet the New APS President
Page 3

Man in the Middle

Photo by Michael Lucibella

Janice Reutt-Robey and Ted Einstein of the University of Maryland, and (right) Kristen Fichthorn of Penn State were just 3 of the approximately 130 physicists who gathered at APS headquarters on December 4 and 5 to sort more than 7500 abstracts for the 2010 March Meeting, which takes place March 15-19 in Portland, Oregon.

Laser Celebration Gets Underway

January marks not only the first month of 2010, but also the first month of LaserFest, the new outreach effort APS is helping to lead. Together with the Optical Society of America, SPIE, and IEEE Photonics, APS is a Founding Partner of the yearlong celebration marking the 50th anniversary of the invention of the laser. The program includes dozens of different events across the country which will stress the importance of lasers in modern society, and more broadly the importance of basic research.

In 1960, Theodore Maiman, working at Hughes Research Laboratories in Malibu, California, constructed the first working laser using a synthetic ruby crystal. Since then lasers have become a critical component in countless technologies ranging from simple CD and DVD players to more advanced applications like Lasik eye surgery and the gigantic petawatt lasers at the National Ignition Facility used for fusion research.

"It's a good example of how one invention can go from a 'solution without a problem' to a 'can't live without it' product in little more than a generation," said LaserFest coordinator James Roche.

Events will include the numerous LaserFest on the Road teams where presenters will stage physics demonstrations that feature the laser. In addition there will be a traveling lecture series, a laser show at the U.S. Capitol building, the student-run LaserDays, booths at numerous scientific conferences, and educational material distributed to classrooms across the country.

"There's something for everybody," said Roche, "We hope to inform the general public of the importance of the laser. We hope to let the science community know about the important faces and the work that they've done. We hope to convince industry and government to fund basic research. We want to inspire children to go into not just laser science but science in general."

The LaserFest website, www.LaserFest.org, features a continually updated calendar of planned events and locations. Also more information can be found there on the many applications of the laser, a timeline highlighting the history of laser innovations, and a variety of other resources.

Physicist Takes on Superhero Role for LaserFest

By Michael Lucibella

Watch out Superman, there's a new superhero in town, and she doesn't just shoot lasers from her eyes, she actually *is* a laser. To coincide with this year's LaserFest, the fiftieth anniversary of the invention of the laser, APS will debut a series of comic books as part of its outreach efforts. Aimed primarily at middle school kids, the two comic books star middle schooler Lucinda Hene and her laser superhero alter-ego Spectra.

The creative force behind Spectra is physicist Rebecca Thompson-Flagg, or Becky as she is known to nearly everyone, APS's Head of Public Outreach.

Photo by Ken Cole and Nancy B. Karasik

She developed the characters, wrote the script, and has been instrumental in bringing Spectra to life. She's even put together a Spectra costume for public appearances.

The comic book began as the companion piece to this year's PhysicsQuest kit. Each year, APS sends out over 13,000 free kits to middle school classrooms

SUPERHERO continued on page 5

Division of Fluids Hears About Sports, Volcanoes, Climate Change, and Blood

The APS Division of Fluid Dynamics held its 62nd annual meeting in Minneapolis in late November. The event, hosted by the University of Minnesota at the Minneapolis Convention Center, brought together over 1,500 physicists from all fields of fluid dynamics. Events included a career workshop run by the National Science Foundation; a tour of the facilities of the precision measurement instrument company TSI incorporated, and a full scientific program highlighting the latest in fluid research. Among the featured topics:

Volcanoes

Michael Manga of the University of California Berkeley took a close look at the fluid dynamics of volcanic eruptions. As magma from Earth's mantle flows up a conduit towards the surface, its flow is governed by its nucleation and bubble formation, escaping gas, crystallization, fragmentation, and the mechanics of the magma itself. Manga combined discrete models of all these factors to come up with a more complete simulation of the flow of magma. He used this combined methodol-

FLUIDS continued on page 7

Multi-Pronged Approach to Stimulate Minority PhDs

By Gabriel Popkin

The APS recently launched a program to increase the number of under-represented minority (URM) physics doctoral recipients in the US. The new Minority Bridge Program (MBP) will facilitate the transition of minority physics majors to graduate programs in physics via bridge programs between institutions where these students earn their bachelor's degrees and PhD-granting research institutions.

Photo courtesy of Michelle Iacoletti

Michelle Iacoletti, Project Manager for the APS Minority Bridge Program, with physics students at the Mayagüez campus of the University of Puerto Rico.

Currently, URMs (defined for this purpose as including African-Americans, Hispanic-Americans, and Native-Americans) make up a third of the country's college-age population and around ten percent of the undergraduate physics majors in the country, but receive only five to six percent of the physics PhDs, according to data from the US Department of Education. "Minorities are underrepresented in physics at all steps along the education pathway," says Theodore Hodapp, Director of Education and Diversity at APS. "We have chosen to address the gap between bachelor's and PhD recipients because this is where we can have the greatest impact." MBP project leaders hope to close this gap through a multi-pronged

MINORITY continued on page 6

New Features and Functions Debut on APS Meeting Abstracts Website

Members logging onto the online Bulletin of the American Physical Society (BAPS) for the upcoming "April" and March meetings will notice several major updates to the website. The new version of the site, which organizes presentation abstracts for all of the society meetings, was launched on December 2nd. The updates added new features, including a word and affiliation search as well as improvements to the scheduler and the overall layout.

The changes were prompted after surveys were taken at last year's March Meeting asking participants about the website. The responses indicated that many members wanted to see numerous improvements to the scheduler and search functions. As a result, APS webmasters initiated the first major update to the website since it was launched in 2005.

Two of major additions to the site are the new word and affiliation searches. Using these tools, meeting attendees can quickly sift through the hundreds of online abstracts for any that pertain to their field of interest.

"The scheduler has been revamped and improved," said Jim Egan of the APS IT department, who was in charge of the updates, "We've made some improvements on the back end to speed that up."

Egan and his team reworked the scheduler's code to make it easier for members to assemble a personalized agenda when attending meetings. It's now faster and better at catching potential scheduling conflicts. In addition the program can send a PDF of a member's com-

WEBSITE continued on page 4

INTERNATIONAL News
...from the APS Office of International Affairs

Astronomy: Pakistan's New Future?

By Saadat Anwar Siddiqi

The year 2009 was the International Year of Astronomy (IYA) and hundreds of organizations worldwide celebrated mankind's understanding and unraveling of the universe. In Pakistan, these objectives were actively pursued by the Khwarizmi Science Society (KSS). The astrofests, or *falakyati melas* in Urdu, are the Society's latest initiative in popularizing science and bringing modern scientific knowledge to the remote and far flung areas of the country.

The KSS is one of Pakistan's most active grass-roots science associations, aimed at furthering a science culture in our educational institutions. Since 1997, the Society has maintained an impressive series of seminars, workshops, field visits, conferences, student orientations and panel discussions, all aimed at university and research students. A full listing can be found on http://www.khwarizmic.org. APS members will be glad to know that physics has remained one of the most popular focus areas.

However, in our academia, there is also the strong appreciation that of all the Pakistani students entering university, it is extremely hard to find those who are adequately prepared and excited enough to undertake the rigors of advanced physics. Without doubt, a massive overhaul is required to transform the way science and physics is taught at the primary and secondary levels. One of the reasons is that the current approach is largely textbook-oriented with little emphasis on real scientific activity, if any at all.

Feeling the need for contributing to scientific outreach and science popularization at the level of the schools and the laity, the KSS decided to take part in the IYA. The idea was to make a roving observatory and use astronomy as a vehicle for promoting science education in distant and rural schools and showing students, and importantly, their teachers, that science can after all be made interesting and inspiring!

In our astronomy initiative, we chose to connect science with tradition and technology with socialization. In our incarnation of astrofests, the word *mela*, literally meaning a 'carnival' or a 'festival,' is a centuries' old tradition in the Indo-Pak subcontinent, where people of all ages flock and engage in festivities: sports, shopping, acrobatics, circuses, merry-go-rounds and emphatic recitations of folk songs and epics. These *melas* have stood the test of time and form long-awaited occasions of community gatherings. We believe that these concepts steeped in tradition and history can be used as a potent vehicle for the transmission of science.

For example, the live astronomical observation of the moon, Jupiter, Saturn and Venus triggered the biggest gathering in the District Public School and College, Okara in the Punjab province. More than two thousand men, women and children gathered in the evening at the school, that had been transformed into a festive carnival by the school authorities, first to listen to a popular lecture on the subject and then to observe the heavenly bodies, all in real time. The idea we use is very simple: connecting the scope's eyepiece to a high-resolution CCD camera and projecting the live view onto multimedia screens.

Let me share a few interesting experiences. While the astronomers aligned their telescopic gear, the witty headmaster of Okara's Public School, Mazhar Hussain, arranged an impromptu competition on poetic recitation relevant to the moon. In Urdu literature, the moon has remained a popular poetic icon and is used as a simile for the beloved. (However, viewing the lunar craters proved to be a complete surprise against the established literary notions!) The older generations were delighted as they were shown the various stellar constellations identified with their horoscopes. Finally, the magnificent rings of Saturn grabbed everyone's attention.

Similar melas have also been arranged in Lahore's Punjab University and at a large school in Phoolnagar, 70 km from the provincial capital. These events have attracted schoolchildren in the thousands and clearly, these are

PAKISTAN continued on page 6

This Month in Physics History

January 15, 1955: "Characteristics of Bubble Chambers" published in *Physical Review*

In 1912, a physicist named Victor Hess was conducting an ion chamber balloon experiment, expecting to find a decrease of ionization in the atmosphere with increasing altitude. Instead, he found just the opposite: ionization in the atmosphere actually increased with altitude. He concluded there must be radiation entering our atmosphere from space, later dubbed cosmic rays. Finding a means of detecting those particles and making the invisible visible, became a major challenge for physicists. Two men in particular rose to that challenge: Charles Thomas Rees Wilson and Donald Glaser.

The first technology invented to detect cosmic rays came from the mind of Wilson in 1895. A Scottish physicist at Cambridge University's famed Cavendish Laboratory, Wilson was interested in the weather and wanted a means of reproducing the condensation of clouds in the laboratory. He constructed a closed vessel filled with saturated air, then caused a sudden expansion of the volume of the vessel. The resulting drop in temperature makes the air supersaturated and produces condensation. And he brought the tools of physics available at that time to bear on the challenge, most notably discharge tubes.


Donald Glaser working on his bubble chamber

By 1910, Wilson was using his cloud chamber device to detect charged particles, since they would leave a trail of ions–and water droplets–as they passed through the gas in the chamber. He took the very first photographs of the tracks left by alpha and beta rays, not to mention evidence of how individual atoms and their electrons interacted. Both alpha and beta particles have distinctive tracks: the former is broad and straight, while the latter is thinner and more easily deflected by collisions with other particles. Apply a uniform magnetic field across the cloud chamber, and positively and negatively charged particles will curve in opposite directions.

But cloud chambers had their limitations for research purposes, particularly as particle physics continued to advance. They were too small, for one thing, for use at large accelerators. And the liquid density wasn't sufficient to interact with a large number of highly energetic particles. It also had a slow cycle: the process of reactivating the cloud chamber took too long compared to the accelerator cycles.

Enter Glaser, an American physicist credited with inventing the bubble chamber, which works on similar principles to a cloud chamber, except it is filled with a superheated liquid instead of a gas. The son of a sundries salesman, Glaser hailed from Cleveland, Ohio, and was a sufficiently accomplished musician that he played with the local symphony at age 16. But his real love was math and physics, and he went on to earn his PhD from Caltech in 1950.

Legend has it that while he was on the faculty of the University of Michigan, Glaser was chilling with colleagues over a cold beer, observed the stream of bubbles in his glass, and was inspired to build a device that could track subatomic particles with bubbles. Glaser himself later refuted this story; beer was not his inspiration, although he did use it as a liquid in early prototypes.

His first device was a small glass bulb roughly the size of his thumb and initially filled not just with beer, but also soda water and ginger ale. He didn't have much success with those liquids at capturing the trail of bubbles left by subatomic particles. Then he built a small bubble chamber in 1953 filled with superheated liquid diethyl ether, augmented with a high-speed camera to record the very first tracks of cosmic rays. He won the 1960 Nobel Prize in physics for his achievement–one of the youngest scientists to be so honored. Today's bubble chambers typically are filled with superheated hydrogen.

Glaser moved to UC Berkeley shortly after this discovery, where he continued refining his invention. In his first two years at Berkeley alone, he collected nearly half a million photographs tracking the passage of particles through a newer, bigger bubble chamber built by his colleague, Luis Alvarez. This device was six feet long, compared to the inch-long bubble chamber Glaser first invented, and it could measure particle tracks every 14 seconds. Alvarez' machine helped launch the era of big science in high-energy physics, and also earned its inventor a Nobel Prize.

Ironically, both Alvarez and Glaser left particle physics after their triumphs. Some have speculated they became bored and disillusioned with how automated the field had become. Glaser went on to make his mark in the field of molecular biology, researching the evolution of bacteria, how cell growth is regulated, and the causes of cancer and genetic mutation. In particular, he found that certain mutations in Chinese hamsters caused the animals to be unusually sensitive to UV light; exposure to UV rays caused the mutated cells to turn into cancer cells. The same defects can be found in humans, giving rise to a rare cancer called *xeroderma pigmentosum*, whereby the sufferer often can remain cancer free by avoiding exposure to daylight.

He co-founded the first biotechnology company with two colleagues in the 1970s, correctly foreseeing the explosion in applying the fruits of molecular biology research to industry, particularly medicine and agriculture. And when even that lost its novelty, Glaser moved into neurobiology, specifically studying the human visual system and its perception of motion and depth.

Glaser also used photo-analyzing equipment he'd originally developed for his bubble chamber to identify species of bacteria via computer scanning, so he brought a bit of automation to his new field as well. And while bubble chambers have been largely superseded in particle physics by later technologies such as spark chambers and wire chambers, they are experiencing some resurgence of interest in the ongoing search for dark matter particles.

APS NEWS

Series II, Vol. 19, No. 1
January 2010

Coden: ANWSEN ISSN: 1058-8132

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

APS News (ISSN: 1058-8132) is published 11X yearly, monthly, except the August/September issue, by the American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, (301) 209-3200. It contains news of the Society and of its Divisions, Topical Groups, Sections, and Forums; advance information on meetings of the Society; and reports to the Society by its committees and task forces, as well as opinions.

Letters to the editor are welcomed from the membership. Letters must be signed and should include an address and daytime telephone number. The APS reserves the right to select and to edit for length or clarity. All correspondence regarding *APS News* should be directed to: Editor, APS News, One Physics Ellipse, College Park, MD 20740-3844, E-mail: letters@aps.org.

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

Subscription orders, renewals and address changes should be addressed as follows: For APS Members–Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, membership@aps.org.
For Nonmembers–Circulation and Fulfillment Division, American Institute of Physics, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502. Allow at least 6 weeks advance notice. For address changes, please send both the old and new addresses, and, if possible, include a mailing label from a recent issue. Requests from subscribers for missing issues will be honored without charge only if received within 6 months of the issue's actual date of publication. Periodical Postage Paid at College Park, MD and at additional mailing offices. Postmaster: Send address changes to APS News, Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844.

Callan Highlights Increased Transparency, Member Involvement and Stable Management

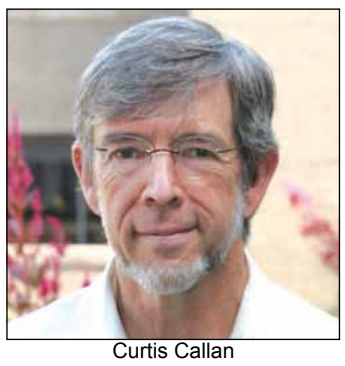
Curtis Callan, a professor of physics and chair at Princeton University, assumed the APS presidency on January 1st 2010. In the following interview with *APS News*, he discusses his priorities for the Society during his presidential year.

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

If you believe the newspapers, it is the crisis in confidence in science created by the "Climategate" email revelations. Sadly, I think they have a point. We physicists didn't create this problem, but we stand to lose a lot if public confidence in science–the presumption that scientists don't manipulate data to make a point–is damaged. The question for the APS is how we might contribute to the discussion in a way that best makes use of our core competence as physicists. This will no doubt be the subject of APS Council discussions all this year. If we get time to think about it, I would also like to see us address the question of how best to argue for societal support of science, physical as well as biological, basic as well as applied. Most of us are intuitively convinced that basic science is not just decoration, and that over the long term it drives the engine of prosperity and quality of life by making possible groundbreaking innovations and drawing youth into science careers. Indeed, there are a number of economic studies from the 50's–'70's that have demonstrated a direct link, but they need to be updated and put in terms that would permit an OMB director to know what percentage of GDP we absolutely must invest in science if we are to ensure our future prosperity. This will be a serious issue when the US heads back toward balanced budgets, as it is bound to in the next couple of years, and I think the APS could take the lead in helping science as a whole address this question.

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

Let me respond by talking first about something that may seem a bit off the point. Some of the discussion in my email inbox concerning the APS climate statement of two years ago, and then the question of how APS should respond to "Climategate" has, in my opinion, gotten overly warm. The APS has bylaws that enshrine the principle that all policy is set by Council, and from that principle follow procedures, perhaps slow and cumbersome, but sound. In a society where policy is made by elected member representatives (who have demanding day jobs) the time scale on which decisions can be made is necessarily drawn out. So I would counsel patience to my colleagues as the Society wrestles with these issues. One lesson President Murray and others



Curtis Callan

have drawn from recent experience is that it would be good to institutionalize some mechanism for "member comment" on statements before Council takes action. A trial version of this will be implemented in the coming months, specifically to deal with matters arising from the climate statement issue (keep your eyes on this page for more info). The bylaws committee has been tasked to look into making some such provision a permanent feature of Council approval of APS statements. This goes in the direction of increased transparency and, with modern IT options, should be quite practicable. So, to answer your question about my focus, in the first instance, it will be to try to calm things down so that the Society can conduct its business in a more normal mode. Without that, thinking about any of the greater plans I might have in mind will be pointless. As far as the climate issue goes, the APS, along with most other scientific societies, is a bit player in the drama. Whatever we say will only have a useful, if necessarily modest, impact to the extent that what we do is done deliberately and without acrimony.

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

This has been a subject of active discussion in the Executive Board and Council under the rubric of "how can we make membership more valuable to the individual APS member?" Our publications and our membership departments are actively working together on ways to give APS members more powerful and customized web access to physics-related information. I believe that the new online journal "Physics!" is a very good example of what can be done and I hope to see more. The important point is that all arms of the Society have taken it on themselves to pool their expertise and work together to create new and better reasons for physicists to be members of the APS. It can't just be the journals and the meetings any more: most physicists get access to the journals through their institution, and would go to the essential meetings in their field whether or not they were members. We have talented and dedicated staff who are working on this "business development" task with new enthusiasm, and I expect to see some interesting proposals brought to Council in the near future.

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

In the end, this is defined by what the members want, and this is something which we learn through the work of the Physics Policy Committee (PPC), the Panel on Public Affairs (POPA) and the associated forums. For some decades, the members have wanted the Society to be activist in public affairs. To be heard in the public arena, we lobby Congress on legislation, and we perform and disseminate studies, both activities focused on subjects where physics and public issues intersect. I believe that both are important, must be done carefully and selectively, and with due regard to our special competence as physicists. The lobbying is done on the basis of positions developed by our committees and approved by Council: there is

CALLAN continued on page 6

The Auto Industry's a Deal for Physicists

By Alaina G. Levine

Bita Ghaffari went into the auto industry following her postdoc because she wanted to make an impact. "What I do," says the Technical Expert at Ford Motor Company's Research and Advanced Engineering (R & A) division, "is a small part of larger projects that can ultimately affect a lot of people."

She studied atomic physics as a graduate student at the University of Michigan and counts her PhD research, in which she discovered chaotic transport in certain classes of charged particle traps, as her greatest professional moment so far. In fact she won the 1998 APS Outstanding Doctoral Thesis Research in Beam Physics Award.

And yet, in the years she spent completing her postdoc, she found she wanted to go beyond atomic physics. A major issue was what she felt was a lack of influence she could have over a significant percentage of the population with her pursuits. "When you're doing anti-matter work, there are maybe five people in the world who really care about what you do," Ghaffari jokingly describes. "I became interested in the impact part" of physics research, she says, and she thought industry in general, and the auto sector specifically, would give her the opportunity to provide a contribution on a grander scale. She was right.

Cynthia Marlatt photo

Bita Ghaffari

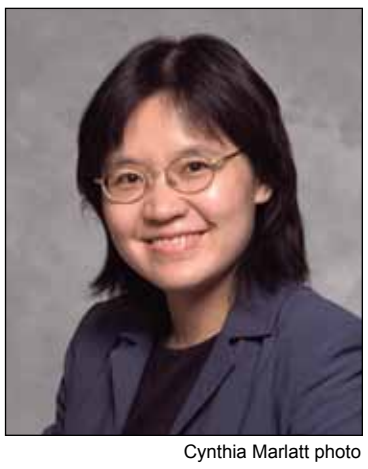
An employee of the company for ten years, she has worked on two major research goals: creating non-destructive tests to find defects in parts as they roll off the assembly line, and strengthening alloys that are used to make engines and other vehicle components.

She spent her first eight years of research at Ford involved in the former. As parts come off the assembly line, invariably, "some don't meet the required specifications" in various categories, such as mechanical dimensions, surface hardness, tensile strength, and even color, she reports. The key is to create ways in which one can examine the parts, to ensure quality, without destroying them. Her research in ultrasonics and other imaging processes led to the development of techniques and instruments that could be used by plant workers, who might not have technical backgrounds, to test various parts for imperfections while maintaining the integrity of the part itself.

Another element of her ultrasonics work was detailed materials characterization to experimentally confirm Computer-Aided Engineering (CAE) models of automotive parts. The importance of computational methods in manufacturing cannot be overstated, says Ghaffari. It takes years to get a car from "concept to assembly," she explains. "If you can predict it before you build it, you save time and money…If you can shave off even a month in the process of designing and developing a car, that's the Holy Grail."

The testing research she and her colleagues at Ford conducted made an impact, she says. The work on non-destructive testing of spot welds, which are used to join the various body structure panels of the vehicle, led to improvement in spot-weld quality in cars. "[This] can reduce the noise and vibration of the ride," she affirms.

For the last two years, Ghaffari has endeavored in R & A's department of Materials and Processes to better understand how the alloys that are used to construct engines, body structures, and other vital auto parts can be made stronger. The metals, which include aluminum alloys and magnesium alloys, "are not as strong as we want them to be," she says. "There are microscopic particles inside many important alloy(s) that impart various properties to the metals, for example, great strength." Ghaffari's job is to examine these particles to understand how they form inside the alloys and how the particles and the alloys themselves respond to various operating conditions such as strain, fatigue, and intense heat.



Cynthia Marlatt photo

Yue Qi

She is one of the few theorists in R & A and "never in a million years did I expect to do theory," she admits. Her work is critical and her physics background is essential–she employs Density Functional Theory to conduct First-Principles calculations of some alloy properties, which are then used to construct thermodynamic models and ultimately micromechanical models to predict various mechanical aspects of the alloys, she says.

Yue Qi, a Staff Research Scientist at General Motors, started in the industry in 2001, fresh from obtaining her PhD in materials science at Caltech. She had completed an internship at the company while a graduate student and liked what she saw. Although she has no degree in physics, she quips that she "pretends to be a physicist." In reality, however, all of her research at GM is physics-related (and, by the way, she is a member of the APS).

Her work in the global R and D division focuses on computational materials science. She examines the grain boundary structures of aluminum panels to find ways to improve them for strength and flexibility. She is also involved in projects pertaining to energy. "I model the nanoscale morphology of proton exchange membranes [in fuel cells] to improve both proton conductivity and mechanical durability," Qi says. This is a difficult challenge, as usually both conductivity and durability cannot be achieved together. Typically she and her team are able to

DEAL continued on page 7

Letters

Many Pioneers in Graphene Discovery

It was a surprise to see your article "October 22, 2004: Discovery of Graphene" in the history column in the October *APS News*. Thank you very much but I am not dead yet and not even old enough (51), and your glorifying comments made me feel rather uncomfortable. While many research papers and several international awards indeed attribute the discovery of graphene to our group, the use of the word discovery is perhaps not entirely accurate: One needs to be aware of many earlier papers that poked in the same direction. Researchers previously tried to make increasingly thinner sheets of graphite and grew thin graphitic layers on top of other crystals. Their papers were mostly–if not entirely–observational, and there was no convincing case put forward to spark the graphene gold rush. The literature search is complicated because until recently relevant papers remained unnoticed and often do not cite each other. Nevertheless, our papers (for example, "The rise of graphene") provide a decent overview of the earlier literature citing tens of pre-2004 papers on both mechanical cleavage and epitaxial growth.

As of today, the earliest paper on graphitic epitaxial growth which I am aware of dates back to 1975 [1], and the earliest microscopy observation of atomically thin graphitic fragments (possibly even monolayers of graphite oxide) can be found in a German-language journal from 1962 [2]. I am certain that even earlier papers will eventually be found, and I would most welcome further historical insights.

Over the years I have received 3 vociferous requests from other researchers to acknowledge their pioneering roles in the experimental discovery of graphene. Let me use this opportunity to do so. In 1999, Rod Ruoff from Austin reported "thin sections of HOPG plates" and promised that "future work will include trying to obtain graphene" [3]. Reginald Little "predicted and conceived graphene" in his 2003 review [4]. And, in 2004, Walt de Heer from Georgia Tech was the first to pioneer thin graphitic layers grown on SiC as a base material for future integrated circuits [5], the vision that I hope will prove right. I whole-heartedly recommend reading all these papers.

[1] A. J. van Bommel, J. E. Crombeen, A. van Tooren. *Surf. Sci*. **48**, 463 (1975).

[2] H. P. Boehm et al. *Z. Naturforschung* **17b**, 150 (1962).

[3] X. Lu, M. Yu, H. Huang, R. S. Ruoff. *Nanotechnology,* **10**, 269 (1999).

[4] R. B. Little. *J. Cluster Sci*. **14**, 135 (2003).

[5] C. Berger et al, *J. Phys. Chem. B* **108**, 19912 (2004).

Andre Geim
Manchester, UK

Heavy, round philosopher invents black holes

I was interested to read, in the November *APS News*, about how John Michell in the 18th century proposed earthquake waves, a precursor to Cavendish's experiment, and black holes. But why, in a physics newspaper, was it relevant to quote (more than once) that Michell was short and fat? Why was it "nonetheless" that he was an "excellent Philosopher?" Is the anonymous author of this American Physical Society monthly column proposing a correlation between attractiveness and physics ability?

Jay M. Pasachoff
Williamstown, MA

The Sun is a Wild Card

As reported in the December *APS News*, at its recent meeting Council returned the APS climate-change statement to POPA "to address issues of clarity and tone".

The key question to be decided remains whether recent global warming results mainly from anthropogenic causes. Only if evidence proves this to be the case can there be any hope that humankind can influence the Earth's temperature.

Forecasting the state of the planet's climate remains an extremely complex problem. As one example, the sun's role in determining the Earth's climate appears to have been seriously underestimated in many IPCC studies.

In fact, the temperature history of the planet during the last century relates very well to the observed solar activity during that period. This has been discussed by the renowned solar physicist C. de Jager of the Netherlands [www.cdejager.com], in a brief radio talk delivered in April, 2009. Here is a partial quote (translated from the original Dutch):

The sun is dead; as dead as a doornail. That is, since quite recently. Only a few years ago, about Hallowe'en in 2003, there were gigantic explosions on the sun. These so-called solar flares were more intense than what had ever been observed previously. They had energies of the order of a couple billion Hiroshima-size atomic bombs, and we know what one single Hiroshima bomb meant.

A short time after that, at the beginning of 2005, the sun emitted the largest gas clouds ever observed. These gas clouds passed the Earth with velocities of more then a thousand miles per second. And they had energies that were even many times larger than the most potent ones of the Hallowe'en explosions of 2003.

The explosions of 2003 and 2005 formed the…conclusion of a period of a half century, during which the sun has been more active than it had ever been during the previous thousands of years. During these fifty years the sun emitted per day, on average, two to four solar flares and two to four gas clouds –with a total energy equivalent to the energy of tens of Hiroshima bombs per day. This fifty year period is called the Great Maximum of the 20th century. After that the sun collapsed into a deadly rest.

In addition to great maxima the sun has also experienced great minima. The most impressive of these was from 1650 til 1720. During that period the sun was dead, just as dead as it is today. This is called the Maunder Minimum*. This episode was characterized by a period of low temperatures on the Earth. During the winters the canals in Holland were frozen over for long periods. The tow boats (important modes of transportation in 17th-century Holland) could not sail during those times. This period is called the Little Ice Age. Also, during the* Dalton Minimum *around 1820, it was colder than average.*

The crucial question is whether there is a relation between the temperature on the Earth and the activity of the sun. It is striking to note that after the Maunder Minimum *till the end of the 20th century, the solar activity gradually increased, while at the same time the average temperature on the Earth also increased. In my research, which I am carrying out in collaboration with my colleague Silvia Duhau, we have found that this fact could have been caused by the increasing intensity of the ejected gas clouds–the solar wind. We found that it appears that a new Great Minimum is approaching; maybe it has already started. We further expect that this period will last during the remainder of the present century. Will we have another cool period? It is too early to tell. In about 20 years we will know more.*

This story contains two profound messages for climate scientists: first, that global warming of the second half of the 20th century may be partly due to the sun's behavior; and second, that the sun remains an unavoidable wildcard in long-time climate prediction.

Frits de Wette
Austin, TX

Climate Change Supporters Resort to Intemperate Calumny

I was disappointed to see the evident bias in letter selection that characterized the *APS News* discussion of the global warming issue. From the flood of e-mail that descended on the Council members before the meeting, I would judge that the membership is split more or less down the middle on the substance of the current APS official position. You published one letter, occupying 3 column-inches supporting the position that the Statement should be rescinded, and two letters, totaling 14½ column inches on the other side. Further, the letter supporting revision of the statement had in it only comments about the science, with no denigration of the motives or characters of those who hold the other view, while the other two were largely devoted to character assassination and obloquy. I give you for examples: "a blatant and political statement, that obscures the issues," "politically based myths," "political extreme", "conflict with state-of-the-art climate models," [I included that one because I hadn't thought that conflict with models is a defect–I thought it was conflict with the facts that was], "it beggars the imagination that serious scientists can ignore this overwhelming evidence", "obfuscating and confused deniers," etc.

These are serious issues. When I joined APS 65 years ago reasoned argument was the order of the day, and such intemperate calumny would never have been published.

Hal Lewis
Santa Barbara, CA

Ed. Note: *As best we can tell, the "flood of e-mail that descended on the Council members" was two to one in favor of the APS position (see the story "Members Bombard Councilors with Messages on Climate Change" in the December* APS News*.) We did not calibrate the letters by column inches–we simply printed the letters we received.*

* * * * * * *

It is unfortunate that the two letters that objected to our attempt to reconsider the 2007 Climate Change statement stooped to name calling. I quote from Eric Swanson's letter:

"It beggars the imagination that serious scientists can ignore this overwhelming evidence. The possible dangers of a warmer world are serious issues, not to be negated by obfuscating and confused deniers."

This recalls in my mind the quote from a former Vice President of the United States, who referred to opponents of the disastrous policy of the Nixon administration in Viet Nam as "Nattering nabobs of negativism." Such sarcasm-laden sentences may make for good journalism copy, but science they are not. It is an inconvenient truth that many very serious scientists do not agree with the present consensus. I am afraid that, inconveniently, that number seems to be growing. I don't recall that science was done by majority vote. Can we please have a serious analysis of the physics of climate change by the APS, rather then a series of letters which hurl insults at those who happen not to agree, based upon their independent analysis?

Robert H. Austin
Princeton, NJ

* * * * * * * *

I believe that the letter by Charles Jackson [*APS News,* November 2009] which accuses Robert Austin of "...blatant political statement that obscures and removes focus on what to do ... prevents scientific discussion..." has no place in *APS News*. Professor Austin of Princeton University is a respected member of our community. He may be right, he may be wrong, but there is no doubt in my mind that he is calling the science as he sees it. His views deserve as much respect as do Charles Jackson's.

I disagree with the APS statement, but believe the statement supported by Robert Austin goes too far in the other direction. My views, as well as my own proposed statement have been documented in the letters to the editor section of the July, 2009 newsletter of the Forum on Physics and Society.

Wallace Manheimer
Chevy Chase, MD

WEBSITE continued from page 1

plete agenda to their email inbox. The scheduler also now features more links back to the main APS webpage.

"What this does mean is easy navigation between the main meeting site to the bulletin and back," said Donna Baudrau, the Director of Meetings and Conventions, "It's like a bridge between the two sites."

In addition to improving the functionality of the site, its overall feel has gotten a facelift as well. Outdated information on the site will automatically be taken down, and the layout will be consistent for all of the meetings. Even its look has been updated and modernized.

"We were attempting to make the scientific program consistent with the look and feel of the rest of the APS website," said Sara Conners, APS's web manager.

APS is continuing to look for ways to improve the website's abilities. Over the next few months, all of the current servers are going to be replaced and upgraded. These new servers will continue to speed up members' updates to their schedules, one of the biggest criticisms of the website found in last year's survey. The updated equipment should be completely in place and operational in time for the March Meeting.

One other major update can't actually be seen from the main BAPS webpage. Abstracts from the meetings are now accessible through searches on Google Scholar. Anurag Acharya, one of the founders of Google Scholar, first contacted APS in July about including abstracts in the databases of scholarly literature that the search giant accesses. Special tabs were added to the meeting archives and included with the new abstracts to make it possible for Google to search through the database.

In addition, Egan said that they are developing an iPhone app to download abstracts onto the handheld devices. The team developing the app said they're aiming for it to be ready in time for the March Meeting.

Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: Science Research Budgets

NSF and NIST Funding

After several months of delay, and nearly a month and a half after the FY10 Energy and Water appropriations bill was signed into law, the House and Senate concluded conference discussions on a "minibus" package created to speed passage of the remaining FY2010 appropriations bills. The minibus package includes the Commerce, Justice, Science (CJS) FY10 appropriations bill in which the NSF and NIST budgets are contained. The Senate had passed that bill on November 5th, after action was delayed by a number of contentious amendments, but conference continued to be delayed as other appropriations bills also lagged behind. The House passed the package on December 10th.

The Senate will consider the package the weekend of December 11th, because Republicans are blocking a consent agreement to complete the measure early the following week. The package is likely to pass, with the Senate either staying in session over the weekend to let the cloture clock run or agreeing to skip those steps and vote Monday. It is likely that Senate Majority Leader Harry Reid would likely file cloture on the omnibus, setting up a Saturday cloture vote and a Sunday vote on passage.

The current continuing resolution expires on December 18th, and if the minibus bill is not signed by the President by that time, Congress will consider a very short term CR to bridge the gap between CR expiration and final passage and signature of the minibus bill in order to ensure continued funding for the affected agencies, including NIST and NSF.

ISSUE: POPA Activities

The National Security Subcommittee is finalizing a report that examines technical steps supporting nuclear arsenal downsizing. Release of the study's final product is anticipated for early 2010.

The Energy Critical Elements Study, which will examine the scarcity of critical elements for new energy technologies, has established its committee membership and will hold its first meeting in March of 2010 at MIT. The study will convene via web-conference in December to prepare for their first workshop.

The Electric Grid Study, which seeks to examine the technical challenges and priorities for increasing the amount of renewable electricity on the grid, held its first workshop in early October 2009. A second workshop, which was tentatively scheduled for December '09, will be held in early 2010.

The Carbon Capture Study, which examines non-biological CO_2 Capture, is in the final stages of review and production and will be available for release in early 2010.

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

ISSUE: Media Update

Congressman Bart Gordon (TN-6th), chairman of the House Science and Technology Committee, wrote an op-ed for the November edition of *Capitol Hill Quarterly*, stating that the path toward lowering our carbon emissions, meeting our growing need for energy, and growing new sectors of the economy–and the jobs they provide–is through the research and development (R&D) of new energy technologies.

New York Times columnist David Brooks wrote an op-ed on Dec. 8 underscoring the importance of funding research, even in a tight economy. He noted that "federal research money has been astonishingly productive, leading to DNA sequencing, semiconductors, lasers and many other technologies."

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

SUPERHERO continued from page 1

across the country. The kits contain four experiments for teachers and students and an activity book with instructions and puzzles for the students. Until now, the kits have centered on the lives and discoveries of famous physicists, including Albert Einstein, Marie Curie, and Benjamin Franklin. The 2008 kits were the first to include a comic book as well. "Nicola Tesla and the Electric Fair," featured the nineteenth century inventor and his adventures to power the 1893 Chicago World's Fair.

For the 2009-2010 school year APS's outreach department wanted to try something new. Instead of basing the new Physics-Quest kit on an individual physicist, they opted to come up with a completely original character to teach laser science to kids.

"Spectra is a laser superhero," Thompson-Flagg said, "Anything a laser can do, she can do. Anything light can do, she can do." Throughout the course of the story, Spectra uses her powers to save her kidnapped friends from the clutches of the evil Miss Alignment, all the while learning about her newfound powers in the process. She can travel at the speed of light, change color, cut through solid metal, pass through windows, reflect off of mirrors, and diffract into multiple copies of herself.

"I want kids to buy into her as a character," Thompson-Flagg said, "I wanted to really create a full character that can carry the story; to make her more than just a plot device."

In order to do so, Thompson-Flagg consulted with members of Girl-Wonder.org, a network of websites dedicated to promoting positive depictions of empowered female characters in comics. Thompson-Flagg said she hoped that by making the lead character a middle school girl, she could make science more appealing to demographics that have been historically underrepresented in the field. Thompson-Flagg and APS's Art Director Kerry G. Johnson worked together to create a diverse cast of characters for the book.

"It was very important to draw a strong progressive superhero," said Johnson who created the artwork. He added that he hoped that children, like his own daughter in middle school, would read the book and see science as accessible to everybody, "I would like to see more children of color getting into science, physics and medicine."

When coming up with the original designs for the characters, Johnson decided to base Spectra's look on Thompson-Flagg herself, in part to inspire Thompson-Flagg to create as realistic a character as possible.

"It's not Becky, but it does resemble Becky," Johnson said, "I did take the essence of Becky."

Despite their uncanny likeness, Thompson-Flagg said she didn't base the character of Spectra on herself at that age. "I just came up with a middle school girl," Thompson-Flagg said, "I think I created her to be way cooler."

Though she started out as a character in the comic books, the Spectra character has quickly become the emblem for much of LaserFest's public outreach efforts. Responses back from teachers and students who have read the comic has been overwhelmingly positive and it is already in its third printing. After it started taking off, Thompson-Flagg assembled a Spectra costume she plans to wear to outreach events.

"We're going to stick her on everything to tie everything together," Thompson-Flagg said, "That was not in the original plan, but we are really excited as to how it's taken off."

Part of the plan is use Spectra to bring the excitement of physics to new audiences. In addition to the physics and educational conferences where APS usually exhibits, the outreach team has secured space at San Diego's annual Comic-Con next summer. The massive convention, which each year brings together over 140,000 comic book fans, will be the largest conference of any kind the outreach team has been to yet.

"We're excited about getting the opportunity to reach a different community," Thompson-Flagg said, "We're going to the audience that already likes our genre."

Securing booth space at the popular convention was no simple task. New exhibitors ordinarily have to wait up to four years before space opens up. However the convention organizers said they were looking to feature more educational comics, and offered up space in its Independent Publisher's section, making APS the first professional organization to exhibit at Comic-Con.

Thompson-Flagg majored in physics at Bryn Mawr, and then went on to earn her PhD at the University of Texas at Austin. While there she worked on a variety of projects, including how oxygen molecules causes graphene to buckle, the theoretical surface analytics of daffodil geometry, and the flower-like patterns of silicon oxide that flow out of carbon nanotubes. Even while working in the lab, however, Thompson-Flagg knew she wanted to find ways to show the excitement of physics to kids.

"It's the physics all around me that gets me really excited about teaching people," she said, adding also that she loves it when kids ask thoughtful questions after having just seen a completely unexpected outcome from an experiment.

When not overseeing APS's outreach efforts, Thompson-Flagg spends much of her spare time training for her next triathlon. Last November she completed her first Ironman triathlon, where she swam 2.4 miles, biked 112 miles, and ran a marathon. She said some of her other favorite pastimes are knitting and traditional lace making, known as tatting. Even when relaxing, physics is never far from her mind.

"The cool thing about knitting is I can see some shape then knit it," she said about how her work in theoretical surface analytics helps her visualize what the final product will look like, and lets her work without patterns, "It totally plays on the physics I did."

Black Holes, Fusion, and Nanotubes Featured at DPP Meeting

The APS Division of Plasma Physics held its 51st annual meeting in Atlanta, Georgia in early November. The meeting brought together over 1,500 scientists specializing in plasma physics to share the latest research in the field. In addition to the science program, the meeting invited local school groups and the general public to come in and meet the physicists to discover more about the importance of plasma physics.

Black Holes

Bruno Coppi from MIT presented a solution to the mystery of anomalous X-ray emissions emanating from the vicinity of young black holes. These powerful signals, usually observed coming from large newly-formed black holes, shoot out into space as part of powerful jets perpendicular to their accretion disks. Coppi showed, using information gathered from confined laboratory plasmas, that eddies in the spiraling plasma around the inner edges of a black hole's accretion disk can create oscillating magnetic fields. These fields excite the spinning plasma, causing the repeated emissions of high energy X-rays visible from Earth.

The National Ignition Facility

The recently christened National Ignition Facility at Lawrence Livermore National Laboratory is poised to dramatically advance fusion research. Technicians there will focus nearly two hundred of the world's most powerful lasers on a small target of deuterium, creating conditions for the isotope to ignite, producing more energy through fusion than was used. The design of the deuterium target's container, known as a hohlraum, is critical for fusion to take place. Numerous presenters evaluated and proposed possible refinements to the hohlraums used at the NIF. Nathan Meezan of Lawrence Livermore gave an overview of ongoing experiments to get the most efficient energy transfer from the incident lasers. Dustin Froula from Lawrence Livermore presented his analysis of the gas-filled hohlraums at the OMEGA laser in Rochester NY to predict how the NIF's laser will behave inside the highly energized plasma of a fusion reaction. Similarly, Otto Landen, also at Lawrence Livermore, reported on a series of test shots at the OMEGA laser of differently configured hohlraums designed to fine-tune their effectiveness.

Tokamak Reactors

Lasers are only one method being investigated to generate fusion power. Tokamak reactors, which enclose rapidly spinning high energy plasma inside toroidal magnetic fields, have been the focus of research since the 1950s. T.C. Luce of General Atomics presented a comprehensive overview of what such a theoretical tokamak power plant might look like. In doing so, he outlined many of the recent advances in tokamak technology that have improved their stability, ability to contain the pressure, and current drive. He showed how one of the biggest looming problems with up-scaling them for industrial power production is the containment of their intense heat and particle fluxes generated by the spinning plasma.

Carbon Nanotubes

Plasmas have numerous practical applications outside of power generation, often in unexpected ways. Single-walled carbon nanotubes hold tremendous promise for future technologies because of their unique structural and electrical properties. One of the most common ways to produce them is the arc discharge method, where the nanotubes are produced out of the arcing plasma during a high powered electrical discharge between two carbon rods immersed in an inert gas. Michael Keidar of George Washington University described new ways being investigated to use electrical and magnetic fields to manipulate the length of carbon nanotubes using the arc discharge method.

CALLAN continued from page 3

no free-lancing! It's a no-brainer that we should lobby for more/better funding for physics, but we should do (and have done) more. The recent energy efficiency study seems to me to have hit a "sweet spot" between public policy importance and physics community competence. As a result of that study, our DC office has a raft of specific good suggestions to make to the drafters of any energy or climate bill. I hope to see more of this kind of thing.

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

Given the internationalization of science, cross-border issues are hard to avoid. The US is still pretty much the center of the scientific world, but you only have to look at the LHC to see that our unique position is eroding. And that's just in relation to Europe. Asia and India have every intention of building scientific enterprises that will eventually match the quality and scope of ours. If mankind doesn't screw up the 21st century the way it screwed up the first half of the 20th, these countries can get there and there is no question that the APS will have to pay attention. Our journals already serve the whole world and we are looking for new ways to make APS membership more valuable to our many international members. The APS has an expansive view of what a physics society can and should do in its home country and I would like to engage in discussions with some of our sister societies, especially in the countries which will become our "peer competitors", to identify ways we can usefully act together internationally.

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

As I have been working my way up the presidential line, I have been learning more and more about these efforts, and becoming more and more impressed with what our small but dedicated staff has been able to achieve with modest resources. The APS seems to have found a way to have a significant continuing impact on the high-school physics teacher problem. It is also about to start a program which will address the thorny problem of increasing the number of minority students who successfully complete a physics PhD. These are important initiatives for the profession and the country and I will give them my enthusiastic backing.

Q: How will you guide APS through the current economic downturn?

By the time these words are in print, I am sure we will be reading in the papers that the recession is over. The biggest impact of the financial crisis on the APS was a big hit to the reserve fund, with the result that the draw on reserves needed to fund the activities of the Society suddenly became alarmingly large. Immediate steps to soften the blow were taken, including short-term budgetary stringencies and minimal salary increases for our hard-working staff. More importantly, though, the financial shock focused the leadership's attention on the need for developing a long-term financial plan and a coherent budgeting process across the whole society. A bit of spreadsheet arithmetic can quickly convince one that this is necessary if we are to have any hope of sustaining our current scope of activities over the long run. President Murray made this a focus of the Executive Board retreat last June, and my job is to make sure that the good ideas that came out of that exercise are fully implemented. By the way, let me emphasize that our financial position is sound at the moment because of two things: the decision of the society some years ago to build a reserve fund, and the steady increases in efficiency and cost-effectiveness achieved by our journal operations. The future, however, is cloudy: first, we have entered an era where we need the reserve to support operations (it's a source of income, not just a rainy day fund); second, there is no long-term stable business model for financing scientific publishing (the outcome of the open access debate is central to the future of scientific publishing). Budget discussions can be mind-numbing, but I would like to come back to all this in another issue of *APS News*.

Q: How did you become interested in physics?

It started with my grandmother taking me to the Hayden Planetarium in New York for my seventh birthday. I was simply enthralled by the story of the planets, stars and the galaxies which was presented in the classic Hayden show. Then in fourth or fifth grade I discovered that math was fascinating and that I was good at it, and I think in the end the intersection of mathematics and the wonders of the universe naturally led me to physics. My mother took us to the terrific public library in our neighborhood (this was NYC before any fiscal crisis) every Monday night and I discovered popular books about math and science (books by Hoyle …including Hoyle's sci-fi, Gamow, and others) which I read avidly. Somehow, by the time I got to high school this had all crystallized into a conviction that theoretical physics was my goal and I never looked back. The only thing I slightly regret about my education is that, by the time it got really serious in college, I was entirely focused on (obsessed by?) mathematics and physics. In retrospect, not taking the time to learn chemistry and biology at a time when the DNA area was just opening was stupid. But I hope to make up for lost time.

Q: Why did you choose to run for the APS presidential line?

I was asked to run by someone I greatly respect. That person told me in no uncertain terms that I owed it to my profession to pay back a little bit of what I had received from it. He also pointed out that the world could probably live without the few papers I would not be able to write because I had taken the time to help run the APS. You have to admit, arguments like these are hard to resist!

PAKISTAN continued from page 2

the country's biggest star parties.

Through the KSS outreach, I have concluded that the best way forward of bringing science, astronomy, and physics to the masses is making connections with the cultural and social contexts. For example, our wonderful resident astronomer, Umair Asim, freely uses the local vernacular in his demonstrations; the poetic recitations that have now become a common theme in the intermissions are also a great resource for attracting the masses who in most cases have refined tastes for poetry and music. We are now also aiming at producing small readable pamphlets for children and their parents. Furthermore, in remote areas where internet and emails are almost non-existent, we use the local mosque loudspeaker for announcing the festivals.

I must mention that it is a real delight seeing parents, teachers, children, housewives and toddlers, all sitting together, with their jaws dropped, reveling in the magnificent views of lunar shadows, craters named after Arab scientists, the mythical Pleiades, the tilt of the Saturn rings and Jupiter's awe-inspiring moons. One does not find many opportunities where school fields are used as grounds for gathering families, teachers and children. Reputable schools send out invitations to nearby schools, so the *melas* also become a meeting point for the local educational administration.

Clearly, our spectators have never looked through a telescope before. I believe that these well-deserved moments of bliss can have a lasting impact, burning indelible impressions into their memories. This way, schoolchildren can be attracted to taking up careers in science, astronomy and physics, filling up the void of enthused and motivated physics students at the university level. I have seen many school children asking our team questions about careers in SUPARCO, Pakistan's space agency as well as the NASA.

The most recent thrust of the

A crowd gathers to experience astronomy firsthand at the historic Rohtas Fort.

Society's *melas* is amalgamating science with history and architecture. Being a largely emotional and traditionalist society, Pakistanis show a deep sense of bonding with their past. In this spirit, the KSS decided to extend the outreach to architectural monuments, a program also resonating with the joint UNESCO and International Astronomical Union project on World Heritage[1].

On the 30th of May, there was a large gathering of local residents and tourists on the plateaus of the marvelous Rohtas Fort in District Jhelum. The fort, completed in 1547, is a blend of Indo-Afghan architecture and a declared World Heritage Site. One of the gates inside the Fort is the *Suhail* Gate, named after the star with the same Arabic name, (called *Lambda Velorum* in modern catalogues). Interestingly, there is a saintly *derwish* with the name Suhail Bukhari who is now buried at the gate, resonating with our nation's continuous blending of science with tradition.

The unhindered mixing of science and tradition could also be witnessed in news reports airing after the solar eclipse viewable from Pakistan on July 23. The event highlighted the many superstitions associated with the natural phenomenon such as protecting pregnant women from its *evil* influence or its propitious power in healing the disabled. However, the solar eclipse not only exposed the challenges but also presented for the first time a rare opportunity to educate the Pakistani society about science. I hope we can make full use of these opportunities.

These *melas* go hand in hand with the series of public lectures on astronomy we are organizing throughout the year. So far, the KSS has organized Dr. Pervez Hoodbhoys's lecture on multiple dimensions and Dr. Jameel-un-Nabi's exposition on stellar life cycles. These lectures are being followed by practical workshops on telescope making and backyard astronomy.

In the coming months, the Khwarizmi Science Society plans to continue its scientific festivities and the *falakyati melas* with greater vigor and keep on inciting the minds and hearts of future astronomers and physicists. You are welcome to help us in our efforts!

The website of the Society is http://www.khwarizmic.org. Pictures and videos of the astronomy-related events are available at http://khwarizmi.shutterfly.com.

Dr. Saadat Anwar Siddiqi, President of the KSS is a Professor at the Centre for Solid State Physics, Punjab University, Lahore. Contact him if you want to get involved in the Society's activities of popularizing science and physics among youngsters.

[1] http://www.astronomy2009.org/global projects/cornerstones/astroworldheritage/.

MINORITY continued from page 1

approach that includes the identification of students with an interest in pursuing graduate degrees in physics, career guidance, development of appropriate undergraduate research opportunities, financial support, and mentoring.

"While several programs exist to increase the number of science, technology, engineering, and math (STEM) undergraduates going on to PhD programs, they tend to have limited success in physics," says Michelle Iacoletti, who manages the MBP for APS. "The challenge unique to physics is one of applicability. Most minority students aren't aware of the careers they can pursue with a physics degree, and lack role models with careers in science. Therefore, career awareness is a big focus of our program."

Faculty at minority-serving institutions confirm that their students tend toward fields with high-visibility career pathways, such as medicine and engineering. "The student population we serve at the University of Texas at San Antonio is primarily first-generation, making engineering programs a popular choice. What we find, however, is that a lot of our engineering students are actually more interested in physics," says Lorenzo Brancaleon, a physics professor at UTSA.

In the first phase of the project, APS staff members are visiting institutions that educate a significant number of minorities to talk to undergraduates and faculty members and identify their needs. "Personal contact with URM students is crucial in remediating the lack of awareness of physics careers. We won't succeed by just mailing a brochure," Hodapp maintains.

Project leaders are also assessing the commitment levels and resources available at a number of research institutions. A conference bringing together students and faculty from minority-serving institutions, faculty and administrators from research institutions, and representatives of successful existing bridge programs is planned for June 2010. The outcome will be a set of operational plans for successful bridge programs specifically tailored to physics undergraduates. Funding for the current efforts comes from the National Science Foundation.

"The under-representation of minorities in physics graduate programs is especially troubling because it leads to a shortage of minority faculty who can serve as mentors and role models to minority students," says APS past-President Cherry Murray, who chairs the MBP's steering committee. "We hope our efforts will ultimately lead to benefits for students at all educational levels."

For more information, visit www.aps.org/mbp.

ANNOUNCEMENTS

Looking for a job?
Looking for the ideal candidate?

Let an APS Job Fair do the work for you!

2010 APS/AAPT Joint Job Fair

Date: February 15-16, 2010
Place: Marriott Wardman Hotel, Washington, DC

Register today at: http://www.aps.org/meetings/april/events/jobfair/index.cfm

APS March Meeting Job Fair

Date: March 15-16, 2010
Place: Oregon Convention Center, Portland, OR

Register today at: http://www.aps.org/meetings/march/events/jobfair/index.cfm

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

2010 PTEC Conference

February 12-13, 2010
Washington, DC

Physics Teacher Education Coalition

Diversity in Physics Education: *Preparing Teachers for the 21st Century*

The 2010 Physics Teacher Education Coalition (PTEC) Conference is the nation's largest meeting dedicated to physics teacher education. It features workshops, panel discussions, and presentations by national leaders as well as excellent networking opportunities. The PTEC Conference will be held in conjunction with the joint APS April/AAPT Winter Meeting and the National Society of Black Physicists/National Society of Hispanic Physicists Joint Annual Conference.

For more information, please see www.ptec.org/conferences/2010

Now Appearing in RMP: Recently Posted Reviews and Colloquia

You will find the following in the online edition of *Reviews of Modern Physics* at http://rmp.aps.org

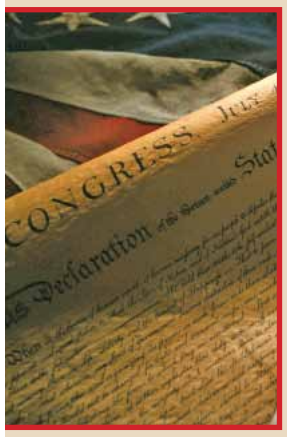
Magnetic pyrochlore oxides

Jason S. Gardner, Michel J.P. Gingras and John E. Greedan

Pyrochlore oxides are prime examples for geometrically frustrated magnets, where long-range magnetic order is suppressed in favor of short-range order. This gives rise to unusual states such as spin ices, spin liquids, or spin glasses. This article gives an overview of this important field, and stresses both materials aspects and the current theoretical understanding of the topic.

APS Congressional Science Fellowship 2010-2011

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



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

TERM OF APPOINTMENT is one year, beginning in September of 2010 with participation in a two-week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

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

APPLICATION should consist of a letter of intent of no more than two-pages, a two-page resume, with one additional page for publications, and three letters of reference. Please see the APS website (http://www.aps.org/policy/fellowships/congressional.cfm) for detailed information on materials required for applying and other information on the program.

ALL APPLICATION MATERIALS MUST BE SUBMITTED ONLINE BY JANUARY 15, 2010.

FLUIDS continued page 1

ogy to show how fast-moving magma can cause explosive volcanic eruptions while slower moving magma tends to erupt in more of a flowing cascade.

Climate Change

Fluid dynamic principles play a major role in the evolving understanding of global climate change. Over the last century, increasing carbon dioxide emissions have been warming the climate and altering the composition of Earth's atmosphere. Gradually warming temperatures could melt the polar ice caps, thus raising sea levels in the coming years. This carbon dioxide buildup has already increased the acidity of the oceans as much of it has been absorbed by sea water. However not all of the complex interactions between the many climate factors are fully understood, leading to a degree of imprecision in long-term predictions. W. Kendall Melville of the Scripps Institution of Oceanography at the University of California San Diego discussed how better understanding of fluid dynamic principles including surface wave dynamics, air sea fluxes, and adjacent boundary layers are improving the science of climate prediction.

Sports

The meeting also featured five mini-symposia on a range of topics. The Fluid Dynamics of Sports highlighted the myriad ways that fluidic flow models have influenced sports. Two separate talks focused on the fluid physics that determine the flight of golf balls. Kyle Squires of Arizona State University showed how computer simulations can be used to model the way that the dimples in a golf ball affect its flight. Taking the analysis of golf balls a step further, Alexander Smits from Princeton conducted experiments in wind tunnels, controlled environments and on the driving range to better model their flight. Rabindra Mehta, a sports aerodynamics consultant in California, showed how the stitching on cricket balls and the fuzz on tennis balls can cause low pressure to build up on a side, causing the ball to curve in flight. Alan Nathan from the University of Illinois demonstrated some of the latest techniques used to predict the flight of baseballs, including Doppler radar, high speed motion analysis, and video tracking. The fluid dynamics associated with swimming seems like it would be a natural topic; however, Rajat Mittal from Johns Hopkins University showed how the scientific community is only just beginning to comprehensively look at the complex physics of competitive swimming.

Blood Flow

Several presentations showed how a better understanding of the blood flows inside the human body can lead to better treatments. Scientists have been working for years to develop a way to take a map of an individual's circulatory system and accurately model the flow of blood through it. Alison Marsden at the University of California San Diego presented her work on ways to better calculate and minimize uncertainty about flow rates, pressures, and the overall shape of blood channels in areas difficult to directly measure. Qiang Zhu, also from the University of California San Diego, has been further refining models that predict how red blood cells flow through the surrounding blood plasma. Ultimately physicists working on this research hope that it can be used to develop new and better treatments for a variety of diseases. Lance Munn from Harvard is working on modeling blood flowing through cancerous tumors to find ways to better deliver drugs to the affected tissue.

DEAL continued from page 3

improve one property while sacrificing another, she explains. She also researches Lithium-ion batteries, to try "to understand how batteries fail so we can make them last longer and be safer," she says.

Qi's most thrilling project? "All of them," she laughs. "If I didn't find them exciting, I wouldn't do it."

At Ford, Ghaffari delights in her ability to move from project to project. One doesn't have that possibility in academia, she recognizes. This freedom to engage in different areas of research in the auto industry is one reason why she feels that her greatest impact "will come in the future, as the projects are long term," she asserts.

Qi likes the intellectual stimulation she gets from her research at GM, as well as another type of freedom. "GM provides me the opportunity to be a scientist and a mom," she says. The company allows its employees to create work-life balances that fit each person's lifestyles. In Qi's case, she works 7:00 a.m. to 3:30 p.m. during the week, which permits her to spend essential time with her kids.

Qi argues that the auto industry, and in particular GM, is a great environment for physicists because "it bridges science and engineering," she says. "We are always looking for long-term solutions…so we have to keep developing new materials."

Both women realize there are a number of misunderstood aspects of the auto industry. When Ghaffari first started at Ford, she was surprised to learn of the rigorous scientific research being carried out. "There is really nice scientific work being done (here)," she says. One might think that Ford is only interested in pushing "tried and true" solutions, but that is a false assumption, she continues. "We are pushing the boundaries of how First-Principles calculations can model real materials,…really doing front of the line work, for example, on alloys." And publication is not a foreign concept nor is it forbidden (in many circumstances) in the industry, both professionals attest.

Another feature of the auto industry that is often misinterpreted relates to fuel economy. "I don't think people realize how hard we try to increase the fuel economy," she says. "Some people may think we have a backroom with a 100 mile per gallon car…(but) we're not holding back on anything. There's no secret…we're keeping." It's a tricky problem, as fuel economy is directly related to the weight and performance of the vehicle.

Ghaffari's physics background differs from that of most of her colleagues, who graduated from engineering programs. In fact, of the roughly 600 people working in Ford's R & A division, she is one of only a handful of scientists she knows who has a PhD in physics. Similarly, Qi says there are few physicists she can think of at GM. But both pros contend that physicists and physics research are essential to the success of the auto industry.

Ghaffari stresses that her scientific diversity gives her an advantage in the sector. "I can see things differently and I can ask questions that are sometimes…very good questions" that may appear naïve, she says. This stimulates problem-solving in new directions. "You have to be able to communicate with people who don't have the same terminology as you," she adds. "Physicists can do this."

Furthermore, the auto industry is a global industry, says Qi, who regularly interacts with colleagues in China and India. And "it is easy for physicists to engage in global environments."

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

The Back Page

Serving our International Members

The Committee on International Scientific Affairs Recommends a "New Approach" for the Society

by Amy K. Flatten

Most APS members would agree that physics is "international" in nature, but, many may not have realized the large number of APS members that are based outside the United States—nearly 25% of our members (excluding students). Despite our large international membership, however, many of these colleagues have commented in membership surveys that they feel APS activities are "US-centric" and lack relevance to physicists in their region. According to these surveys, most of our international members do not travel to the US for APS meetings, and do not participate in the "APS community" beyond reading journals and receiving *Physics Today*. Moreover, less than half (46%) of international respondents believed that APS meetings and programming reflect the interests of the international physics community, and overall, only 31% of respondents believed that APS provides international members with ample opportunity to comment upon APS priorities and activities.[1] These same members, however, express eagerness to participate in APS more actively. For example, the verbatim comments from international members to the 2008 membership survey indicate that they would welcome a "more international outlook" from APS and would like more opportunities to connect with APS members.[2]

While historically the percentage of international members has remained constant, the interest of the international community in APS membership could now be threatened in several ways. Along with the aforementioned survey results, several emerging trends may threaten the retention of our non-US members. A US-centric focus may be perceived as irrelevant (and even perhaps arrogant) to those outside the US, particularly in this era of globalization. The possibility of Open-Access, and the availability of peer-reviewed scientific information, may threaten the perceived membership benefit of our journals.

Today's globalization causes increased expectations for better engagement of international members, especially as international issues increasingly cut across all aspects of the Society–research, industry, education, policy. For example, international R&D collaborations are on the rise and countries are partnering to build big facilities. Companies are increasingly multi-national and US companies are moving R&D facilities offshore. As the US competes for the world's best talent, it needs to attract and retain first-rate students and scientists. National S&T policies are affected by global events and federal R&D funding influences US participation in international large-scale collaborations.

The feedback of international members, the threats to membership retention, and trends of today's scientific globalization, make a review of the Society's international focus timely. In May 2009, APS President Cherry Murray asked the Committee on International Scientific Affairs (CISA) to examine two important questions for the Society:

• *What could/should APS do to better serve its international members?*

• *Given that nearly 25% of APS members (excluding students) live outside the US, what is the appropriate level of international representation in APS governance (i.e., Executive Board or Council)?*

Collectively, the APS leaders, the Executive Board, and CISA believe this is a critical time to engage our international members–they provide an important resource for addressing cross-cutting issues faced by the Society's governance, and it is appropriate and responsible to ensure that international members feel served. In order to examine how APS might reach out to its international members, CISA investigated how other scientific societies address this same issue. In doing so, CISA conducted interviews and/or received written responses from leaders of the several scientific organizations, regarding benefits, services and outreach to non-US based membership. These groups included the Optical Society of America (OSA), the American Chemical Society (ACS), the Institute of Electrical and Electronics Engineers (IEEE), SPIE, and the American Society of Microbiologists.

The results of this effort proved enlightening. First, CISA found that most societies included international members in their governance or international committees in some way. While no society offered membership benefits such as insurance, journals, etc. based on a member's geographic location, or nationality, nearly every society that was interviewed had established formal programs operating outside of the US, to better connect with international members. These primarily fell in one of two categories: 1) "international chapters" or, 2) designated "regional contacts" who act as intermediaries between the society and members in their region.

These groups engaged in a large variety of activities, from hosting local meetings focused on technical topics and business networking, to reaching out to help young students. Each society varied in the level of support provided to these groups, and had established mechanisms for launching new activities for members outside of the US. The organizations remained mindful of the appearance of competition with other national societies in their region and encouraged their international sections to plan joint activities with these groups. The societies believed that supporting the communities outside of the US with opportunities to network provided a major benefit to international members. As the CEO of one society remarked, "Our overseas events allow much needed local connections, not only for the well funded globe roaming top echelon but for others less fortunate and especially for students."

CISA's Proposal for APS

As CISA deliberated on how the Society might better engage with members outside of the US, two important goals remained essential to any newly proposed program. First, any new initiative should not be just an "information-push" to international members, but must foster *two-way communication*, providing better channels for non-US members to bring issues of international interest and concern to the Society's governance. Second, the APS should *support opportunities for local engagement*–enabling international members to engage in APS programs and activities without requiring overseas trips to the United States. This may include establishing regional contacts to ensure that activities match local interests, rather than pre-determined events decided upon by the Society's US-based leaders. With these goals in mind, CISA brought the following recommendations to the Executive Board at its November 2009 meeting:

Recommendation #1: Expand the currently existing "Friends of APS" program to include members outside of the United States. The "Friends of APS" program, started in 2000, includes 159 participating US institutions. "Friends" are APS members who have agreed to help facilitate communication with other members at their institution and/or in their local community. Throughout the year, information is sent regarding membership, programs, and benefits for sharing with colleagues and students. While the Friends program has proven itself as a useful tool in communicating with APS members, it currently involves only APS members based in the United States. [3] CISA believes that expanding this program internationally will be help strengthen linkages with members and key institutions beyond US borders.

Recommendation #2: Provide modest funds to support local events proposed by "International Friends" As previously mentioned, most APS members outside the United States do not attend APS meetings, and many feel cut-off from US-centric activities. To augment the linkages from the International Friends program, APS could invite these non-US "Friends" to submit proposals for a small amount of funds to hold an event at their institution, in their local community, or in conjunction with another local/regional physics meeting. Providing such funds would enable international members to participate in APS events without traveling to the United States, and foster networking among members and collaborative events with other physics organizations. More importantly, providing resources for International Friends events encourages "pro-active" involvement in APS by international members.

Recommendation # 3: Allot 3 additional International Councilor positions for the APS Council, as one International Councilor cannot sufficiently represent the 10,000 international members, nor the breadth and regional diversity of international issues that impact the Society. One of the International Councilors should be elected to serve on the Executive Board.

When making this recommendation, CISA fully recognized that in 1999, the APS Council voted to amend the Society's Constitution to reduce the number of voting members from 51 to 39, and the number of representatives at the Council table from approximately 65 to 42. At that time, one International Councilor with a two-year term was added, as foreign members had no direct representation on Council, and were thought to be at a disadvantage when running against US physicists for other elected Council positions.

The role and function of this international Councilor seems undefined, however, as: 1) one Councilor cannot give perspectives on the breadth of international issues relevant to APS; and 2) there is little or no requirement as to the geographic region of the International Councilor's election, thus the Society cannot rely upon strategic considerations of the international community represented. In addition to these challenges, CISA also noted that the international membership (at approx. 10,000) is over 4 times larger than the average size of any APS Division, more than twice as large as the average Forum, 5 times larger than the average Section, and almost 10 times larger than any Topical Group. As international issues cut across all aspects of the Society (research, policy, industry and education), CISA suggests that just one International Councilor cannot adequately represent the breadth, regional diversity and impact of international issues that have implications for the Society.

Granted, other international representatives on the Council include a Councilor from the Forum on International Physics (FIP)–but this is typically a US-based physicist who represents a "program oriented" unit, rather than issues of the international community. Likewise, while the presidents of both the Canadian and Mexican physical societies are invited to Council meetings, they are "non-voting advisors" who did not seek Council membership. As they are from the same North American continent as the United States, they cannot be reasonably expected to provide the full breadth of international perspective for Council deliberations.

To achieve the necessary representation of the geographic diversity of international members, the four international Councilors might represent four distinct regions where APS international members are concentrated. These Councilors should have a clear and unambiguous function–bringing issues from their region to the Society's governance. Here, they can leverage the "International Friends" network in their respective regions, thus enabling two-way communication between the "Friends" and APS, and providing a defined mechanism for bringing issues from the international membership to the US-based Board and Council. From these four international Councilors, one can be elected to serve on the Executive Board. Likewise, if the APS leadership did not wish to increase the size of the Council, one proposal suggested that some of the new International Councilors positions could be re-allocated from the current 8 "General Councilor" slots.

CISA believes these recommendations will achieve several important goals–providing clearly defined channels to bring international issues to the Society's Board and Council and strengthening two-way communication between APS Governance and international members via linkage between "International Friends." Perhaps most importantly, this approach will ensure more effective representation of the large and diverse international membership and define a clear process to serve international members.

The recommendations were well-received by the APS leadership. At its November 2009 meeting, the APS Executive Board unanimously passed the following motion:

That the Executive Board requests the Constitution and Bylaws Committee draw up a plan to enable the election of 4 Regional International Councilors as recommended by the CISA report. It also recommends that the Constitution & Bylaws Committee consider expanding the Executive Board by one member to include an international representative. If a constitutional amendment to add international Councilors is approved, an effort should be made to connect the international Councilors with the international friends network.

Any suggestion from the Constitution and Bylaws Committee must be reviewed and voted upon by Council, at least once (maybe twice) over the next year or two. Consequently, any of these changes to the Council would likely be implemented in late 2011, in time for the next round of International Councilor elections. While many of the details of these recommendations still remain to be fleshed out, CISA stands ready to assist the APS leadership in its endeavor to ensure international members are served. The International Office, CISA, and other APS Departments look forward to presenting new programs and opportunities for our international members over the upcoming years.

Amy Flatten is the Director of International Affairs of the American Physical Society (APS). Prior to joining APS, she served with the White House Office of Science and Technology Policy. She also worked in private industry along with holding a part-time faculty position with Johns Hopkins University's Part-Time Engineering and Applied Sciences Program. She received her Ph.D. degree in Engineering Science and Mechanics from Georgia Tech.

[1] 1998 APS Non-US Resident Membership Survey

[2] 2008 Membership Survey; Verbatim Comments from Non-US members

[3] American Physical Society; 2008 Annual Report; p. 9

APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Responses may be sent to: letters@aps.org