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PhysicsQuest Goes to Kenya

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Presidents Two

On April 27, APS presented a plaque to Harvard University as part of its historic sites initiative. The plaque honored the Jefferson Physical Laboratory, which was built in 1884 and as such is the oldest surviving university building dedicated to physics in the country. Over the years it has been the site of many important advances in physics, including the celebrated Pound-Rebka experiment that confirmed one of the predictions of General Relativity. Sitting together in this photo are APS President Cherry Murray (left), who presented the plaque on behalf of APS, and Harvard President Drew Gilpin Faust, who received it on behalf of Harvard.

APS Awards Three Hildred Blewett Scholarships

This year APS has announced three women as recipients of the M. Hildred Blewett scholarship. Chosen by the Committee on the Status of Women in Physics, the three are Janice Guikema at Johns Hopkins University, Marija Nikolic-Jaric at the University of Manitoba, and Klejda Bega at Columbia University.

Each year the committee selects women who are returning to their research careers that had been interrupted for family or other reasons. The scholarship is a one-year grant of up to $45,000 that can be used towards a wide range of necessities, including equipment procurement, salary, travel, tuition, and dependent care. This is the fifth year the scholarship has been awarded.

After taking time off to follow her husband and start a family, Janice Wynn Guikema is continuing her return to the laboratory

Janice Guikema

as a second-time recipient of the Blewett Scholarship. She currently has a part-time research position at Johns Hopkins University, where she is primarily studying graphene.

Graphene molecules are one-atom-thick sheets of carbon atoms organized in a hexagonal pattern like a honeycomb. Since its first synthesis in 2004, it has quickly become one of the hottest fields in condensed matter physics because of its remarkable structural and electrical properties.

"It was amazing how many sessions there were on graphene at the March Meeting," Guikema said.

She plans to use funds from the Blewett Scholarship to further research the feasibility of using graphene as a sensitive magnetic detector. She said that graphene has a lot of potential for use as a Hall effect detector to detect nanoscale particles and map out magnetic structures. Currently she is continuing to look for ways to make the material as sensitive as possible. In addition she will use scanning probe microscopy to further explore the nature of graphene.

Guikema first left her postdoctoral research at Cornell University in 2005 when her husband received an offer to join the faculty at Texas A&M and they relocated to Texas. There she took a lecturing position teaching introductory physics

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US Team Ties for Second in International Physics Olympiad

The traveling team representing the US at the 2009 International Physics Olympiad won four gold medals and one silver, tying with India and Korea for second place overall. This high placement duplicates last year's outcome, and is the US's best standing to date.

The Olympiad is an annual international competition for high school students. In the 2009 Olympiad, held in Merida, Mexico from July 11th to the 19th, 316 students representing 70 nations competed to solve complex physics problems. Gold medals are awarded to students whose total scores from the five tests were in the top 8 percent, and silver went to students in the top 25 percent.

Photo courtesy of AAPT

Left to Right: Anand Nataranjan, Coach Warren Turner, Bowei Liu, David Field, Coach Paul Stanley, Marianna Mao, and Joshua Oreman

The gold medal winners on the United States team were Bowei Liu of Freemont, California; Marianna Mao of Freemont, California; Anand Nataranjan of San Jose, California; and Joshua Oreman of Los Angeles, California. David Field of Andover, Massachusetts earned silver.

"They all did very well," said Paul Stanley, the team's academic director. "Much of the success of the traveling five can be attributed to the collegial, supportive atmosphere of training camp; I thank each of the nineteen team members for working so hard to make this one of the best teams ever."

China placed first overall, earning five gold medals. In addition, China's Handuo Shi scored the highest individual score, the first time in the forty-two year history of the Olympiad that a female won the honor.

The exams consisted of three theoretical problems and two lab experiments. This year's subjects ranged from calculating the tidal drag affecting the moon to measuring the wavelength of light using a razor and a pair of vernier calipers. All of the team coaches graded the

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Winning Videos Use Toys to Teach Physics

A rocket propelled racetrack illustrates Albert Einstein's equivalence principle. An orange teddy bear driving a dump truck into a cinderblock demonstrates Newton's law of inertia. A mushroom cloud rises over the desert with Johnny Cash playing in the background. These are just a few of the scenes from the finalists in the Toy Box Physics video contest.

Toy Box Physics video contest trophy

The APS outreach website PhysicsCentral hosted the contest which invited participants across the country to create their own short YouTube videos to explain physics incorporating their favorite toy. Other than asking for videos around three minutes in length, the rules for the contest were left open-ended, to encourage as much creativity in the submissions as possible.

The grand prize winner, chosen by a panel of outreach experts, was James Lincoln's "Smoke Rings, Mushroom Clouds and Vortexes," which explained the physics of a vortex air cannon. In the video, Lincoln creatively demonstrated how his toy air cannon used the same fluid dynamics principles as dolphins blowing bubble rings and a rising mushroom cloud. He received a $1,000 reward and a trophy made of toys.

"I thought it was important that I showed demonstrations that were easy to do so that the audience could try it on their own," Lincoln said, "I thought I would be able to reach a larger audience if I kept my video equation-free and jargon-free."

Lincoln has been teaching high school physics for six years and is currently working on his master's degree in physics at UCLA. He said that putting together a successful video takes a lot of work and planning, and sometimes ideas don't pan out. Despite his sparse YouTube page, Lincoln is no newcomer to making these kinds of short science

VIDEOS continued on page 6

Sorted Business

Photo by Ken Cole

On July 23, 25 sorters for the fall meeting of the Division of Plasma Physics met at APS headquarters in College Park to arrange 1,629 abstracts into appropriate sessions. Here, DPP Chair-elect Tom Antonsen (left) of the University of Maryland confers with Eric Fredrickson of the Princeton Plasma Physics Lab. The DPP meeting will take place November 2-6 in Atlanta.

"If ITER is built on money having to do with energy or oil, that is perfectly good...But if it is taken from the public support of research in physics or biology then I would be very upset,"

***Sebastien Balibar**, École Normale Supérieure,* BBC News*, June 17, 2009.*

"Certainly the worst way to play better golf is to study physics."

***Robert Adair**,* The Wall Street Journal*, June 18, 2009.*

"We would grow some crystals and we would come back to him and he would measure them again and say 'Oh, you've gone too far' or 'You haven't gone far enough' and then we would try again."

***Jim Analytis**, Stanford University, on the difficulties growing crystals of bismuth telluride to be used in spintronics research,* ABC 7 News, *June 17, 2009.*

"The cuts will absolutely impact academics…Everyone has said it's not going to affect the core mission of the institution–which is teaching–but indirectly, it will. "

***Eric Mazur**, Harvard,* The Boston Globe*, June 17, 2009.*

"It has been said that major curriculum change is a sacred undertaking not unlike moving a cemetery: Lots of things in it are dead, but they have many friends who aren't."

***George Campbell Jr.**, Cooper Union for the Advancement of Science and Art, on the challenge of breaking down barriers between academic disciplines,* The Philadelphia Inquirer*, June 28, 2009.*

"My concerns regarding the potentially damaging economic impacts on Michigan were not addressed."

***Vernon J. Ehlers** (R-MI), on why he voted against the climate bill in the House,* Detroit News*, June 27, 2009.*

"There's an old tradition, that which is partly true and partly not so true, that journalism and the media never represent science right; and a lot of scientists do get uptight about that."

***Sidney Perkowitz**, Emory University,* National Public Radio*, June 26, 2009.*

"The fact that we're going to be in the Davis Cavern just tickles us pink,"

***Tom Shutt,** Case Western Reserve University, starting construction of a dark matter detector in an abandoned mine in South Dakota,* The Associated Press*, June 22, 2009.*

"There's so much neat science in NASCAR…It's a great way to educate people. NASCAR fans are fervent and will wade through net force and molecules if it helps them understand why something happens to their driver."

***Diandra Leslie-Pelecky**, University of Texas at Dallas,* USA Today*, July 1, 2009.*

"I've always been interested in how art and science shed light on one another… The relationship of art and science is something I think about a lot."

***Peter Galison**, Harvard University,* The Wall Street Journal*, July 10, 2009.*

"It has been known for several decades that this unknown star was actually the planet Neptune…Neptune would have looked just like a faint star almost exactly where Galileo observed it."

***David Jamieson**, University of Melbourne, on how Galileo may have been the first to discover the planet Neptune,* MSNBC.com*, July 10, 2009.*

"In the near- and medium-term, it's going to be extremely difficult for graphene to displace silicon as the main material in computer electronics…Silicon is a multibillion-dollar industry that has been perfecting silicon processing for 40 years."

***Tomas Palacios,** Massachusetts Institute of Technology,* Kansas City Star*, July 12, 2009.*

"I think scientists need to talk to people more. After all, we work for the people, all people, the taxpayers. We should do our bit to explain where your money is going and why our work is interesting, important, and what it means to you and your future."

***Michael Tuts**, Columbia University, on his conversations with people while flying,* The New York Times*, July 13, 2009.*

"Your honor, I am nearly 72 years old, and this is the first time I have stood accused in a court of law,"

***J. Reece Roth,** University of Tennessee, after being sentenced to four years in jail for improperly sharing United States military secrets with foreign nationals,* The Knoxville News Sentinel*, July 2, 2009.*

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This Month in Physics History

September, 1911–The Sackur-Tetrode Equation: How Entropy Met Quantum Mechanics

***Editor's note:** This month's column has been contributed by guest author Richard Williams.*

Early in the twentieth century, leading physicists were struggling to get a deeper understanding of the concept of entropy. Entropy is at the heart of the all-encompassing Second Law of Thermodynamics and can be used to establish the absolute temperature scale, so it needs to be fully understood. But a troubling question remained unanswered. Could its absolute value be determined, or would it always involve an unknown additive constant?

The Sackur-Tetrode Equation

$$S = N k\{ \ln M^{3/2} T^{5/2} / P + \ln [(2 \pi / N_{Av} h^2)^{3/2} k^{5/2}] + 5/2 \}$$

Attention began to focus increasingly on Ludwig Boltzmann's ideas. His long work on the problem is summarized in the terse epitaph, $S = k \ln W$, that is carved on his tombstone in Vienna. The equation expresses entropy, S, as the logarithm of W, the number of possible states of motion available to the atoms in a system, consistent with their energy, and multiplied by the constant, k, named for Boltzmann. However, according to classical theory, there was no limit to how close to one another, in momentum and space, the neighboring states of motion could be, and, therefore, no limit to the number of states that could exist. How then could W be enumerated to give a unique result? Thus, the question about the arbitrary additive constant.

The answer would come in two separate articles in the premier German physics journal, *Annalen der Physik*, one published in September, 1911, and the other a few months later. One author was Otto Sackur, 31 years old, a rising young physical chemist at the University of Breslau. The other was Hugo Tetrode, 17 years old, the precocious son of the president of the Dutch National Bank. Both focused on how to count the number of possible distinguishable states of motion of the atoms of a monatomic gas. In similar, but not identical, analyses, they argued that the number of allowed states in a given energy range depended on how close the states of motion could get to one another–in position and momentum, for example. They considered pairs of coordinates that define the motion of atoms, either momentum and position, or energy and time. If a lower limit existed for the possible size of the elements of the space representing the pair of coordinates, this would give an upper limit to the magnitude of W, and allow a definite count to be made.

Tetrode started with an equation from the classical statistical mechanics of J. Willard Gibbs. He required the product of the elements, momentum–position, to be not smaller than Planck's constant. Sackur adhered more to the style of Max Planck's school of thermodynamics. By similar reasoning, he limited the spacing of the allowed states for the elements, energy–time. This, together with Boltzmann's Equation, gave them an expression for the absolute entropy, the Sackur-Tetrode Equation.

Their equation can be used today without modification to calculate the standard entropy for ideal monatomic gases. Knowing only the temperature, pressure, and atomic weight of the atoms, an extremely simple calculation gives the entropy value so accurately that the calculated value is preferred to experimental values in tabulations of best values of thermodynamic data, such as the *CRC Handbook of Chemistry and Physics*.

After his work on this problem, Tetrode wrote some other theoretical papers, but none achieved comparable recognition. He lapsed into scientific obscurity, little remembered even among the community of Dutch physicists. In 1932, his compatriot, the physicist H.G.B. Casimir, spent a year as an assistant to Wolfgang Pauli at the Technische Hochschule in Zurich. Once, Pauli goaded him, "You Dutch people are strange birds. You have the example of Tetrode. He has done outstanding work, but no one knows about him, and it seems that no one wants to know." Casimir realized that he, too, knew little about Tetrode's life, and he began to learn more about it. In 1984 he wrote an article summarizing Tetrode's life, entitled, "A Forgotten Genius." Tetrode's higher education was brief, obviously at 17 years of age, when he wrote his article for *Annalen*, but also, later, his education was irregular for a scientist. He spent 1912 at the University in Leipzig, but apparently attended few lectures and did not take the usual exams. He corresponded with the major Dutch physicists at times, but did not form lasting scientific relationships. Nor did he cultivate those who might advance his scientific career. At one point, Albert Einstein and Paul Ehrenfest called at his home, but the maid told them that he could not receive them. He died of tuberculosis in 1931.

Sackur's career advanced more along the normal course for a scientist. After his doctorate from the University of Breslau, he worked there with Rudolph Ladenburg, then in London with William Ramsay, and finally in Germany with Walther Nernst, whose heat theorem was at the center of efforts to resolve the concept of absolute entropy, leading eventually, with some help from the work of Sackur and Tetrode, to the Third Law of Thermodynamics. Sackur wrote well-received books on thermodynamics, and in 1914 he joined Fritz Haber's prestigious Institute in Berlin. Haber's reputation at the time was golden, after his stunning achievement of the fixation of nitrogen from the air to form ammonia. It would bring him the Nobel Prize. His reputation began to suffer when he led Germany's project to use poison gas as a weapon in World War I. He focused the Institute's work on this project, bringing in Sackur, James Franck, and others. In late 1914, Sackur was killed in a lab explosion, prematurely ending a promising career. But this was not all. Haber's wife, Clara Immerwahr, was a close personal friend of Sackur. She opposed Haber's poison gas work on moral grounds and had long protested bitterly. When she learned of Sackur's death, from what she saw as coerced work on an immoral project, she was inconsolable. Finally, distraught, she committed suicide, using her husband's service pistol, completing a tragedy of Shakespearean dimensions.

Otto Sackur and Hugo Tetrode died too young, victims of the scourges of their time, tuberculosis and war. Despite their disparate backgrounds, they, like Boltzmann, left an equation as an epitaph, one that endures and joins them together.

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Missile Man: Raytheon President influenced by Physics, Feynman, and Senators in Geeky Glasses

By Alaina G. Levine

Raytheon Missile Systems (RMS) is the world's leading producer of weapon systems for the United States military and the allied forces of more than 50 countries, according to company communications. It employs 12,500 people and had sales of $5 billion in 2007. It is led by Dr. Taylor Lawrence, a physicist who likes big problems, has shared a classroom and a stage with Richard Feynman, and once inspired a roomful of US senators to don pocket protectors and "geeky looking glasses" in recognition of Lawrence's vocation.

His intersections with Feynman occurred while he was studying physics as an undergraduate at the California Institute of Technology. As a junior, Lawrence took a course on the quantum limits of computing with Feynman. "What was so amazing about him–and this kind of gets your juices going about physics," says Lawrence, was that "he had such an amazing understanding of the physical world and he was the first one who convinced me it wasn't about the math, it was about the physics."

Lawrence was taking relativistic quantum mechanics and had difficulty understanding the concept of renormalization. He fortuitously ran into Feynman in the hallway and requested his help, even though he wasn't taking a course from him at the time. "Here I am 'Joe Undergraduate' and I asked if I could come by… and he said sure…" recalls Lawrence. "He was so open."

Feynman explained to Lawrence that "it's not about the math, it's about the result," he says. "He said the math is just a tool that allows you to compute something and if it's telling you the wrong thing, then it's the math that's wrong, not the physics… It sort of flipped my universe over."

Lawrence's interaction with Feynman extended beyond the realm of physics. They both auditioned and won parts in the play "The Madwoman of Chaillot", presented by the Theatre Arts Department of Caltech. Feynman played the Sewer Man and Lawrence was a street urchin. "There was a kind of buzz when he came to try out," says Lawrence. They shared only one scene together "but just to be in a play with Richard Feynman was very cool…He was a good actor. He had fun with it. He'd ham it up."

While he was in college, Lawrence "didn't know exactly where my path was going to go," he recalls. "I knew I wanted to get a PhD–that was one of my life's goals. But I didn't know if I wanted to do that right out of college." He did know for certain that he "wanted to go out and make some money," he says.

So upon graduation, he moved to San Diego where he took a job as a senior staff scientist in the Research and Development division of Trex Enterprises, a high

technology company that served the defense industry. His work there exposed him to the role physics plays in the industry, and set him on his current career path, he says.

While in San Diego, Lawrence learned of a program at LLNL that would fund his PhD while he worked there. He applied for and was accepted into the program, and enrolled at Stanford University for his doctorate. His thesis advisor was Robert Laughlin, "probably the most brilliant man I had ever worked with closely," says Lawrence. His research focused on high temperature superconductivity.

Although Lawrence runs a global enterprise today, he considers one of his most profound professional experiences to have occurred while he was working on his PhD. "There was a moment where I discovered a new way to measure something that led to improving my ability to [take measurements] by several orders of magnitude," he says. He was measuring optical properties during the superconducting phase transition. Inside the vacuum chamber where he was performing the experiment, "there was a noise source coming from the impurities of the material itself and I found a way of basically using heterodyne techniques [to] divide out that noise source and measure [the optical properties more precisely by] a couple more orders of magnitude."

"I will never forget that feeling that I discovered a new way to do something," says Lawrence. "You rarely get it now at my level in management because you're not so close to the problems…" It became one of the cornerstones of his thesis and although "it's not like discovering a cure for cancer," he says, he explains that "the pride that this is (my) product and it has a meaning and a result,…was pretty profound." He jokes that his discovery is probably "an ancient technology" today, "but at the time it was pretty cool."

By the time he finished his PhD and left LLNL in 1992, "I had figured out that I was on the path of doing really big research," he says. "I saw myself on larger and larger projects and eventually going into management and didn't see myself as going the path of a tenured professor."

He was attracted to the defense industry because of its intersection between national service and high technology, he says. "I was drawn to applying technology to national security applications… [and] to protecting our country and protecting the men and women who serve our country."

Lawrence says this attitude is a fundamental calling. "That [is] a very important part of who I am as a physicist," he says. He concedes that "sometimes my colleagues in physics don't necessarily see the same calling." However, Lawrence feels a certain responsibility to apply knowledge and discovery in "physics to what I consider to be very important problems…[in support of] key missions for our country," he says. "It's part of national service."

Lawrence has held many positions in the defense industry. He has served as the deputy program leader of the Advanced Imaging, Imaging & Detection Program of the Lasers Directorate of LLNL, as deputy director of the Information Systems Office of DARPA, and in various management positions at Northrop Grumman, including as the sector vice president and general manager of the Systems Development & Technology division. He joined Raytheon in 2006 as vice president of Engineering, Technology and Mission Assurance, and was promoted to his current position

MISSILE MAN continued on page 7

Physics Vital to Kerr's Intelligence Career

By Calla Cofield

In 1966, Donald Kerr began his physics career at Los Alamos National Laboratory, young and eager to apply his training to solving some of the biggest challenges facing the nation. Now, more than forty years later, he's looking forward to the chance to read the newspaper in the morning. With the end of the last presidential administration, Kerr is taking a break from a decade of high-profile jobs in the national intelligence community, culminating in his appointment as the second highest intelligence officer in the Bush administration. As the Obama administration rolls in, and with it a new flock of physicists ready to get their feet wet in government, Kerr shares a few words of experience and advice.

A dedication to serving his country is clear from the very start of Kerr's career, beginning at Los Alamos, where he focused on ionospheric physics and its applications in high altitude weapons effects. Ten years later, he began working with the Department of Energy during its formation, testifying before congress while first in charge of defense programs and later energy technology. He returned to Los Alamos and directed the lab from 1979 through 1985. Kerr's career quickly advanced to leadership positions not often filled by scientists so young. For his next challenge, he left the government sector to work in private industry, where he would hold top positions at three corporations, including the defense contractor SAIC.

Kerr's résumé continued to become a patchwork of posts and appointments, all focusing on issues of security and national intelligence. He re-entered government work in 1997, beginning with a position with the Federal Bureau of Investigation, followed by a job as Deputy Director of Science and Technology for the Central Intelligence Agency, and in 2005 Kerr became Director of the National Reconnaissance Office. By overseeing and advising researchers working on cutting edge technology and scientific analysis related to national security, Kerr kept his physics knowledge sharp.

"Physics is one part of applying all of the tools and techniques that one can think of to different parts of the intelligence problem. It's woven in," says Kerr. "You need a strong science and technology input, and at the same time, you need people who have field experience who know what kinds of things you can do in different places. You've got to build the whole team."

In 2007 Kerr was given his first Senate-confirmed position as Principal Deputy Director of National Intelligence, placing him at the crossroads of all incoming intelligence information. Kerr was privy to information about terrorist activities and the state of military affairs. He had become skilled at assessing this kind of information and communicating his assessments to policy makers. "It's a long way from the laboratory or the classroom. The consequences of getting it wrong are so different," he says. "If you make a mistake in a laboratory experiment, you're not putting lives at risk."

Looking back, Kerr says he never expected to stay in the intelligence community as long as he did. These days he works as a research professor at George Ma-

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APS Fills New Career Program Manager Slot

By Gabriel Popkin

Fresh from completing her PhD in nuclear physics at Indiana University, Crystal Bailey assumed the position of Education and Careers Program Manager at APS in early July.

Photo by Ken Cole

Crystal Bailey

She will be leading a number of efforts to promote and market physics education. She is helping to create a new website that will provide information on physics careers to undergraduate, high school, and middle school students, as well as to their parents and teachers. "We want to highlight the 'hidden physicists'—all those people with a physics background whose job title doesn't include the word 'physicist,'" says Bailey. Most people with bachelor's degrees in physics do not work as research physicists in academic or industrial settings.

In addition, Bailey is working on a multimedia presentation designed to be shown in venues frequented by potential physics majors, such as university science buildings. "We're trying to make these shows highly informative and visually striking, so they will excite undergraduates about careers and opportunities in physics," says Bailey.

"Crystal will be a great addition to our team as we expand our efforts to double the number of physics majors and recruit more women and underrepresented minorities into physics," says Ted Hodapp, Director of Education and Diversity for APS. "Lack of information about physics careers is a major barrier to increasing undergraduate enrollments."

"I am looking forward to helping get the word out about the many uses of a physics education," says Bailey. "I am especially excited about reaching out to those students who have never given physics a thought, and here at APS I'm in a great position to do that."

Letters

Creation Argument Begs the Question

In the June 2009 issue, Jeffery Winkler treats us to a cute refutation of the dominant view that the universe was created. He first equates the word "magic" with "impossible." This is an example of begging the question, since Webster makes no such association. He next asserts that Christians believe the universe was produced by an act of "magic." I've never heard it put that way and doubt any Christian would agree with this formulation of his belief. Nevertheless, it provides a convenient straw man which Winkler has set himself up to vanquish. One assumes he was writing with tongue in cheek.

Indeed, Christianity has always opposed magic, or sorcery, and deserves credit for replacing the pagan view of a chaotic, magical world controlled by warring, whimsical gods and spirits with that of a rationally comprehensible world of order, purpose, laws and beauty created by a single omniscient and omnipotent God. Without this shift in perspective, we would never have reached the point where modern science could take root.

It should also be pointed out that "the Christians" are not alone in believing in creation's Creation; they share this conviction with religious Jews and Muslims, and several other religions as well. Focusing on the former group may be perceived as discriminatory and cause the others to feel left out.

Christopher Nantista
Redwood City, CA

Foundation Could Help Demystify Indirect Costs

The July Back Page, by Arthur Bienenstock, points out how administrative costs associated with federal funding are burdening both universities and those carrying out the research. Many faculty are troubled by the opaque nature of indirect cost: how the rate is calculated, what expenses go into it, what use is made of it. This would be greatly helped if all Universities were to establish a Foundation (research and training) to receive and administer all awards (maybe restricted to federal awards, and maybe to those agencies that allow indirect cost).

The Foundation would have its own budget process, separate from the rest of the University. It would 'rent' space and administrative services as needed or appropriate (outsourcing could be an alternative). If the University were the supplier, the Foundation would be charged the local going rate for space of the quality provided. Services like budget administration would be done by the foundation. So, for example, if a researcher needs office space, the foundation would rent space with defined amenities (HVAC, lighting, parking, etc.). For lab space, there are definitions by GSA of different types of space, and there are types (like light industrial) that could apply. The Foundation would be a tenant of the University, but if good space could be found more cheaply or with better maintenance, then going outside the University would be a possibility. Getting services like internet access could also be outsourced. Clearly there are areas of overlap that have to be negotiated.

The general policies of the Foundation, and an annual income/expenses statement should be available to all PIs.

Kenneth W. McFarlane
Yorktown, VA

PRL Reaffirms Stringent Selection Criteria

The editors of *Physics Review Letters* announced in an editorial in their July 1st issue that the journal will apply more scrutiny to submitted manuscripts, and be more selective in those that it publishes. The announcement said that *PRL* was not adopting any new guidelines for papers per se, but would be applying previously established policies more stringently.

This update will likely mean a decrease in the number of published papers in *PRL* and a short term drop in the acceptance rate for papers. The editors hope that over the long run, submitters themselves will be more self-selective about which papers have a broad enough appeal for publication in *PRL*.

"It is not fundamentally different from past practice, but the emphasis on *PRL's* criteria, and what those criteria mean, has increased," said Reinhardt B. Schuhmann, one of *PRL's* editors, "A Letter still must be valid, important, and of broad interest, but we hope to encourage the physics community to think in more detail about the attributes that make a manuscript important, or of broad interest."

This reaffirmation was prompted by some concern over the future growth of *PRL*. The competing journal *Nature* recently began printing the offshoot publications *Nature Physics* and *Nature Nanotechnology* which could start siphoning away some manuscripts from *PRL*. In addition, the growing number of papers published annually in *PRL* has prompted criticism from some subscribers who have found the large volume of papers difficult to sort though. The editors hope that by reaffirming *PRL's* core principles to publish the most important physics papers of broad interest the journal's vitality will be refeshed.

"I would characterize the *PRL* publishing policy as aiming to publish the most important and interesting results in all (or almost all) fields of physics," said Jack Sandweiss, another of *PRL's* editors and chairman of the *PRL* Editorial Board. "This has been our policy since *PRL's* inception but unavoidably as physics has developed and the journal has grown, we find that we need to be more rigorous in the application of these standards."

According to the published editorial, referees will be required to report compelling reasons why a paper recommended for *PRL* is appropriate for the publication and wouldn't be better suited for one of the more specialized *Physical Review* journals. In addition it asks researchers to carefully consider their findings and submit only papers that "substantially advance a particular field, open a significant new area of research, or solve a critical outstanding problem."

An additional aim of this reaffirmation of standards is to speed the publication of accepted Letters and the transfer of other papers to a more appropriate, specialized journal. The criteria were officially adopted as of July 1st , but editors expect that it will take some time for all referees and authors to fully adjust.

Since its inception in 1958, *Physical Review Letters* has continually sought to bring the most important and groundbreaking physics research to its subscribers.

zero gravity

Good Science
1. Apple falls on Newton's head.
2. Newton discovers Law of Universal Gravitation.

Bad Science
1. Apple falls on Newton's head.
2. Newton publishes the following paper:

On the Impact of a 0.12 kg Apple with the Head

Isaac Newton

Abstract. We have carried out an experimental study to determine quantitatively the risks faced by people standing under an apple tree. The Collision Induced Pain (CIP) produced by a 0.12 kg apple on the head was measured.

Introduction. Since the early days of Creation, Man has been interested in apples [1]. Its nutritive properties [2] as well as its potential toxicity have been thoroughly discussed [3]. More recently, apples have found important technological applications [4]. However, little attention has been given to the critical issue of the risks faced by the eventual fruit picker who approaches the branches of an apple tree.

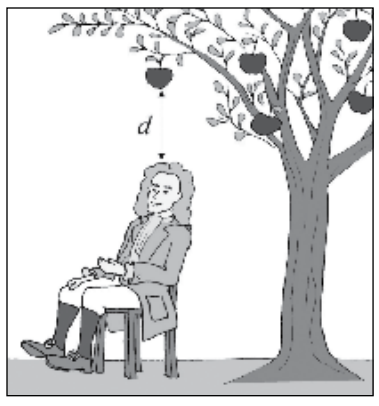

FIG 1. Experimental setup.

Experimental procedure and results. An experiment was carried out to determine the effect of an apple falling on the head. The experimental setup is sketched in Fig. 1. The experimenter sat under an apple tree for five consecutive days and different intervals of time Δt (Table 1). On the fifth day an apple fell on the experimenter's head from a distance d=1.8±0.1 metres. The mass of the apple was found to be M=0.12±0.01 kg. Immediately after the collision the experimenter reported a mild discomfort that decreased exponentially with time as he rubbed his hand against the Apple Impact Area (AIA). On a scale of 0 to 10, the Collision Induced Pain (CIP) was rated as 2.3±0.1 (Fig. 2) and it decreased down to negligible values after a time τ=14.6±0.5 seconds. Some authors suggest that a more vigorous rubbing on the AIA would reduce substantially the Pain Relaxation Time (PRT) [5], although this theory has been highly disputed. No structural damage was observed in the experimenter's skull.

Table 1. Recorded events.

Day	Δt (hours)	Apples fallen
1	1.3	0
2	0.6	0
3	2.1	1(*)
4	1.4	0
5	1.8	1

(*) This apple missed the target.

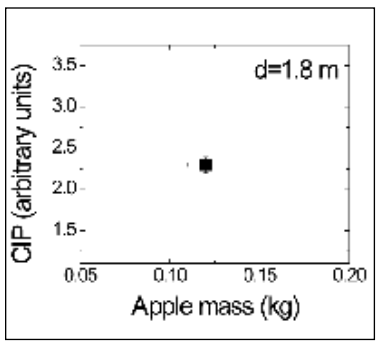

FIG 2. Plot of the CIP as a function of apple mass (solid square, *d*=1.8 metres).

Conclusion. A quantitative determination of the effect of an apple falling on the head was carried out for the first time. A 0.12 kg apple falling on the experimenter's head from a distance of 1.8 metres was found to produce a CIP of 2.3±0.1 arbitrary units. A future development of this work includes the measurement of the CIP induced by apples of different mass and investigating the collision with pears. These studies will be carried out as soon as the author finds a PhD student as he is not very keen on repeating the experience himself.

Acknowledgments. The author thanks the University of Cambridge (UK) for providing the apple tree.

[1] Adam *et al*., Eden J. Nat. Hist. **1**, 1 (8000 BC).

[2] Granny Smith, "1000 recipes with apples", Orchard Publishers, Appleville, 1964.

[3] S. White and Seven Coauthors, *J. Appl. Witchcraft A: Poisons* **7**, 2345 (1532).

[4] Macintosh *et al.*, J. Hort. Comput. **52**, 2167 (1973).

[5] Mrs. Newton, private communication.

Ed. Note: *This Zero Gravity was contributed by Ricardo Torres of Imperial College. Since it is, essentially, a work of fiction, we hope our readers will indulge the author and forgive certain anachronisms and historical inaccuracies (e.g., the metric system had not been invented in Newton's time, and the apple tree was in Newton's home town of Woolsthorpe, not Cambridge).*

US TEAM continued from page 1

exams, so to maintain secrecy the students spent most of their time with host guides.

The closing ceremony was held at the grand Peon Contreras Theater where several officials spoke and a local mariachi band performed. On the days the students were not competing, the Olympiad committee sponsored excursions to some of the nearby Mayan ruins throughout the Yucatan Peninsula including Uxmal, Dzibichaltun and Chichen-Itza. They also featured a series of three science lectures in the evenings, including one by Nobel laureate Joseph Taylor.

The Olympiad was first held in 1967 in Warsaw, Poland for the nations of Eastern Europe. During the 1970s the competition expanded to the rest of Europe and later the rest of the world. In 1986 the United States sent its first team to the competition in London and returned with three bronze medals, the best any team had done on its first outing.

The American Association of Physics Teachers and the University of Maryland have organized and trained each U.S. team since the beginning. More than a dozen other organizations, including the APS and the American Institute of Physics, also help to sponsor the team.

MEMBERS continued from page 2

"Whatever targets you thought you were going to make… it will be undermined by the fact that you have…additional emissions that you hadn't planned on."

David Fahey, *National Oceanic and Atmospheric Administration, describing how the chemicals used to replace ozone-depleting CFCs are potent greenhouse gases,* The Washington Post, *July 20, 2009.*

"You could imagine using multiple emulsions: take the fats that add flavor to the milkshake, and structure them in a way they don't have as much fat."

David Weitz, *Harvard University, on using nanotechnology to engineer healthier food,* The Boston Globe*, July 27, 2009.*

"I love to do research that is both high-risk and high-value... I also like the idea of doing something that could impact US industry and really have a long-term potential payoff for society."

Ian Spielman, *NIST,* Washington Post, *July 27, 2009*.

Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: Science Research Budgets

DOE/SC Funding

On July 17th, the House of Representatives passed H.R. 3183, the FY2010 Energy and Water Development appropriations bill, which-includes funding for the Department of Energy. The Senate passed H.R. 3183 on July 29th.

In the House, the bill includes a total of $4.94B for the Office of Science (DOE/SC) and represents an increase of 3.58% over FY2009 funding. Nearly all of the DOE/SC accounts, including High Energy Physics (HEP), Nuclear Physics (NP), and Basic Energy Sciences (BES) received increases over FY09 levels. The only two exceptions were a modest reduction in the Biological and Environmental Research (BER) account due to a reduction in earmarks, and an 8% reduction in funding for Science Laboratory Infrastructure (SLI) because of the additional funding that account received in the American Recovery and Reinvestment Act (ARRA-the "Stimulus" bill). Without earmarks, BER received a 30.44% increase over FY09 levels. Moreover, when coupled with the additional funding provided in the ARRA for DOE/SC, the National Science Foundation (NSF), and the National Institutes of Standards & Technology (NIST), FY2010 increases in funding for science puts these agencies on track to meet the ten-year doubling track set out in the America COMPETES Act strongly supported by the Obama Administration. It is unclear, however, if such increases will continue in successive fiscal years, particularly in light of the expected Administration push for deficit reduction measures.

The Senate numbers for the same accounts are fairly close, but with more modest increases over FY09 levels. For example, the topline number for DOE/SC represents a 2.64% increase totaling $4.89B, lower than the House number. Fusion received nearly 4% less in the Senate bill than in the House, with an increase of 3.34% instead of the 9.55% in the House.

NSF and NIST Funding

The House passed H.R. 2847, the FY 2010 Commerce, Justice, Science (CJS) bill, which funds NSF and NIST, on June 18th. NSF received a 6.87% increase over FY2009 funding, with Research and Related Activities adding 8.85% to its account over last fiscal year. These increases are in addition to the $3 billion NSF received through the ARRA. The Senate has not yet considered the CJS bill.

For a complete listing of changes in key DOE/SC, NSF and NIST accounts see http://www.aps.org/policy/issues/research-funding/index.cfm

ISSUE: POPA Activities

The National Security Subcommittee held a second workshop June 30-July 1 for work on their Study, which examines technical steps that support nuclear arsenal downsizing. Writing has now begun on a draft report.

The Energy & Environment Subcommittee has two studies in progress. The first, a Carbon Capture Study examining non-biological CO_2 capture, will convene committee members for a second workshop August 4-5 on the west coast. Work continues on producing a final report.

The second, a Grid Study that will examine the technical challenges and priorities for increasing the amount of renewable electricity delivered by the grid to high-demand centers, is in the process of shaping their committee. Their first meeting is planned for September.

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.

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

Reaching Out – Wa-a-ay Out

Photo courtesy of NCAR

APS's public outreach specialist, Chris Discenza, traveled to Kenya in July, performing physics demonstrations and delivering materials to the ten rural schools near the equatorial town of Nanyuki. The trip was sponsored by the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, in conjunction with the Kenyan Meteorological Department, to teach students about the physics of weather and climate. APS supplied PhysicsQuest kits for the students at the schools. Here Discenza, along with colleague Christina Pease (2nd in from right), just finished presenting the materials to Mrs. Teresia Wahome's (far left) eighth grade science class at the P.C.E.A. Girls' Boarding Primary School.

INTERNATIONAL News

...from the APS Office of International Affairs

The heirs of Nawojka: Women's Section of the Polish Physical Society

By Lidia Smentek

There is a grain of truth in every legend. One of those legends is the story of Nawojka, who is a good example to follow for young girls with academic inclinations. Nawojka is considered to be the first female student and teacher in Poland. It was about 1407 when she, disguised in boy's clothing, entered the Kraków Academy[1] in violation of all rules, laws, customs and tradition; defying everything that was expected of women at that time. This fact was recorded about 1429 by Martin of Leibitz, an elderly abbot of the Benedictine order in Vienna.

Founding members of the Women's Section of the PPS (from left): Aleksandra Leliwa-Kopystyńska, Elżbieta Czerwosz, Małgorzata Suchańska and Teresa Grycuk (from the first meeting of the newly established Executive Committee, Warsaw, November 15, 2008).

Nawojka was very talented, hard-working and serious, but nobody knew why this student remained rather distant. After two years at the Academy, he/she graduated with a degree in teaching. There are several accounts of how it was discovered that in fact this student was a girl. According to one, when she became ill, during an examination a physician discovered the truth. Other sources say that she was offered a position as a servant in a professor's home and his/her duty was to go with the master to a public bath... Regardless of which one is true, when the crime was disclosed (at that time it was forbidden for girls to attend the university) she was brought for judgment to the bishop's court. It was assumed that as punishment for the violation of the moral and ethical rules she would be burned at the stake. However when the bishop asked her why she had committed such a deadly sin, she answered: *out of love for learning*. Because of this honest answer the bishop mellowed and, out of mercy, she was spared from burning. Instead, per her request, she was allowed to spend the rest of her life in a convent where, as a good and educated scholar, she taught the other nuns how to read and write.

Although the beginning of academic careers for women in Poland goes back to medieval times, the development of equal opportunities for both genders was rather slow over the ages. Women have been admitted to the Jagiellonian University only since 1897 and allowed to hold an academic position since 1906. The first dormitory for female students, obviously named Nawojka, was opened in Kraków ...three decades later.

It was in 1911, not the 15th century, when a scandal broke in the French press about the relationship between Madame Curie and Paul Langevin. Although Madame Curie at that time was single (widowed since 1906) and Langevin was married (in fact with serious, long-standing marital problems), it was *her* reputation that was ruined and in addition, *her* scientific career that was almost destroyed. The drama developed to the point that the question "… can she still remain a professor at the Sorbonne?" was published in a serious newspaper. It culminated when, after learning of her Nobel Prize in Chemistry, she received a letter from Svante Arrhenius, a member of the Nobel Prize Committee in Stockholm. He asked her to send a cable that, in light of the turmoil, she would not attend the ceremony, and not accept the award until the accusations were cleared up and proven to be untrue. Instead, standing up to defend herself, she replied "*I believe that there is no connection between my scientific work and the facts of private life... I cannot accept the idea in principle that the appreciation of the values of scientific work should be influenced by libel and slander concerning a researcher's private life"*. She accepted the prize in person, the second Nobel Prize of her career.

These and other stories provide a historical background for recent activity in Poland to improve the plight of women scientists. Unfortunately statistics

NAWOJKA continued on page 7

[1]The Kraków Academy, now known as Jagiellonian University, was established in 1364 after many years of negotiations by the king of Poland, Casimir the Great, with the pope; it is the second oldest university in Central Europe, after Charles University in Prague, established in 1348.

KERR continued from page 3

son University, is on a few boards and advisory committees, and is otherwise enjoying having more discretion over his own time. He is in contact with some of the physicists who have entered positions with the new administration, most of whom are in the energy or national security sectors. Even after forty years of experience, Kerr says there isn't a skill set or type of experience that can guarantee a physicist will be ready for a job in government.

"It seems to me that what you do is wish them luck," he says sincerely. "And the reason you can't do better than that is they're working with a different set of people in a different context. Who could have predicted the combination of the economy being where it is, the two wars…you don't get to choose the problem. It's not like laying out your research agenda and saying 'I'm going to focus on that problem.' So I think it's important that people can adapt to the situation."

His only other piece of advice is a humble one, giving credit to the mentors he's had along the way. "It's trite to say, but make sure you have the right bosses, because they're the ones that give you the right opportunities, and enough rope to go hang yourself," he says with a laugh. "Over the years I was very fortunate. I worked for very good people. They were confident enough in me to see whether I could really take it on, and it seems to have worked out so far."

AWARDS continued from page1

classes while pregnant with her first son.

"I really like teaching and would like to see it in my future some time from now," Guikema said.

Her son David was born in the summer of 2006 after she concluded her first semester. Guikema returned to the university that fall, balancing teaching part-time with "finding time to learn how to be a mom."

In January of 2008, the family pulled up stakes again and moved to Maryland after her husband was offered a position at Johns Hopkins University. She saw this as a good opportunity to return to research. Though Guikema enjoyed teaching, she missed the hands-on aspect of running her own experiments.

"I wanted to get back to learning something new," Guikema said, "my interest was more in finding out new things about the world."

The scholarship will allow her to further her experiments on graphene and continue working with an undergraduate research assistant. She also said that the Scholarship will give her time to line up funding through regular channels. Additionally, switching from teaching to research has given her more flexibility to care for her newest son Matthew, born in June.

"The continued funding will help me more firmly establish my research career and maintain momentum after having the [second] baby," Guikema said "It's really encouraging…to have the committee decide what you're doing is worthwhile."

Though family tragedy postponed Marija Nikolic-Jaric's PhD, she never doubted she would ultimately complete it and return to the lab.

She is currently doing her postdoctoral research on biomicrofluidics at the University of Manitoba,

Marija Nikolic-Jaric

Canada. She is investigating the properties of shear-induced rotation on aspherical particles in non-uniform electric fields. Studying these properties will allow researchers to better identify a particle's structure based on its behavior in these electric fields.

"From these rotating particles, we will be able to deduce more about the particle's electrical signals," Jaric said, "It will allow us to know what the limitations are on performing measurements on spherical particles."

She hopes to use these methods to help identify a living cell's characteristics in order to improve medical diagnostic and therapeutic technologies. With more work these methods could be used in medical instruments to detect defects in living cells remotely. Identifying the electronic signatures of diseased cells would mean that doctors could analyze large numbers of cells at a time without needing microscopes.

"We work on making these detectors very sensitive and do these detections via electronic means," Jaric said, "If you can do the whole thing electronically you can miniaturize it and put it on a chip"

In August of 1996, everything had to be put on hold. Just weeks before Jaric was due to defend her thesis, her husband was diagnosed with a rare brain tumor. Jaric already had a lot on her plate; trying to pull together her credits from multiple universities while at the same time caring for her four-month-old son. Her husband's illness was just too much, and completing her degree would have to be put off for a while. After his death the following year, she moved back to Canada to be closer to her parents.

During her time away from the lab she volunteered at her son's elementary school, helping to teach math to the students through games. Though the work at the school was rewarding, she knew she wanted to return to conducting research.

"The challenge of research was definitely missing there," Jaric said, "I knew I had to just go back to what I loved to do the most."

Her step-father's death in 2007 put off her defense an additional semester. But in January of 2008 Jaric was finally able to defend her thesis at Simon Fraser University in Vancouver, finishing the PhD she started years before. She said the Blewett scholarship has given her a solid financial and psychological boost, and she is now awaiting publication of her first paper.

"It's just amazing," Jaric said, "This hand extended to me is just wonderful."

Klejda Bega is excited to return to research after four years working as a management consultant.

Now back in the lab, she plans to develop new approaches for creating ultracold diatomic molecules in optical lattice traps at microKelvin temperatures. Once they are cooled, she will conduct precise measurements of these molecules, including determining their resonance frequencies. Her first order of business will be to construct and operate the laser systems, which will be used for creating, cooling and probing the molecules.

One possible application of her work will be in the creation of a molecular clock. Today's atomic clocks operate by measuring the fundamental resonance frequency of an atom, most commonly cesium or rubidium. Molecular clocks operate by measuring resonance molecular vibrational frequencies, and Bega hopes to accurately measure these vibrations. In addition to improving the standard for super-accurate clocks, Bega said that results from her experiment will be used to further define fundamental physical constants.

Klejda Bega

"These molecular vibrations are very sensitive to the variation of the proton/electron mass ratio," Bega said, "and will provide the only model-independent measurement of these variations to date."

It had always been Bega's dream to study physics after she first read the biography of Marie Curie when she was nine. She first came to the United States after the old communist regime in her native Albania collapsed, making studying in the West possible. She earned both her BS and PhD at Caltech, and did her graduate work at SLAC.

Unfortunately Bega soon had to put her research ambitions on hold. In order to support aging family members still living in Albania and cover their medical expenses, she worked as a management consultant. There, Bega found that her scientific background helped in her new consulting job.

"My physics education came in very handy," Bega said, "One could use the same analytical skills to first define and then solve a complicated business problem, and just like in physics, of course nothing is straightforward."

She said also that this time away from research helped her realize she was eager to return to it.

"It made me realize how much I actually like physics."

Last year, Bega married and moved to New York and joined Prof. Tanya Zelevinsky's lab at Columbia University. With the help of the Blewett Scholarship, Bega hopes to complete her postdoctoral work and obtain a permanent research position.

Bega is also expecting a baby in September. She joked that with the scholarship, "even if it crossed my mind, there is no way I am taking another break now."

M. Hildred Blewett was a particle physicist who left much of her estate to APS when she died in 2004, at age 93. She wanted to establish a scholarship to help women in physics overcome the obstacles they often face in the field. Blewett started her career in Schenectady, New York in the 1940s working for General Electric, where she developed a method to control the pollution emitted by smokestacks. In 1947, she and her husband John were among the original team members at Brookhaven National Laboratory. Later she worked at Argonne National Labs and finally CERN until her retirement in 1977. A recollection of Blewett appeared as the Back Page in *APS News* in February, 2005 (see www.aps.org/publications/apsnews/200502/backpage.cfm).

VIDEOS continued from page 1

films.

"I used to make a lot of videos when I was in high school. I had a lot more free time then, and was also the Science Club president," Lincoln said, "I had an audience that was willing to watch science-related videos and I learned how to mix in a lot of comedy."

The Viewer's Choice winner was James Tangredi for his video "The Physics of the Ollie." Tangredi breaks down the mechanics of one of the most common skateboard tricks into the fundamental forces involved. He received an assortment of physics-themed toys and APS merchandise.

"It feels great, I'm glad the viewers got the chance to see my video and recognize the work me and my buddy put into creating it. It's always nice to have your efforts rewarded," Tangredi said, "Skateboarding appeals to so many different people, even more so to the younger generations, that using a trick as a tool to teach physics makes perfect sense."

This year's contest followed up on last year's successful NanoBowl, which invited participants to create videos that combined physics and football. The toy theme this year was inspired by the many physics toys and demonstrations around the outreach offices. Like last year, the contest was open to anyone who wanted to submit an entry.

"We wanted all ages to participate," Rebecca Thompson-Flagg, head of outreach for APS, said, "and we got all ages to participate."

The submitters were as diverse as the toys featured in the videos. Kids as young as elementary school and adults who've graduated from college submitted entries to the competition. Even Argonne National Labs put together an official entry about how electricity can conduct through a dozen elementary school students holding hands, powering a light-up noisemaker. The aim is to try and keep explanations at around a middle school level, so the contest can be accessible to everyone.

The two winners can be seen on the PhysicsCentral website. The entire collection of submissions received can be found on YouTube under the Toy Box Physics playlist. Because of the success of this year's contest, plans for another one in the near future are already in the works.

Proposal to Amend the APS Bylaws To Establish a Standing Committee on Informing the Public (CIP)

FIRST VOTE APPROVED BY COUNCIL–MAY 1, 2009

In 2006, the Executive Board established an ad-hoc Committee on Informing the Public (CIP), in recognition of the fact that Public Outreach and Media Relations had become significant programs of the Society, and were the only such programs to operate without an oversight committee.

In establishing the committee, the Board approved the following preamble and charge:

Preamble

A public well-informed about physics and related sciences is essential for the well-being both of the physics profession and of society at large. A scientifically well-informed and appreciative public reflects itself in policy choices in Washington, and in a clear understanding of what should and should not be taught in the science classroom. Better motivated and better educated students will also go on to contribute significantly to the economic health and security of the nation.

With the help of recommendations from a task force that submitted its final report in February, 2000, APS began a number of activities in the area of informing the public. The position of Head of Media Relations was created, as was a second position, now called the Head of Public Outreach, designed to bring the excitement of physics to the general public. The APS website for the public, Physics Central, made its debut in November of 2000.

As a result of the World Year of Physics in 2005, APS outreach activities received another boost. The position of Public Outreach Specialist was added, and a new ongoing project for middle schools, Physics Quest, was carried over from the World Year.

Because of this increased activity, at its meeting in June of 2006, the Executive Board decided to establish an ad hoc Committee on Informing the Public.

Charge to the Committee

The committee should begin by reviewing and assessing the current portfolio of APS activities in the area of informing the public, using the February, 2000 report of the task force as a guide. The committee should offer advice on which activities to expand or contract, and suggest new directions as appropriate. The committee will draft a mission statement to express the goals of APS in its efforts to inform the public. Based on this mission statement, outside experts, such as public relations professionals or practicing journalists, may be brought in as advisors to the committee.

On an ongoing basis, the committee will provide oversight of APS public outreach and media relations, and will continue to generate ideas on possible new activities and approaches. The committee may be of particular use in finding external resources, in encouraging APS member support and involvement, and in dealing with such issues as how APS outreach activities can be meaningfully evaluated. In addition, the collective knowledge of the committee can be helpful in calling attention, in a timely manner, to new outreach opportunities similar to the Einstein anniversary of 2005 or the Franklin anniversary of 2006.

The committee has been operating under this charge for more than two years. They have held two meetings a year in 2007 and 2008, with Philip W. "Bo" Hammer as Chair. In 2009, Dan Dahlberg succeeded him as Chair. The committee has drafted the following mission statement, on the basis of which it is petitioning the Board to be changed from an ad-hoc committee to a standing committee of the Society. The mission statement can also serve as the text to be added to the bylaws to establish the CIP as a standing committee.

Mission Statement & Proposed APS Bylaws Amendment

ARTICLE III Standing Committees; Section B Public Affairs/Outreach Committees; Paragraph 8 Committee on Informing the Public

The membership of the Committee on Informing the Public shall consist of nine members appointed by the President-Elect to staggered three-year terms. The President-Elect shall appoint the Chair from among the members. The committee will provide oversight of the Society's public outreach and media relations activities while also seeking mechanisms to encourage or facilitate public outreach by APS members. Committee members will also suggest future activities, approaches, and outreach opportunities, as well as possible external funding sources. The committee will recommend to the APS Board the allocation of financial resources among membership and APS initiated activities at least once a year.

ANNOUNCEMENTS

Professional Skills Development for Women Physicists

Improve your negotiation skills and learn to communicate your great ideas to your colleagues.

When
Friday, February 12, 2010, Washington, DC
Sunday, March 14, 2010, Portland, Oregon

Who may apply
Women postdoctoral associates and women faculty in physics. Each workshop will have one session aimed at post docs and one session aimed at women faculty.

Deadlines to apply
November 9, 2009 (for February 12)
December 7, 2009 (for March 14)

First consideration will be given to applications received by the deadlines. Workshops will be limited in size for optimal benefit. Women of color are warmly encouraged to apply.

Participants are eligible to receive a stipend to help cover the cost of travel and up to two nights lodging.

Details at http://www.aps.org/programs/women/workshops/skills/index.cfm

These workshops are funded by a grant from the National Science Foundation.

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**

Physics of laser-driven plasma-based electron accelerators

E. Esarey, C.B. Schroeder and W.P. Leemans

In the past decade, high intensity laser-driven particle accelerators have made significant progress. Recent results have shown relatively monoenergetic electron beams (~4% energy spread) with energies of ~1 GeV. This article reviews the state of the art of laser-driven electron accelerators.

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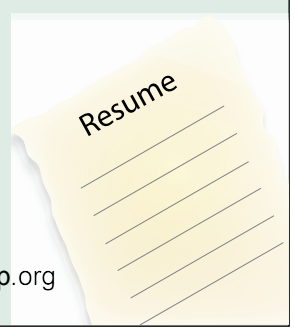

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in July 2008.

While Lawrence was at DARPA, he was invited by Senator Richard Shelby (of his home state of Alabama) to serve as staff director for the Select Committee on Intelligence for the U.S. Senate. During his two and a half year tenure, Lawrence was charged with explaining the complicated physics of the intelligence projects on which the committee voted. "I think some of the best times I had there was when we had closed sessions, and the senators could ask questions about the way things work," recalls Lawrence. "I loved just explaining, kind of like how Feynman would explain, [for example,] here's how a satellite in space takes pictures with this kind of resolution, [or] here's how a satellite in space listens in on communications."

His senate colleagues appreciated his technical expertise and his understanding of large defense projects. They referred to him as "our physicist". When Lawrence decided to leave the committee and go to work for Northrop Grumman in 1999, they threw him a surprise farewell party. "When I walked in [to the party], they said they were really sorry to see 'their physicist' leave the committee;…then I noticed they all had pocket protectors on and geeky looking glasses," describes Lawrence with a laugh. "It was very funny to see all these senators expressing appreciation for…*their physicist.* Even Senator Bob Kerrey said it was always amazing for [me] to try to explain physics to the senators."

Today, Lawrence is excited about innovation in defense technology. "The defense industry is always changing," says Lawrence, "because the nature of the products we produce must change to meet the changing requirements of our customers." Security needs of RMS customers range from counter-insurgency in remote areas like Afghanistan, to protection of shipping or vital assets like oil fields, to looking for capabilities to secure urban environment entities, he says. And in the next ten years, he says, we can expect to see innovation in greater sensitivity in detectors, higher throughput in electronics, better processing of information, better communications, and more and smarter networked weapons systems.

His physics background has helped him to lead the business to success and growth, he says. "…Physics is an incredible foundation [to have for this business] because it draws on all the tools of mathematics, [and] it teaches you analytical and critical thinking." Furthermore, physics guides you to "think about your own concept of the world and then challenge it, measure it and see if it connects," says Lawrence. "That's another thing I learned from [Feynman]: sometimes your physical intuition may not be exactly right…It teaches you to think beyond 'the normal' …and ask what does the physics tell you?"

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still demonstrate the challenges and barriers that are faced by women physicists (in particular) on the professional path to promotion. And the idea is *not* to have a better chance or be more easily promoted because of other roles in life that are assigned to women by Mother Nature. The main issue is to have expected and required the same standards, results, and quality of performance of the scientists no matter what their gender. There are still too many examples of women scientists who have been mistreated, under-evaluated, and blocked in their promotion, while at the same time male scientists (quite often from the same institution) with poorer achievements are rewarded and promoted. Women in science are still being judged not on their merit but their gender, as in the drastic case of Madame Curie.

In the early spring of 2008, a new idea was born to create a separate section of the Polish Physical Society (PPS), which would be devoted to all gender issues in science. The mission of the section is to monitor and defend victims of the violation of equal opportunity and of rules, which are inconsistently interpreted and applied only in the case of women. Unfortunately we still have a long way to go to reach a situation in which scientific merit, not gender, counts in all professional evaluations for promotion.

Although the Section was born as a result of discussions of its charter members Elżbieta Czerwosz and Aleksandra Leliwa-Kopystyńska with Professor Barbara Sandow, the chair of the Women's Section of the German Physical Society, it is not formally connected with any other organization. However, the first result of cooperation with the section of the German Physical Society was the invitation (financially supported) of charter members to take part in the third International Conference on Women in Physics organized by IUPAP in Seoul in September 2008.

The statement "*Because equity is still an issue*" served in 1881 as a strong motivation for 17 enthusiasts joined by the common experience of a university education to establish The Association of Collegiate Alumnae, forebear of the American Association of University Women. Unfortunately in spite of all these years that have passed since the beginning of this activity, still equity is an issue in the scientific world. The AAUW is now a powerful network of more than 100,000 members, with 1,300 branches and 500 college and university partners. *"The organizations are to allow ordinary people to do extraordinary things"* was said by one of the founders of this women's original movement; we hope that the Women's Section of the Polish Physical Society will soon become one of such organizations that provide a strong advocacy for equity in academia.

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Postscript

On April 20, 1995 the bodies of Madame Curie and her husband were moved from a cemetery outside Paris to the Panthéon. Madame Curie is the first woman, who due to her own merit, is laid to rest in this famous place; "*in order to finally respect the equality of women and men before the law and in reality"*, as said by President François Mitterrand.

The Back Page

Science Diplomacy in the 21st Century

Nina V. Fedoroff

Bill Gates, arguably the world's most famous technocrat, gave a remarkable speech during the 2008 Davos World Economic Forum, calling for a new form of capitalism to go beyond traditional philanthropy and government aid. Citing examples ranging from the development of software for people who cannot read to developing vaccines at a price that Africans can afford to pay, Gates said such projects "… provide a hint of what we can accomplish if people who are experts on needs in the developing world meet with scientists who understand what the breakthroughs are, whether it's in software or drugs" (http://www.microsoft.com/Presspass/exec/billg/speeches/2008/01-24WEFDavos.mspx). He suggested that we need to develop a new business model that would allow a combination of the motivation to help humanity and the profit motive to drive development. He called it "creative capitalism," capitalism leavened by a pinch of idealism and altruistic desire to better the lot of others.

Scientists and engineers have an important role to play in creating what *New York Times* columnist Tom Friedman calls a "flat world," a world of economic opportunity made equal through electronic communication technologies (http://www.thomaslfriedman.com/bookshelf/the-world-is-flat). This transformation has not yet penetrated into the poorest parts of the world and needs much more scientific and technical investment. But today, most scientists look to foreign institutions for top-notch graduate students and postdocs to populate their laboratories. The notion of becoming a science diplomat, of taking time out from a busy and competitive career to teach, develop research collaborations, or start a business in the least advanced countries is just not on the radar screen for most scientists and engineers. Yet there are such opportunities, both in the U.S. Department of State and the U.S. Agency for International Development (USAID), as well as in non-governmental organizations, such as the National Academy of Sciences, for scientists and engineers to use their scientific and technical skills in the service of international diplomacy.

I took one such opportunity last year when, as a geneticist and molecular biologist at the Pennsylvania State University, I was invited to serve as the Science and Technology Adviser to the U.S. Secretary of State. My position is not a political one: I served both Condoleeza Rice and current Secretary of State Hillary Clinton. I accepted the position because my involvement in scientific interactions between US scientists and scientists in the former Soviet Union through the 1990s convinced me of the profound stabilizing influence that scientific interactions can exert between countries with deeply discordant ideologies and political systems. Not long after I joined the State Department, I received an invitation from USAID Administrator Henrietta Fore to be her Science and Technology Adviser, as well. The mission she gave me was to assist her in restoring the scientific and technical strength of the agency to enable the better use of science and technology for international development.

My primary task at both the U.S. Department of State, the home base of our international diplomatic corps, and USAID is to increase scientific input into the many activities of the Department and the Agency. The Office of the Science Adviser to the Secretary of State was established in 2000 in response to a National Research Council study, titled "The Pervasive Role of Science, Technology, and Health in Foreign Policy" (http://books.nap.edu/openbook.php?isbn=0309067855), that highlighted the attrition of scientists from State Department ranks at a time when the importance of science and technology was expanding in every aspect of foreign policy. Under the leadership of the first Science Adviser to the Secretary of State, Norman Neureiter, the number of active scientists in the department began to grow again as he promoted the expansion of the AAAS Science Diplomacy Fellows program (http://fellowships.aaas.org/02_Areas/02_index.shtml) within the State Department. Today we have roughly 30 new AAAS Fellows joining us every year for 1–2 years of service.

Many stay on to make careers in the State Department, becoming science diplomats serving either in Washington DC or as Foreign Service Officers. My predecessor as Science Adviser, George Atkinson, created the Jefferson Science Fellowship program (http://sites.nationalacademies.org/pga/jefferson/index.htm), which provides an opportunity for tenured academic scientists and engineers farther along in their careers than the typical AAAS fellow to work in the State Department. Jefferson Science Fellows come to the State Department for a year, funded by their own university as they would be on a sabbatical leave. The State Department covers their local living and travel expenses. Fellows then consult

for the State Department for an additional 5 years after returning to their home institutions.

Jefferson Science Fellows are often individuals who already have a keen awareness of the importance of international collaborations and use their association with the State Department to broaden their influence and involvement in foreign relations and development efforts. For example, Osama Awadelkarim, a Sudanese-born Professor of Materials Science at the Pennsylvania State University, served as a Jefferson Science Fellow in 2006. His passionate devotion to enhancing scientific and engineering expertise in Africa took him to several African countries to teach and to establish collaborations, as well as to talk with government officials and champion the importance of international scientific interactions.

There remains a profound gap between the citizens of affluent nations, who have access to abundant food, up-to-date technology, and excellent educational opportunities, and citizens of the poorest countries of every continent, many of whom lack adequate food, often have no electricity, and have little access to either the Internet or higher education. The technological aspect of this gap has been called the "digital divide" and much has been written about it. Some believe that the problems of the poorest countries are simply solved by cell phones and inexpensive computers that can be used even in places that lack electricity. Certainly these technologies are important and make the job possible, if not easy.

But the problems are deep and stubborn. Perhaps the most poignant disparities exist between the countries of the developed world and much of Africa, where climate, disease, soil exhaustion, and a host of other problems contribute. In his book titled *The Bottom Billion*, economist Paul Collier (http://users.ox.ac. uk/~econpco/) offers an insightful analysis of the many factors that contribute to trapping the poorest nations in continuing cycles of poverty and unrest.

Progress will depend on a high level of education, particularly in science and engineering. All will be impacted by climate change and politics–everywhere. Climate change is a wake-up call to the awareness that we live in a world without borders. Airplanes can make SARS and multidrug-resistant TB everyone's problem in a heartbeat. Trade barriers between nations and farm subsidies in developed nations stifle agricultural growth in developing countries. The rush toward renewable energy from biofuels accelerates deforestation in the Amazon, however indirectly, and with each acre lost, another multitude of species goes extinct. Wall Street's problems echo around the world.

And all of these seemingly separate problems turn out to be interconnected. Food and energy are now viewed as fungible. Growing the food–and feed and fiber and fuel–demanded by a still expanding and increasingly affluent human population requires innovations not just in agricultural productivity but also in water and land management, food processing, and transportation. Decimating what remains of the tropic's forests will as surely exacerbate climate change as it will reduce biodiversity. It's one big thorny tangle: people, money, food, energy, health, water, land, climate, biodiversity. How do we as scientists begin to think–and act–on a global scale to address such complicated problems? It seems to me that we must first become citizens not just of our own nations, but of this world without borders. We need to see, experience, and identify with the peoples and the problems of other nations and to recognize the complexity and interconnections among the challenges facing 21st century humanity. And perhaps most importantly of all, we need to understand, at a deep gut level, that all our fates are truly intertwined.

Science, of course, provides the common language to build bridges between cultures. Education is a stumbling block. The US has educated talented students from around the world for many years. Today virtually every developed country realizes the value to the economy of such talent–and actively seeks to recruit it. But herein lies a paradox: sending its best students to be educated in more developed countries exacerbates a poor country's problems because the education itself–whether it is a teacher's certificate, a nursing degree, or a PhD–makes it easier to find employment and a more stable life in a developed country. Such "brain drain" has robbed–and is continuing to rob–many poor countries of their educated people. These are the people who design, develop, and maintain society's infrastructure–its agriculture, its schools, its clinics, its power, and telecommunications networks. As well, they are the professors and researchers who generate and propagate the knowledge–the science and technology–that are essential in every aspect of life and that are increasingly recognized as the driving forces of successful economies. I believe that we need a deep paradigm shift in our interactions with the less developed world: from distant aid recipients to partners in building a global future. We need to bring the science, the engineering, and technology and the educational systems of developed countries to bear directly and in new ways to create a world in which all people have the educational and economic opportunities now available almost exclusively in the developed world. I believe this paradigm shift is getting underway–among governments, in foundations, in the business world, and in the academic world. It is driven in some measure by necessity and perhaps in some measure by the fact that modern communications media make the disparities among the nations of the world harshly and constantly apparent to everyone.

But there is much, much more to be done and not all of it can be done by governments. In April of 2008, Secretary of State Rice, Secretary of Education Spellings, and USAID Administrator Fore convened a global conference of college and university presidents, companies, and foundations (Higher Education Summit for Global Development, April 29–30, 2008). Its purpose was to explore new ways of connecting the institutions of higher education in the developed and developing worlds across the entire spectrum of what contemporary universities do, from teaching and research, to supporting technology transfer and entrepreneurship. The means of connecting educational resources and people between continents have never been richer, more varied, or easier. From MIT OpenCourseWare to digital videoconferencing and collaborative software, we can teach and work between countries and continents–and in real time. The Internet and broadband connections are critical; availability is increasing and cost is decreasing but in places remains prohibitive. This is where governments, companies, and foundations can help. Yet the challenge of connecting people and resources remains, of making global service–what I've called science diplomacy–a part of what we do as scientists and engineers, whether we work in a government agency, a university, a research institute, or a company. The traditional approach of educating students in our institutions and laboratories is increasingly unacceptable. President Paul Kagame of Rwanda, arguably the African leader most supportive of science and technology in developing and modernizing his country, gave an articulate and moving talk at the recent Higher Education Summit for Global Development. Bluntly paraphrased, his most salient points are these: "We provide you with foreign aid in the form of trained and educated people. You send us expensive consultants to tell us what we already know" (President Kagame's full speech is available at http:// www.gov.rw/government/president/speeches/2008/29_04_08_education_usa.html). We need our scientists and engineers, our experts of all kinds, whether in the lab or in the diplomatic corps, to help us jump the digital divide, both technically and personally. We need scientists, engineers, and entrepreneurs to coach and teach until the world is truly flat, to call on Friedman's metaphor again; that is, until all peoples have the educational and economic opportunities to build and live in sustainable knowledge societies. That's 21st century science diplomacy.

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