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Remembering Jack Marburger
see page 4

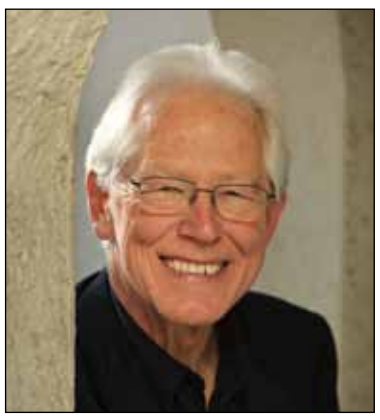
Members Elect Beasley to the APS Presidential Line

In the Society-wide elections, which ended on June 30, APS members elected Malcolm R. "Mac" Beasley of Stanford University as the next vice-President. As the newest member of the presidential line, Beasley will become APS President in 2014.

The members also voted for Annick Suzor-Weiner, of the French Embassy, to be the international councilor, and Keivan Stassun of Vanderbilt University to be general councilor. In addition Sally Dawson was elected vice-chair of the nominating committee, and will become chair of the committee in 2013.

Beasley will assume his office in January of next year, replacing Michael Turner of the Kavli Institute for Cosmological Physics at The University of Chicago, who becomes President-elect. This year's President-elect, Robert Byer of Stanford, will assume the office of President, and current President Barry Barish of Caltech will remain on the APS Council and Executive Board as past-President.

Beasley has been at Stanford since 1974 when he moved there from Harvard. While at Stanford he was appointed the Sidney and Theodore Rosenberg Professor of Applied Physics, helped establish



Malcolm R. Beasley

the Geballe Laboratory for Advanced Materials and served as dean of the School of Humanities and Sciences. Beasley retired in 2010, but stayed on as an emeritus professor and continues his research.

Beasley's research has been primarily focused on superconductivity. He is most well known for determining that the Kosterlitz-Thouless-Berezinskii theory of two-dimensional phase transitions plays a role in superconductors. Currently he is focused on improving and finding new high temperature superconductors.

"I really had not imagined being in this position and am obviously honored," Beasley said, "Looking down the list of past presidents is sobering. I also think it is a very interesting time to help lead organizations like the APS. As I said in my statement, really fundamental change is all around us. This makes being part of the APS leadership at this time particularly interesting and important.

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APS Protests Iranian Jailing Of UT Austin Physics Student

APS's Committee on International Freedom of Scientists issued a letter calling on the Grand Ayatollah of Iran to release an imprisoned physics student. The committee believes that he has committed no crime, and his arrest will discourage future scientific collaboration.

Omid Kokabee, a first-year graduate student at the University of Texas at Austin, and an APS member, has been imprisoned in Iran since January or February and is currently awaiting trial. For the first month of his arrest he was held in solitary confinement. He has been jailed in Evin prison in northwest Tehran, where the Iranian government holds many of its political prisoners. The government of Iran is accusing him of leaking Iranian nuclear secrets to the United States, accepting "illegal earnings" and "communicating with a hostile government."

"Mr. Kokabee has no training in nuclear physics, is not politically active, and is not associated with any political movement in Iran. Rather his primary concerns were his science studies in the field of optics. This area of physics has essentially no overlap with nuclear technology," the letter read, adding that they believe the arrest came as a misunderstanding of his science.

Kokabee had returned to Iran during winter break to visit his family. When he stopped responding to emails, officials at the university started getting concerned. At first, word came through an acquaintance who also hailed from Iran that he had had an accident in Iran and wouldn't be returning the following semester. Later the same acquaintance revealed that he had in fact been arrested.

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AIP Releases Complete Goudsmit Papers Online

The complete papers of Samuel A. Goudsmit (1902-1978) have been digitally scanned and are now available for free download from the Niels Bohr Library & Archives of the American Institute of Physics (AIP). The trove of documents will offer historians and the public an unprecedented look at one of the twentieth century's most notable physicists.

"It's our most popular collection in our archives," said Melanie Mueller, the assistant director of the digitization project. She added also that the wide diversity of subjects that Goudsmit touched on in his career makes it so sought after. "It's a really good snapshot of his really diverse career."

Goudsmit first made his mark on physics in 1925 when he along with George Uhlenbeck proposed the concept of electron spin. He helped set up the celebrated Michigan Summer School in Theoretical Physics at the University of Michigan, before moving to MIT during World War II to help develop radar. Towards the end of the war, he was named scientific chief of the allied Alsos project, which sought to determine how close the Germans got to developing their own atomic bomb.

After the war, Goudsmit took the position of senior scientist at the newly established Brookhaven National Laboratory. In 1950 he also became the editor of *Physical Review* and helped propel the journal to the forefront of physics publications. In 1966, he became the first editor in chief of the APS. Goudsmit retired from Brookhaven in 1970 and from his editorial duties in 1974.

The compilation of documents spans his career from 1920 through his retirement. It includes drafts of his scientific papers, recovered scientific memos and documents from the Third Reich, academic notes and correspondences. Goudsmit was a meticulous record-keeper, often retaining copies of his own outgoing letters. The collection includes correspondences with such luminary physicists as Enrico Fermi, Albert Einstein, Max Born and Werner Heisenberg. Many of the documents are in German because of his work as head of the Alsos mission.

The primary purpose of the

PAPERS continued on page 5

NSF Task Force Fields Comments On Broader Impacts Criterion

By Michael Lucibella

A recently announced review of the National Science Foundation's grant process has reignited discussion about whether it should award grants based solely on scientific merit or whether it should weigh societal issues as well.

NSF receives about 45,000 funding requests each year, of which about 11,500 are successful. Each proposal is evaluated based on two main criteria. The first is Intellectual Merit, which looks at the proposal's potential to advance knowledge in a given field. The second and more controversial criterion is Broader Impacts, which weighs such issues as whether the proposal would promote education, broaden the participation of underrepresented groups in science, enhance scientific infrastructure, improve scientific understanding or otherwise benefit society in some way.

The Broader Impacts criterion, introduced in 1997 and renewed in 2007, has been controversial within the scientific community. In early spring of 2010 the National Science Board, the oversight body of NSF, announced that a task force would be reviewing the criteria for awarding grants. It

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DOE Weighs Its Options for Underground Lab

By Michael Lucibella

A now defunct gold and silver mine in South Dakota was all set to host a next generation underground science lab until the National Science Foundation backed out. The Department of Energy is working to save the biggest physics experiments, but because of the uncertain nature of future budgets, it is unclear how much will ultimately be built.

The DOE and the NSF had planned to jointly build and operate the expansive underground lab in the Homestake mine in Lead, South Dakota. In December, following a directive from its oversight body, the National Science Board, the NSF unexpectedly pulled out of the project, citing concerns over the cost and their broad role in running the lab. This halted the project, and the Department of Energy had to go back to the drawing board and rethink its plans for the site.

The original plan for the Deep Underground Science and Engineering Laboratory, known as DUSEL, featured a massive multidisciplinary lab at multiple levels in the mine. In addition to physics, the lab would have had facilities for biological, geological and structural engineering experiments. That comprehensive vision is essentially dead. The DOE is mulling over how to move forward and build the three biggest physics experiments planned for the mine.

The biggest hurdle facing the facility, now officially known as Sanford Underground Research Facility at Homestake, is that of funding. According to a recent report by the Department of Energy that reviewed the proposed experiments, the total cost for the facility would likely come to around two billion dollars.

The three experiments the DOE is still considering would probe some of the most fundamental questions about the makeup of the

DOE continued on page 7

Selling Like Hotcakes

Photo by Nick Hammer/University of Maryland

Rebecca Thompson, head of public outreach at APS, hands out a free set of comic books to passers-by during preview night at the 2011 Comic-Con International comic book convention in San Diego, Calif. Over five days, the public outreach team gave out around 7,000 sets of physics-based comic books to conference attendees.

Members in the Media

"Of course we know those sectors are correlated anyway."

***H. Eugene Stanley**, Boston University, on using random-matrix theory to predict the ups and downs of the stock market,* The Wall Street Journal*, June 21, 2011*

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"The most exciting thing that has a good chance of happening is to discover particles of dark matter, which we know makes up five-sixths of the matter of the universe. It's not any of the particles described by the standard model. We can imagine various possibilities of what it might be, and many of those possibilities are things that would be created at the Large Hadron Collider."

***Steven Weinberg**, University of Texas at Austin,* Bloomberg*, June 28, 2011.*

"You can get images and maps that you overlay . . . and by doing that you start to re-create the composition of what is left from the original animals."

***Uwe Bergmann**, SLAC, on using a particle accelerator to figure out the color of fossilized birds and possibly dinosaurs,*The Philadelphia Inquirer*, July 1, 2011.*

"I've always tried to make physics come alive for my students... I believe it's much more important for them to remember the beauty of the discoveries than to focus on the complicated math –after all, most of them aren't going to become physicists."

***Walter Lewin**, MIT, from his new book* For the Love of Physics, *July 3, 2011.*

"By pouring paint in this continuous jet fashion or by dripping it, he incorporated physics into the process of painting itself."

***Andrzej Herczynski**, Boston College, on artist Jackson Pollock,* MSNBC.com*, July 3, 2011.*

"On Friday, scientists from the LHC presented their current results on the search for the Higgs boson at an international conference in Grenoble, France. While there is no discovery yet, it is clear its existence will either be proven or disproven in the near future."

***Paul Padley**, Rice University,* The Houston Chronicle *online, July 23, 2011.*

"No reputable scientist is going to tell you anything more than 'this is very, very interesting and we'll keep an eye on it.' But it is indeed very, very interesting."

***Donald Lincoln**, Fermilab, on new data from the LHC that hints the Higgs boson would be found at around 140 GeV,* MSNBC.com*, July 25, 2011.*

"That immediately gives you a time interval between the first two attacks…You take that, put it into the equation and it gives you an estimate."

***Neil Johnson**, University of Miami, describing how his method can take the timing of two terrorist attacks and predict when the next might occur,* National Public Radio*, July 31, 2011.*

News from the Journals

APS Redefines Length

In July, APS revised its system for calculating the length of a paper, no longer using the printed page as a standard unit. In an editorial published on the APS Journals website, Editor in Chief Gene Sprouse said "Technological changes have moved publishing to electronic-first publication where the print version has been relegated to simply another display mode...Therefore, in an effort to streamline the calculation of length, the APS journals will no longer use the printed page as the determining factor for length. Instead the journals will now use word counts (or word equivalents for tables, figures, and equations)."

Details of the new scheme are available online at http://publish.aps.org/authors/length-guide.

PRX Publishes First Papers

In early August, APS's new online-only open-access journal, *Physical Review X*, published its first five papers. In keeping with the broad scope of the new journal, the subject matter ranged from theoretical AMO physics to experimental applied physics/pharmaceutical research. More information about *PRX*, including submission guidelines and instructions, can be found at prx.aps.org

This Month in Physics History

August 15, 1758: Death of Pierre Bouguer

Photometry is a staple of astronomical techniques, particularly when determining the luminosity of certain celestial objects, such as variable stars, minor planets, active galactic nuclei, and supernovae. The so-called "father of photometry" was Pierre Bouguer, an 18th century French mathematician, astronomer and geophysicist, who made some of the earliest recorded measurements in photometry.

Bouguer's father was Jean Bouguer, a well-known hydrographer who authored a seminal treatise on navigation. Pierre was born in 1698, and it soon became apparent that he not only inherited his father's scientific gifts, but also was a bit of a prodigy. He had attained such a mastery in mathematics and hydrography by the age of 15, when his father died suddenly, that the teenager was appointed to succeed his father in his professorship at Croisic in Brittany.

Jean Bouguer

Like his father before him, Pierre Bouguer primarily applied his mathematical talents to questions of navigation, writing extensively on ship design, maneuvers, and navigation, including the derivation of a formula for calculating a measure of ship stability known as the metacentric radius. In fact, he beat out Leonhard Euler for the Grand Prix awarded by the French Academy of Sciences for his paper "On the Masting of Ships."

He went on to win the Grand Prix twice more, for papers on observing variations (magnetic declination) of a compass, and the altitude of stars, at sea. And in 1746, he published the first treatise specifically devoted to naval architecture, *Traite du Navire*, earning him the moniker "the father of naval architecture."

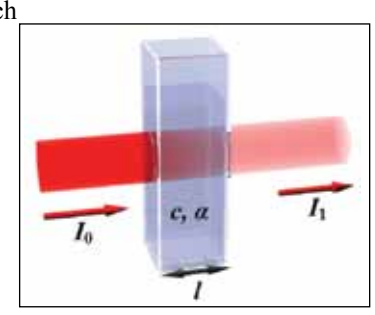

Diagram illustrating absorption of light according to the Bouguer-Lambert law.

Bouguer brought the same analytical skills to bear on his hobbies, one of which was photometry: the measurement of light in terms of its perceived brightness to the human eye. On November 23, 1725, he performed an experiment to compare the apparent brightness of the moon to a candle flame, hypothesizing that the human eye could detect whether two objects were the same brightness, even if it makes a rather poor light meter. With similar methods, he concluded that the sun's light was a good 300 times as intense as that of the moon.

Bouguer published a specific formula for relating the absorption of light to the properties of whatever medium through which the light is propagating in his 1729 paper., "Essay on the Gradation of Light." Bouguer's Law states that "In a medium of uniform transparency the light remaining in a collimated beam is an exponential function of the length of the path in the medium." For example, shine green laser light through a solution of Rhodamine 6B, and the beam intensity will become weaker as it passes through solution.

It is sometimes called Beer's Law, the Bouguer-Lambert law, or Lambert's law of absorption, due to confusion over attribution in the scientific literature. Johann Heinrich Lambert cited Bougeur's essays in one of his own papers in his treatise *Photometria*, published in 1760, and it has been mis-attributed as Lambert's original work. And in 1852, August Beer extended this exponential absorption law to incorporate the concentration of solutions in the absorption coefficient.

There are very specific prerequisites for Bouguer's law to be applicable. For instance, the absorbing medium must be homogenous and must not scatter radiation. Ideally the incident radiation should be monochromatic, or at the very least have a bandwidth narrower than that of the absorbing medium. And that same incident radiation must consist of parallel rays traveling the same length within the chosen medium.

When combined with the inverse square law, such photometric measurements can be used to determine the luminosity of a celestial object, provided the distance is already known, or can be inferred. Bouguer's law can also be used to describe the attenuation of solar radiation as it passes through the atmosphere, and to analyze polymer degradation and oxidation in infrared spectroscopy.

As impressive as Bouguer's work on photometry might be, it was his ten-year expedition to Peru with Charles Marie de la Condamine to measure the length of a degree of meridian at the equator that brought him the most contemporary fame. Along with another scientist, Louis Godin, they set sail in April 1935 and soon began to bicker, with Bouguer and la Condamine eventually going their separate ways and taking a different route than Goudin to their destination.

Even then, relations between the two remaining scientists were hardly smooth sailing. Six years in, Bouguer had the gall to point out a small error in the measurement they had made jointly the year before. He suggested they recheck their results. La Condamine balked at this, and he, too, split with Bouguer. All three of the scientists who set out together returned home by different routes. In 1749, Bouguer published a full account of the expedition in *La Figure de la Terre: Determinee par les Observations de Messieurs*.

He invented a heliometer, and his name is also associated with a meteorological phenomenon sometimes called "Bouguer's halo," more colloquially known as a "fog bow." It occurs when the sun breaks through the fog on a mountain, for example, forming a faint ring of light. (It is also known as Ulloa's halo, after the Spanish explorer Antonio de Ulloa.)

Bouguer died in Paris on August 15, 1758, but he left his mark not only on the law for absorption of light, but also on craters on the moon and Mars, two of which are named in his honor.

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Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: Budget and Authorization Environment

Fiscal Year 2012 Appropriations

As of the deadline for *APS News*, the House of Representatives had passed the Energy and Water Development (E&W) bill that funds DOE and completed full committee action on the Commerce, Justice, and Science (CJS) bill that funds NSF, NIST, and NASA. A summary of key elements of the action follows.

- *E&W Appropriations bill (HR 2354):* On July 15th the House passed H.R. 2354 by a vote of 219 (209 R, 10 D), to 196 (21 R, 175 D), providing $24.7B for DOE (-$850M relative to FY11), including $4.8B for the Office of Science (-$43M); $1.3B for Energy Efficiency and Renewable Energy [EERE] (-$491M); $733M for Nuclear Energy [NE] (+$8M); $477M for Fossil Energy (+$32M); $180M for ARPA-E (+$0); $10.6B for National Nuclear Security Administration [NNSA] (+$76M); and $4.9B for Defense Environmental Cleanup (-$42M). Rep. Holt D-NJ 12th) offered an amendment that would have restored the $43M cut from the Office of Science. The amendment failed, as did a series of amendments offered by Rep. McClintock (R- CA 4th) that would have stripped all funding from EERE and ARPA-E and reduced the Office of Science appropriation by an additional $820M.
- During the Appropriations Committee markup and subsequently during floor consideration, Rep. Schiff (D-CA 29th) offered an amendment shifting $10M from NE to NNSA in order to restart production of Pu-238 for NASA's deep space probes. It failed both times. The issue has emerged several times during the last three years because Pu-238 is in very short supply. It was originally produced as a byproduct of the nuclear weapons program and more recently obtained from excess Russian supplies. Neither source currently exists, and if the NNSA production program is not re-started, NASA will be unable to conduct future deep-space exploration. The issue is jurisdictional: the E&W chair and ranking member both argue the funding responsibility is entirely NASA's rather than equally shared by NNSA and NASA, as the White House argues.
- The E&W Subcommittee report also contains language of concern: (1) It cautions DOE against undertaking construction and management of the proposed Deep Underground Science and Engineering Laboratory (DUSEL) in South Dakota, although it provides $19M to keep the mine from flooding; (2) It also directs Basic Energy Sciences to create, "a performance ranking of all ongoing multi-year research projects…by comparing current performance with original project goals" and directs DOE to eliminate $25M by terminating the lowest ranked grants based solely on that criterion.
- *CJS Appropriations bill (No bill number assigned):* The House Appropriations Committee passed the CJS bill by voice vote on July 13th, providing $4.5B for NASA Science (-$431M); $701M for NIST (-$49M) and $6.9B for NSF (+$0). Within the NSF total, relative to FY11 the bill would increase Research and Related Activities by $43M, decrease Education and Human Resources by $26M and decrease Major Research Equipment Facilities and Construction by $17M.
- Of greatest concern to the science community should be the elimination of funding for the James Webb Space Telescope (JWST), the highest priority for astronomy and astrophysics. Rep. Wolf (R-VA 10th), chair of the House CJS Appropriations Subcommittee, alleged that NASA had "been hiding costs" associated with the telescope and cited an escalated $7.8B cost estimate provided by the Government Accountability Office. He also claimed that NASA had rushed its planning. In response, Sen. Mikulski (D-MD), chair of the Senate CJS Appropriations Subcommittee, reaffirmed her support for the JWST project, stating, "The Webb Telescope will lead to the kind of innovation and discovery that have made America great. It will inspire America's next generation of scientists and innovators that will have the new ideas that lead to the new jobs in our new economy. The Administration must step in and fight for the James Webb Telescope." Money for JWST could be restored at a later stage in the budget process, by either the full House or the Senate.

Thus far, the Senate has begun debate on only one appropriations bill: Military Construction. It is not expected to address the other eleven bills until after Congress returns from its August recess, virtually assuring a Continuing Resolution to take effect when the new fiscal year begins on October 1st.

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

ISSUE: POPA

A new Subcommittee on International Collaboration was proposed at the Panel's last meeting. The subcommittee would focus on including an international perspective on the many issues discussed within POPA. Opportunities to partner with other scientific societies in the global policy arena would be sought out. The Subcommittee on Energy & Environment is more fully researching a proposal for an educational component associated with the Direct Air Capture Technology Assessment. The Subcommittee on National Security will provide a full proposal for a workshop on issues related to nuclear weapons treaties at the Panel's next meeting.

Since early May 2011 there has been considerable activity associated with the Energy Critical Elements report; the study chair, Dr. Robert Jaffe, has presented the results of the study at Congressional hearings and in briefings with non-governmental organizations (see story and picture in the July *APS News*).

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

ISSUE: Media Update

The Kane County Chronicle (IL), a local newspaper that covers Rep. Randy Hultgren's district, published a story on June 3rd about his introduction of the Energy Critical Elements Advancement Act of 2011 (HR 2090). The legislation includes recommendations outlined in the APS Energy Critical Elements Report. They include information sharing, research and recycling.

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

Two Gold and Three Silver Medals for US Physics Olympic Team

By Mary Catherine Adams

The United States' physics Olympiad team is back in the US with gold and silver medals in hand. The team spent a week in Bangkok, Thailand, competing against almost 400 students from over 80 countries at the 42nd International Physics Olympiad.

Two of the 5 team members brought home gold medals: Ante Qu, a senior from West Windsor-Plainsboro High School South in Princeton Junction, N.J., and Brian Zhang, a senior from Henry M. Gunn High School in Palo Alto, Calif. Zhang also earned the eighth highest overall score in the competition. To take home a gold medal, a competitor must score 90 percent or better on the exams.

The remaining team members each brought home a silver medal: Lucy Chen, a senior from Ames High School in Ames, Iowa; Andrew Das Sarma, a senior from Montgomery Blair High School in Silver Spring, Md.; and Eric Spieglan, a junior from Naperville North High School, in Naperville, Ill. Das Sarma also earned the second highest score among the silver medal winners.

"We were pleased. We go to the competition hoping to do our best, and we try to instill healthy study habits to help students do that," Paul Stanley, the team's senior coach, said.

Gold, silver and bronze medals

OLYMPIC continued on page 5

East Coast, West Coast

Photo courtesy of Scripps Institution of Oceanography/UC San Diego

Photo courtesy of Benjamin Bederson

In May and June, APS presented two plaques as part of its historic sites initiative. The one in May honored the Davisson-Germer experiment, performed in 1927 at the then site of Bell Labs in lower Manhattan; and the one in June recognized the Keeling Curve describing the rise of carbon dioxide in the atmosphere, research that was done by Charles David Keeling at the Scripps Institution of Oceanography in San Diego.

In the top photo, the plaque at the Scripps Institution is admired by (l to r) Chair of the APS Historic Sites Committee Ben Bederson, Director of the Scripps Institution Tony Haymet, and APS President Barry Barish. In the bottom photo, APS Past President Curtis Callan (left) and President of Bell Labs Jeong Kim prepare to unveil the Davisson-Germer plaque (see inset). The former site of Bell Labs is now the Westbeth Artists Housing community, the largest artists' residency community in the world.

More information on the APS Historic Sites Initiative is available online at http://www.aps.org/programs/outreach/history/historicsites/ .

Women Take Less Advanced Physics in High School, Study Finds

A recent study found that while female representation in high school physics classes has almost reached parity with males overall, girls still remain underrepresented in advanced physics courses. The American Institute of Physics released a study in early July that showed that significant disparities between the sexes persist in AP course enrollment.

Between 1987 and 1997 the proportion of girls in high school physics classes increased from 40 percent to 47 percent, where it has remained fairly consistently since then. However, in AP classes, girls make up only 41 percent in Physics B and 32 percent of the Physics C classroom. This is an improvement compared to 1993, when girls made up 36 percent and 27 percent of the classes respectively.

The authors of the study looked at both those students enrolled in AP courses and those that took the corresponding AP tests. It found that other sciences and math tests generally had much higher rates of female participation. Only about 35 percent of the Physics B tests and 27 percent of the Physics C test are taken by girls. Comparatively, about 42 percent of Calculus BC tests, 46 percent of chemistry, 48 percent of Calculus AB, and 51 percent of statistics tests are taken by girls. Of the AP courses surveyed, only computer science had lower rates of female participation than physics. Overall, girls make up 54 percent of test-takers across all AP tests.

The report found also that girls were less likely than boys to take the AP test even if they were enrolled in the class. About 77 percent of the boys who took the Physics C course took the AP test, and about 56 percent received passing scores. However, only about 61 percent of girls enrolled in the course took the test and about 36 percent passed. The disparity was similar for the Physics B test as well. About 65 percent of boys took the test and 42 percent passed it, while only 50 percent of the enrolled girls took the test and about 25 percent passed.

Because the report only looked at the raw numbers of students enrolled in AP classes, it stopped short of specifying a clear reason for the disparity. "Mathematical rigor does not explain the low representation of females in AP phys-

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Letters

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

Top 20 American Physicists of 1903

In connection with the inquiry of Henry R. Lewis in the May issue, it seems inconsistent with the character and tone of APS journals that a listing of physicists in order of (presumed) merit would have appeared in one of its publications.

There was one such listing, of "leading men of science in the United States in 1903 arranged in order of distinction in each science," made in 1903 by J. McKeen Cattell, professor of psychology at Columbia, publishing entrepreneur, and leader in the movement for faculty free speech and participation in governance. It was published in the fifth edition of *American Men of Science* (1933). It might have been recalled to people's attention in the late 1940s by the appearance of Stephen S. Visher's "Scientists Starred, 1903-1943, in *American Men of Science*; a study of collegiate and doctoral training, birthplace, distribution, backgrounds, and developmental influences" (1947), which did publish the lists. The Visher book was reviewed in *Science* and *Nature*, though without mention of the lists, and there were perhaps reviews in other places.

Cattell recruited ten leading and representative physicists to make rank-ordered lists of twenty or more researchers, and then compiled the results. There are 154 names in all. The first twenty are (we give the names as Cattell gave them, but add institutional affiliation):

(1) Albert Abraham Michelson, Chicago;

(2) Carl Barus, Brown;

(3) Edward L. Nichols, Cornell;

(4) Arthur Gordon Webster, Clark;

(5) John Trowbridge, Harvard;

(6) M. I. Pupin, Columbia;

(Edward Williams Morley, Case–ranked second in chemistry, but would have been seventh in physics);

(7) Ernest Fox Nichols, Columbia;

(8) Samuel Pierpont Langley, Smithsonian;

(9) DeWitt Bristol Brace, Nebraska;

(10) Elihu Thomson, General Electric-Lynn;

(11) Robert Simpson Woodward, Columbia;

(12) Charles Proteus Steinmetz, General Electric-Schenectedy;

(13) Henry Smith Carhart, Michigan;

(14) Edwin H. Hall, Harvard;

(15) J. S. Ames, Johns Hopkins;

(16) Henry Crew, Northwestern;

(17) R. W. Wood, Johns Hopkins;

(18) F. L. O. Wadsworth, Allegheny Observatory;

(19) Benjamin Osgood Peirce, Harvard;

(20) Ernest Merritt, Cornell.

J. Willard Gibbs and Henry A. Rowland would surely have been at the top of the list with Michelson, but Rowland had died in 1901, and Gibbs in April of 1903. Cattell includes some cautions about taking the fine details too seriously, especially as one gets deeper into the list.

There are some electrical engineers on the list, and some inventors were also included, for example (23) Alexander Graham Bell, (28) Thomas Alva Edison, (65) Nikola Tesla. In both categories, Cattell says, they were included because of their contributions to physics.

One can find in the Cattell Papers in the Library of Congress strong evidence that the ten physics rankers were: Michelson, E. L. Nichols, Webster, E. F. Nichols, Thomson, Carhart, Ames, Wadsworth, William S. Franklin (24 on the list), and Wallace C. Sabine (27 on the list).

Cattell implies, in *American Men of Science*, fifth edition, that he has made, or was making, a similar list for 1932, but that it wouldn't be published for at least twenty years. That list, if it did get made, is not known to us.

Guy Emery and Alfred Fuchs
Brunswick, ME

Reducing Coal Use an Important Topic of Study

A great deal of the effort being spent on an endless debate about global warming could be better used. Many of the things proposed to deal with global warming would be desirable in any case.

One of the most important is reduced use of coal. In March, while the world was focused on the nuclear crisis in Japan, the US EPA released proposed new emission standards for toxic materials, including mercury, in coal emissions. The EPA estimated this change would prevent 15,000 deaths per year. Yet the proposed rules came under attack in a Congressional hearing this week.

With increasing use of coal power worldwide, in China and other countries without even the current US standards, the release of toxic materials into the environment should be a major concern. Even if emissions are controlled, one still has the problem of disposing of toxic coal ash.

I would hope that the new topical group on the physics of climate will enlarge its focus to study the broader issues involved in any energy policy.

Mary Beth Ruskai
Arlington, MA

Jack Marburger Remembered

Dear Friends and Colleagues,

You may have seen the very sad news from the APS Homepage noting the passing of John H. Marburger, or "Jack," as we all called him. Jack had many important positions and occasions in which he served the physics community. Perhaps some of you may remember him best as Director of Brookhaven Laboratory, or others may have known him more recently as President Bush's Science Advisor and Director of the White House Office of Science and Technology Policy (OSTP). Many of us have worked with him, and some of us have worked for him, and all of us must admire his dedication to science and his sense of duty and commitment.

While Jack's many professional accomplishments are highlighted on our webpage, I want to take this opportunity to talk about Jack on a more personal level, as his contributions transcend any job title or accolade–and his loss will be intimately felt by many of us. I had quite a few meetings with Jack over the years. I was always particularly impressed with his dedication and deep interest in science, and even more by his sensitivity to the human aspects of doing science.

Jack had been battling cancer for some time–defeating the pervasive drain on vigor and spirit that overwhelm many with such a disease, he was still able to carry out his high level responsibilities. He was a beloved husband, father, friend and mentor. While Jack was tall and robust, it was his enthusiasm, his dedication to service, and his open and affable nature, that made him a giant in the eyes of many who knew him.

Sometimes, there are simply no words to adequately acknowledge the loss of a truly good and honorable man. This is one of those times. And for that reason, I must conclude here, perhaps ineloquently, yet ever sincerely, expressing my deep sadness for his passing, and my utmost respect for his life.

Barry Barish
President, APS

Back Page Authors Respond to Comments on Women in Physics

Ed. Note: *In the July Letters column, there were a number of replies to the Back Page article by Marie-Claire Shanahan and Zahra Hazari on women in physics. (Both the article and the replies can be viewed online at www.aps.org/publications/apsnews.)Below, Shanahan and Hazari respond.*

Investigations into gender in science, and in physics in particular, are complex and often elicit differences of opinion. Our Back Page article in the June *APS News* brought several interesting responses from readers. One Physics PhD student expressed disappointment that this study did not address the voices of women on the physics faculty career path and the challenges they face. We were specifically interested, however, in an earlier stage of the physics career path: the transition between high school and undergraduate physics and trends that could be identified in students' high school experiences. The reader is correct in the assertion that female physicists do not necessarily pursue physics because they want to help others. However, for general populations of students at the primary, secondary, and undergraduate levels, the evidence overwhelmingly points to the fact that women (to a greater extent than men and more than other motivations) report wanting careers in which they can help others. We recognize, though, that overall trends do not capture every individual voice.

Another reader, Alvin M. Saperstein, asks about the possibility that this study addressed students too late and that differences in mathematics interest may be more important. In the full paper, on which this Back Page was based, we note the importance of confidence in mathematics and include it in our measure but also recognize that studies among younger students suggest that other factors are more predictive (e.g., Tai, Liu, Maltese & Fan, 2006). Our data also indicate that among students who reported wanting to be a physicist, females became interested during high school while many males became interested prior to high school. The dearth of early interest in physics supports the reader's concern that we need to reach more girls prior to high school, particularly since girls report fewer physics-related experiences, but at the same time disconfirms the supposition that high school is too late. High school physics teachers still have the opportunity to make a difference, even if they are in some ways working against the odds.

Finally, Karl D. Stephan suggests that our essay approached underrepresentation as a moral wrong, a position belying a radical individualist philosophy which would see exact proportional representation as the only option. While this may be his interpretation of our position, it was not the argument that we made. Our findings that science classroom practices impact identity in both male and female students and that simple discussion of representation seems to have particular influence on female students suggests that we are not yet in a position where all the women who would want to enter physics have necessarily had the opportunity to do so. The contemporary research indicates that young women's interest is mediated by external factors not related to physics itself, stemming instead from social ontologies (e.g. archetypes regarding what it means to be a physicist). Exact proportional representation is not necessarily the goal, but having girls turn away from physics studies because of social ontologies is a loss to physics and to girls themselves as they lose the opportunity to participate in a subject they may love.

We are grateful to the APS and its members for the opportunity to engage in these important discussions through an essay in the Back Page.

Fewer PhDs, Better Trained

"Women Face Slim Odds for Academic Careers" (July *APS News*) is one of the most honest letters I have ever read in this APS publication. It focuses on the sad stand of women in physics but it really brings to mind the sad situation of all PhD students. I agree with the author that most PhD students do want to stay in academia. The point that everybody agrees on is that there are no positions. That the odds are indeed "one-in-a-million" is a fact. This is an issue that is always overlooked.

I propose:

(1) The physics community should lobby for a reduction of the number of PhD students accepted by physics departments. Take the money saved with fewer PhD students and compensate the remaining number of PhDs better (pay and other educational benefits).

(2) Create an office within each PhD department that is responsible for career counseling. This should help students to plan the future.

It would be especially helpful for industry-bound students, suggesting classes in management and other industry-relevant topics. We should prepare entrepreneurs and not only good employees.

A. Christian Silva
Houston,TX

Individual Physicists Deserve Credit

I was disconcerted by the July "This Month in Physics History" column. Most of us at Fermilab were pleased at this recognition of an important piece of neutrino physics. The article was well written and in many ways comprehensive. The historical lead-in citing a number of important individual contributions to neutrino physics was accurate, interesting, and useful.

What was discouraging was the sense that the "Laboratory" had done the experiment. While laboratories facilitate experiments, they do not do them. People do experiments. Perhaps the problem here was that so many people from so many places contributed. Specifically the work of Japanese institutions working on emulsions was pivotal to the experiment. Six US and several other foreign universities made important contributions. Finally, real people from Fermilab such as Byron Lundberg and Regina Rameika were deeply involved for years on this experiment.

Generally, scientists working on an experiment deserve nearly as much citation as their predecessors.

Dick Carrigan
Batavia, IL

Letters (continued)

Lubell Column Brings Out Partisan Divide

Michael Lubell in his July Inside the Beltway column quotes some impressive statistics from the Pew Foundation that only 6% of the scientists they polled self-identify as Republican and 55% as Democrat. This correlates strongly with identification as conservative or liberal. He deplores this "instinctive distaste for Republicans," seeing it as an unreasonable and baseless prejudice.

The notable imbalance he reports may be based on an inescapable reality. Professionally and personally scientists need to be more dedicated and more sensitive to the pursuit of truth and the correction of error than would be to the self-interest of either the power and money hungry or the politician. That scientists tend to be more idealistic–and perhaps more public-spirited–than the general population is no surprise, nor is the correlation of those ideals with liberalism. The chain of correlations is tight, and it makes sense. Nobody doubts that the Republicans claim the banner of "conservative", nor that some Democrats claim that of "liberal". What Lubell deplores follows as a necessary part of what we are and what we do. We are a minority, and we contribute something special to society. We can be proud of our standards.

As scientists it is our business as it is our natural inclination to look toward facts and to question common perceptions and sloganeering. When Lubell tells us that the public "wants the federal government to begin to balance its books" it is worth remembering that Clinton and the Democrats left the treasury with a healthy surplus. What party was it that squandered it, and wants to insure that it will not be rebuilt?

Felix Smith
San Francisco, CA

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At Livermore Lab in the Fifties, Bill Newcomb and I shared an office. We would joke about the blind overwhelming distaste for Republicans that most physicists had, and ascribed it to their naive prejudices and their willful ignorance about politics. Michael Lubell's excellent column described just one instance of this.

It is the Republican Party, the party of Lincoln, Theodore Roosevelt, Eisenhower and Reagan, that can and will really help American science and technology, once the big government controlling Barack Obama is defeated in 2012. It is the Republican Party that can and will enact badly needed reforms in public high school mathematics and science education.

Howard D. Greyber
San Jose, CA

Song of the Tau Neutrino

I was reading the July "This Month in Physics History" (Fermilab Announces First Direct Evidence for Tau Neutrino) to my wife Alice, a sociologist and folk singer. When I got to "... particles passing through.." she burst into song:

Passing through, passing through,
Sometimes happy, sometimes blue,
Glad that I collided with you,
Tell the people that you saw
A muon neutrino change into a tau.

H. Richard Leuchtag
Bandera, TX

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released a draft of the proposed updates that broadened existing criteria to include advancing national security interests, increasing partnerships between academia and industry, improving US economic competitiveness and more explicitly calling for efforts to improve education and public outreach. The proposals can address all or some of these criteria, and can do so either through the research itself or through an ancillary program also funded by the grant.

In July, the task force asked for comments, and received 5,100 responses. The National Science Board is currently mulling over the suggestions it received before announcing final updates or changes to the policy.

"The scientific community has expressed a range of opinions about the Broader Impacts criterion. Most understand that this criterion helps to ensure that there is a connection between scientific research and society. However, many PIs and reviewers have asked NSF to provide clearer guidance about how they should address this criterion," Joanne Tornow of NSF, who is on the NSF's Merit Review taskforce, said in an email, "The Broader Impacts criterion helps to connect science and society, and leverages research investments more broadly."

Objections to the criteria range from concerns about defining science in the national interest, and that requiring scientists to engage in outreach can distract from research.

In early July, *Science* and *Nature* both ran items critical of the Broader Impacts criterion. In *Science,* a letter by Robert Frodeman and J. Britt Holbrook, both from the University of North Texas, said that requiring research to articulate the national importance of a project would impair "scientific creativity and autonomy." Similarly, *Nature's* columnist Daniel Sarewitz said that neither "project leaders nor peer-review panels are likely to have sufficient expertise to really understand a single project's capacity to connect to a persistent challenge such as increasing the nation's science literacy or economic competitiveness."

Also in early July, the four members of the APS presidential line sent Raymond Bowen, chairman of the National Science Board, an open letter outlining their concerns.

"We draw our inference from the directive contained in the revised criteria that NSF should align its research programs with a set of national goals that emphasize the worth of the envisioned applications of research rather than the worth of the scientific knowledge emanating from research," the letter read. It adds that all other federal agencies that support research support it in line with their own agency's mission, and the NSF should sponsor "scientific excellence wherever it leads."

Other scientists have criticized the Broader Impacts criterion for its requirement that grant recipients engage in outreach and education. Even some physicists who actively engage in outreach and education have said that it's a distraction from the core goal of conducting research.

"We should not discourage people from doing outreach, but requiring people to do outreach is just plain silly," said Lawrence Krauss of Arizona State University. "I think we should encourage it, but we should give carrots and not sticks."

Others have been more supportive of the policy, saying that outreach and education are important to encourage.

"I don't think it's a bad policy. I don't think it does any harm," said Chad Orzel a professor at Union College who has helped to review a number of NSF proposals, "A lot of the things it leads to are very uninspired, very standard outreach things. But I don't think that really hurts anything…There are a few that are doing something interesting or doing bigger outreach things than [they] would be otherwise. In that sense it's probably a good thing on balance."

The Task Force on Merit Review acknowledged the controversy in its charge to revaluate the program.

"Anecdotal evidence suggests that this requirement can be very confusing to the research community, which continues to express frustration in interpreting and thus responding effectively to the Broader Impacts criterion when creating a proposal," the task force's founding charge read. "[T]here appears to be substantial confusion about how best to meet the requirements of this criterion, whether on an individual project level or at the proposing institution level."

Despite the objections of some researchers, it seems unlikely that the NSF will strike the criterion outright. In all likelihood the NSF will issue clarifying guidelines similar to the draft issued in June of 2011.

John T. Bruer, President of the James S McDonnell Foundation and co-chair of the merit review taskforce, said at July's National Science Board meeting that "a significant proportion of the comments suggested eliminating the B.I. entirely. That's not possible."

OLYMPIC continued from page 3

were awarded to those competitors who scored at least 65 percent on their exams. Her Royal Highness Princess Maha Chakri Sirindhorn, a member of the royal family of Thailand, handed individual medals to around two hundred medal winners at the closing ceremony on the last day of the competition.

This year's Olympiad took place from July 10–17. The international physics competition for high school students first started in Eastern Europe in 1967 before it grew into a worldwide competition. The U.S. joined the competition in 1986 when three team members won bronze medals, the best debut of any participating team. Though the competition doesn't rank teams in terms of medal count, if they did, the U.S. would have tied for eleventh place this year.

At the competition, students face exams on a range of physics subjects, answering three theoretical exams and completing two laboratory experiments. This year's theory question topics included a three-body problem, charged soap bubbles, and Rutherford scattering. The first experiment question required the students to determine the shape of a capacitor and the second had them locating a ball inside a tube. Exams are administered in the students' native languages and all of the team coaches review the students' answers to calculate the winners.

The five members of the traveling team were guided by this year's coaches: Paul Stanley, the academic director and senior coach; Warren Turner, a senior coach and lab coach; Andrew Lin; Jia Jia Dong; Quizi Li; David Fallest; and Marianna Mao. Lin and Mao are both former gold medal winners from previous traveling teams.

The U.S. team is supported by the American Association of Physics Teachers (AAPT), the American Physical Society (APS) and the American Institute of Physics (AIP), along with almost a dozen other AIP member societies.

Photo courtesy of Paul Stanley/AAPT

Brian Zhang (left), Ante Qu, Andrew Das Sarma, Lucy Chen and Eric Spieglan represented the U.S. at the 2011 International Physics Olympiad in Bangkok, Thailand. Zhang and Qu both earned gold medals in the competition and Das Sarma, Chen and Spieglan each brought home silver medals.

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grant AIP received to help digitize the collection is to increase access to it. However because parts of the collection are now almost a century old, digitizing it will help preserve the collection.

"Folks have digital surrogates to look at so it reduces wear and tear on the collection," Mueller said.

Comprising of over 69,000 documents, the original hard copies took up over 39 linear feet of shelf space. Digitizing the huge trove of papers took nearly two years to fully scan and sort and was supported by the American Institute of Physics and the U.S. National Historical Publications and Records Commission, part of the National Archives.

Before the scanning process began, AIP spent about six months prepping the documents; smoothing out all of the sheets by hand and removing any attached fasteners. Once all the prep work was finished, they send out the collection one box at a time to their contractors. After each box returned, they visually checked each document one by one to make sure the scans worked properly.

"It took a lot of work," Mueller said. "It's very satisfying to have it done."

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ics," the report read. "The reasons for lower female participation in advanced high school physics remain unclear."

Women receive about 20 percent of bachelor's physics degrees, a rate that has been remained stagnant since the turn of the century. By comparison, women receive 40 percent of bachelor's degrees in biology, chemistry and math. The report identified a few possible sources for these disparities, including cultural pressures, problems with the curriculum and stereotyping, but did not identify any definitive cause.

"These and other questions can only be answered with research which actually asks students these questions. Because these questions remain unanswered, we can offer no simple solution for increasing women's participation in physics," the report read.

The report looked at the 2008-2009 academic year. The American Institute of Physics contacted a representative sample of 3,600 schools across the country to put together its report. The full report is available online at http://www.aip.org/statistics/trends/reports/hsfemales.pdf .

INTERNATIONAL News

...from the APS Office of International Affairs

The International Commission on Physics Education Celebrates 50+ Years

By Dean Zollman

Last year the International Commission for Physics Education, Commission 14 of the International Union of Pure and Applied Physics (IUPAP), celebrated the fiftieth anniversary of its founding. The concept of creating a commission devoted to physics teaching and learning was developed at an international conference in Paris. Thus, it was fitting that the 50th birthday party occurred at an international conference in France.

ICPE Chair Pratibha Jolly offers a piece of birthday cake celebrating ICPE's 50 years.

As described in two articles on the ICPE website, ICPE was founded by a group of physicists who saw a need for collaboration and cooperation related to the teaching and learning of physics at all levels of instruction. As with all of the commissions of IUPAP, ICPE seeks to foster cooperation and collaboration on issues related to research and development in the teaching and learning of physics. Of course, education systems are vastly diverse in different countries (and sometimes even in different regions within a country). However, research over many years has shown that physics instructors at all levels face many of the same challenges and can utilize many of the same solutions worldwide. In this article, I will discuss some of ICPE's approaches to international collaboration in physics education.

The international character of physics education research is very apparent in an area of research called conceptual change. As an example, we find that many students come to us with a somewhat Aristotelian world view–a constant force results in a constant velocity. Helping students to learn the limitation of this view, and to adopt a Newtonian view, is to change the students' conceptual view of nature. Reinders Duit at the Institut für Pädagogie der Naturwissenschaften in Kiel, Germany has created a bibliography on research concerning conceptual change. A quick glance at this bibliography (http://www.ipn.uni-kiel.de/aktuell/stcse/stcse.html) shows that the study of this topic and development of materials to address it are truly international.

Of course, differences between countries in teaching and learning do exist. For example, we see at the secondary level, differences in achievement on standardized tests such as The International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA). The meaning of these differences is discussed widely and is beyond the scope of this article. However, in spite of cultural differences and a variety of educational systems throughout the world, physics instructors and physics education researchers find a large number of common concerns and are frequently able to share results and instructional materials which are a benefit in many different situations.

Within physics education research, similarities of student learning and struggles with physics seem much more common than they are different. To encourage exchange of best practices, the Commission undertakes a variety of activities to encourage physics educators and physics education researchers to share their research, success and concerns through sponsoring an annual conference on a specific physics education theme. In 2010, the conference entailed a joint meeting with Groupe International de Recherche sur I'Enseignement de la Physique (GIREP) and the Multimedia in Physics Teaching and Learning Group (MPTL). Both GIREP and MPTL are international groups with a majority of their membership in Europe. The theme of the conference was "Teaching and Learning Physics Today: Challenges? Benefits?" and was held at the Université de Reims, Champagne Ardenne, Reims, France. A summary of the conference can be found in the Commission's newsletter which is available at http://web.phys.ksu.edu/icpe. This conference ended with a celebration of ICPE's fiftieth birthday.

The next conference, "Training Physics Teachers and Educational Networks", takes place in Mexico City, 15-19 August 2011. The co-sponsor for this conference is the Latin American Physics Education Network. The website is http://www.icpe2011.net.

Most of the ICPE conferences have had a format typical of physics conferences. Thus, they include plenary lectures and invited and contributed presentations. A somewhat different format is being envisioned for the World Conference on Physics Education (http://www.wcpe2012.org/) which will be held in Istanbul, 1-6 July 2012. ICPE and GIREP are the primary sponsors of this conference and the American Association of Physics Teachers Executive Board has endorsed it. Other physics education organizations are expected to be involved as well. Rather than just including presentations and workshops, this conference will focus on identifying common interests in physics education research and development.

The format of the conference mentioned above will be modeled on the education strand of the World Conference on Physics and Sustainable Development (WCPSD; http://www.wcpsd.org/) that was held in Durban, South Africa in 2005. During the 2005 WCPSD, one of the working groups of the education strand noted that many of the instructional innovations which are based on physics education research had not had wide dissemination and implementation in developing countries. The working group proposed establishing a series of workshops which could provide hands-on experiences for physics faculty in these countries. In 2009, three members of ICPE (Pratibha Jolly, Elena Sassi and Dean Zollman) working with Priscilla Laws created the first such workshop. PHYSWARE: A Collaborative Workshop to Promote Physics Teaching and Learning in the Developing World was held at the International Centre for Theoretical Physics (ICTP). Support for the workshop came from a variety of sources including follow-up funds from the World Conference, ICTP and APS. Thirty-two faculty from Africa, Asia and South America participated and agreed to further disseminate the ideas of the workshop in their home regions. More information can be found in the *International Newsletter on Physics Education* and at the website for the workshop at http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a07137. This workshop was conceived to be the first in a series of such workshops on physics pedagogy for university faculty in developing countries. Present plans are to hold a regional PHYSWARE workshop in Delhi, India, in the autumn of 2011.

Using this model, we anticipate that the 2012 World Conference on Physics Education will

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I will do my best, and my friends tell me that I seem to like this kind of challenge."

In addition to his position at Stanford, Beasley sits on the boards of several international scientific collaborations. He said he hopes to help APS and its journals adapt to the changing publishing landscape and encourage more international scientific collaborations.

"Historically, the APS has done an exemplary job in fulfilling this role and continues to do so. But the changes facing science these days are so profound and so rapid that a special effort is required. As an officer of the APS, I would work to bring the best talent among us to address these issues and adapt wisely. More specifically, we need to continue to tend to the financial health of physics by informing Congress and the public at large of the role that physics plays and can yet play in the nation's security and economic future, but also its cultural heritage," Beasley said in his candidate statement.

Suzor-Weiner is currently the Counselor for Science and Technology at the French Embassy in Washington D.C. She came to the United States after teaching at the Université Paris-Sud in Orsay, France since 1987. There she was promoted to the highest rank of professor in 2005 and served as its vice-president for international affairs. She was also the vice president of the International Union for Pure and Applied Physics from 2005 through 2008.

"I did not expect it, but I am grateful to the APS members who allow me to work more closely with APS," Suzor-Weiner said. "Since my year in Chicago as a postdoc with Ugo Fano, and then as visiting scientist at NIST with Fred Mies, I have had many fruitful collaborations with American physicists and I am more than happy if I can help in any way to strengthen the role of physics on the American and international scenes."

She said that she hoped to further international collaborations between APS and other physical societies around the world. She emphasized the need to work with both European nations where the United States has a long history of collaborating with, but also with burgeoning societies in the developing world such as ones in Haiti, Africa and Vietnam.

"Physics in general needs to continue attracting the brightest students, since the human potential is the primary factor of success and progress," Suzor-Weiner said. "On a broader scale, physicists need to join all other sciences, including social sciences, to answer the global challenges of our time, namely energy, environment, climate change and health. These domains have in common the characteristics to be transdisciplinary, as well as global. Yet physics must play its specific role, with well trained specialists and enough budget to meet the challenges."

Keivan Stassun is an observational astrophysicist at Vanderbilt University, focusing on the formation of stars, brown dwarfs, and exoplanets. In 2007 he served as the first chair of the Vanderbilt Initiative in Data-intensive Astrophysics, a program to make the university one of the world leaders in the fields of astrophysics. He is also chair of the Sloan Digital Sky Survey's exoplanet science team and a member of the Large Synoptic Survey Telescope executive committee. He participated in the National Research Council's 2010 Decadal Survey of Astronomy and Astrophysics.

"I've never been entirely sure whether to think of myself as an astronomer or as a physicist. Being elected to the APS Council suggests that the wave function has collapsed," Stassun said.

When asked what he hoped to accomplish as a general councilor, he at first quipped that he wanted APS to sponsor National Talk Like a Physicist Day.

"Seriously, I think two important issues are what you might call 'big data' and 'big diversity.' As a profession we need to begin deliberately preparing the future leaders of our field for the data-intensive revolution that is already underway. At the same time, we must make a renewed, high-level, concerted effort to recruit, train, and retain a truly diverse next generation of professional physicists. For too long physics has been the least diverse of all the sciences. With thought and care and dedication, we can change this. Shame on us if we don't," Stassun said.

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Initially Kokabee's family had wanted to keep the matter quiet so as not to provoke the Iranian government.

"There's no rational reason for his arrest. He's not a political person," said John Keto, the advisor for graduate students at the University of Texas at Austin. "He was a serious dedicated scientist who was mostly interest in his science."

The trial for Kokabee was originally slated for July 15th, but was unexpectedly postponed.

Kokabee first tried coming to the United States to pursue his masters degree a few years ago, but he could not secure a visa to travel to the country as a student. Instead he received his masters at the Universitat Politecnica de Catalunya in Spain then enrolled in the University of Texas at Austin's PhD program after a concerted effort on the part of the university. Keto described Kokabee as a "remarkable" student, who had already produced a number of scientific papers and traveled to many conferences across Europe.

The arrest has also worried other Iranian students studying in the United States. "The Iranian students are very concerned about whether they should ever go home again," Keto said.

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universe. The experiments would look to directly detect dark matter through a third-generation dark matter detector, attempt to determine if a neutrino is its own antiparticle by looking for neutrinoless double beta decays, and hunt for evidence of CP violations in neutrino oscillations.

The DOE report looked at multiple construction options for the deployment of these experiments. Possible plans ranged from locating all of the experiments as deep as 7,400 feet underground, 4,850 feet or as shallow as 800 feet, installing different experiments at different levels, or building some of them in existing labs in other parts of the world.

"We were asked to evaluate what it would take if the DOE wanted to do the three experiments at what would be DUSEL," said study chair Jay Marx of Caltech and executive director of LIGO. He added that they were charged "just to gather information and evaluate the cost, the time scale and the technical risks."

The report concluded that if the experiments were to be located in the South Dakota mine, bundling the experiments on the same underground level would save a lot of money because they could share infrastructure such as electricity, utilities and mine shafts. It also found that while dollar for dollar it would likely be cheapest to locate the dark matter experiment or double beta decay experiments in Ontario's SNOLAB, there are other less tangible benefits for basing the experiments in the United States.

"Locating the facility in the US would help to promote US leadership in these fields for the foreseeable future," the report read.

The Long Baseline Neutrino Experiment is the focus of much scrutiny. While the dark matter and double beta decay experiments could conceivably be located at a different facility, the neutrino experiment is bound to Homestake because it relies on a stream of neutrinos from Fermilab.

The design of the neutrino detector is still up in the air. The two competing designs would use either a water Cherenkov detector or a liquid argon-based detector. Water detectors are a long established technology for detecting neutrinos, while liquid argon is much newer and unproven. The report was largely critical of the proposed liquid argon detectors. If the liquid argon technology did prove to work, the report said it would still take a substantial amount of funding until at least 2015 to complete the necessary research and development to create the detectors.

The DOE report is complemented by a second study, done by the National Research Council (NRC), that came out at about the same time. "In our view, the LBNE, the long baseline neutrino experiment, is somewhat special," said Andrew Lankford of the University of California, Irvine, who chaired the NRC study. "It's not saying that it's more important than the others, but it's made special because there's an intense neutrino source at Fermilab."

The NRC's report found that the three proposed experiments were a "top priority" and recommended that the experiments be pursued.

"Our first conclusion was that there were three extremely important experiments that we thought were of the utmost importance," Lankford said. He added also that the NRC report and the DOE reports looked at different aspects of the planning of the lab. "They're very complementary. Ours is to focus on the science assessments and the other issues that I call programmatic, while theirs focuses primarily on cost and technical issues."

William Brinkman, the head of the DOE's Office of Science, has said that he wants to go forward with the proposed experiments. However, what final form they may take is up in the air because of continued budget uncertainties. Whatever final budget is passed for the department will determine how the facility will ultimately be built.

"I am optimistic about things coming together," said Kevin Lesko of the University of California Berkeley and DUSEL principal investigator. "I'm optimistic we have all the elements on hand to help the DOE decide how they want to go forward with the facility."

Lesko added that despite the unexpected handoff, having the Department of Energy take over the operations of the facility wasn't a bad thing because it has considerable experience running large national labs. "It's a more natural role for the DOE to run such a facility."

The Homestake Mine in Lead South Dakota is a sprawling web of underground chambers and tunnels at depths up to 8,000 feet. When the mine shut down in 2002, it was the largest and deepest mine in the country. After the shut down, water began flooding the lowest levels. Congress appropriated $15 million in funding to keep pumps running to keep upper levels dry and viable for any future science experiments.

"The science is absolutely first rate. The idea of putting things in the same place to share infrastructure and share intellectual excitement makes sense. It might not make sense for the biological or geological sciences because they have an interest in variability," said Marvin Marshak of University of Minnesota, who founded the underground laboratory at the Soudan mine in Minnesota. "For the physics, which is really more interested in the experiments than characterizing the site, it makes a lot of sense."

APS News reported on the NSF pullout in the January issue, and featured a Back Page on DUSEL/SURF by Kevin Lesko in the July issue. (both available online at www.aps.org/publications/apsnews.)

Change to APS Bylaws

At its meeting in April, Council approved a change to the Bylaws consisting of a new article concerning APS Public Policy Statements. The text of that article follows. At its upcoming November meeting, Council will hold a second vote, and if approved with a 2/3 majority, the new article will become part of the Bylaws.

ARTICLE XVI

APS PUBLIC POLICY STATEMENTS

A. Introduction

Article IV Section 2f of the APS Constitution authorizes the APS Council to review public policy statements issued by the Society. The processes by which statements are drafted and approved are described herein. The APS recognizes three approval processes:

1) The Normal process results in a statement to be designated as a **Public Policy Statement of the American Physical Society** ("APS Statement" or "APS Public Policy Statement".)

2) The Expedited process results in a statement to be designated as an **American Physical Society Executive Board Statement** ("APS Executive Board Statement".)

3) The APS unit process results in a statement to be designated as an **American Physical Society Unit Statement** ("Unit Statement".)

B. Procedure for Issuing Public Policy Statements:

1. Initiation

Any APS member in good standing, group of members, or APS unit may submit a proposal to POPA for a Statement. POPA will consider those proposals which meet the POPA Guidelines for Submission of APS Statements. If a decision is made not to proceed with drafting a Statement, POPA will convey its decision to those who submitted the proposal.

2. Statement Drafting

POPA has exclusive responsibility for drafting Statements. The Chair of POPA has the responsibility for ensuring that the Statement draft incorporates appropriate APS member expertise. Members with conflicts of interest should not participate in Statement drafting or approval (see section E below). PPC input to the draft statement will be solicited as described in Article III, Section b7 of the APS bylaws.

Upon POPA approval, the draft shall be sent to Council members for comment. The Executive Board will vote on the proposed statement, taking into consideration the comments from Council members. Should the Executive Board not approve the draft, the Executive Board will provide POPA with a written list of concerns, and POPA may redraft and resubmit the statement to the Executive Board. A second disapproval shall terminate the process. Executive Board approval leads to a Membership review.

3. Membership Review

Upon Executive Board approval, the APS Executive Officer shall actively solicit comments from the entire Membership. Members shall have a minimum of 30 days to provide comments. At the end of the comment period, all comments will be made available to POPA, appropriate APS staff, the Executive Board, and the Council.

If POPA determines that member comments justify modification or rejection of the draft statement, POPA will transmit its recommendation to the Executive Board in the form of a POPA-approved redraft or a letter that the statement process should be terminated. POPA, with the help of the APS Executive Officer and staff, will provide the Executive Board with a verbal synopsis of member comments and the impact of those comments on the statement.

The Executive Board shall determine if Member comments have been adequately addressed and if the statement is ready for Council approval. Two denials by the Executive Board subsequent to membership review terminate the process. At no time may the Executive Board edit or redraft the statement.

4. Council Approval

POPA will present the verbal synopsis described in B-3 to the Council. The synopsis and subsequent discussion will be reflected in the minutes of the Council meeting. If the Council approves the statement, it is deemed ready for publication.

If the Council does not approve the statement, it shall be sent back to POPA with a written list of concerns. POPA may edit the draft and return it to the Executive Board and the Council or terminate the statement process.

A second denial by the Council normally terminates the process. At no time may Council edit or redraft the statement.

5. Publication

The APS Executive Officer shall publish and distribute duly approved statements, at a minimum informing APS unit officers and announcing the statement in the *APS News* and/or the APS website.

6. Archiving

Statements of the American Physical Society are subject to review on the 5th anniversary of issuance or renewal, or earlier at the discretion of POPA or the Council. POPA will provide a recommendation to the Council, and the Council will vote to either renew or archive the statement.

C. Procedure for Issuing Executive Board Statements

In accordance with Article 6 section d of the Constitution, The Executive Board or Presidential Line (President, President Elect, Vice President, and Immediate Past President) may determine that it is in the interest of the American Physical Society to issue a public policy statement in an expedited manner. Expedited statements shall be designated as Executive Board Statements.

1. Drafting

The Executive Board or Presidential Line shall draft the statement.

2. POPA review

The POPA steering committee shall review the draft statement and solicit comments from the PPC and the APS Office of Public Affairs. The POPA steering committee may edit the draft before returning it to the Executive Board for final approval.

3. Executive Board Approval

The Executive Board shall review the draft statement and any comments from the PPC and Office of Public Affairs. Additional edits to the draft require POPA steering committee approval. Upon final Executive Board approval, the Executive Board Statement is distributed by the APS Executive Officer and passed to POPA to determine if the Normal Procedure (outlined in ARTICLE XVI, Section B) should be initiated to turn the statement into an APS Public Policy Statement.

4. Publication

The APS Executive Officer shall publish and distribute the Executive Board Statement, at a minimum informing APS unit officers and announcing the statement in the *APS News* and/or APS website.

5. Sunset

Executive Board Statements will be archived after one year and are not renewable. An Executive Board Statement may become an APS Public Policy Statement if the Normal Procedure (outlined in ARTICLE XVI, Paragraph B) is followed.

D. Procedure for Issuing Unit Statements

1. Guidelines

Units will establish guidelines for issuing their own policy statements ("Unit Statements"). Units will take into consideration the impact of the statement on the Society and the physics community and evaluate whether or not it is within the area of expertise of the unit's members. Unit Statements must not be in conflict with statements of other units or the APS as a whole. Unit Statements will clearly denote that the statement does not necessarily represent the position of the APS as a whole.

2. Process

Units will establish their own process for drafting, approving, publishing and periodically reviewing and archiving their unit's statements. At a minimum, this process will require the unit to solicit comments from unit members and input from the PPC and Office of Public Affairs, and to consider possible conflicts with other APS unit statements. Units must have a process incorporated into their bylaws before they may issue statements.

3. Concurrence

The Unit Statement, along with a plan for publicizing the Unit Statement and summaries of comments from unit members, the PPC, and the Office of Public Affairs, will be sent to the POPA steering committee for comments and to the Executive Board for review. Concurrence is required from the Executive Board prior to publication of any Unit Statement.

E. Conflict of Interest

Conflict of Interest is defined as "any financial or other interest which conflicts with the service of the individual because it (1) could significantly impair the individual's objectivity or (2) could create an unfair competitive advantage for any person or organization."[1] Anyone, particularly POPA and Council members, who can reasonably be perceived to have a conflict of interest, shall recuse themselves from all aspects of the Statement process, including drafting, commentary, and voting. The President of the APS shall be the final arbiter of potential conflicts of interest.

[1] National Academies of Science, Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports (May 12, 2003.)

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encourage collaborations which will continue after the conference in much the same way that the PHYSWARE Workshops developed in Durban have continued beyond the 2005 WCPSD. The Commission and GIREP anticipate holding such a conference once every four years.

Over the past 20 plus years, physics education has emerged as one of the areas of research and development that has a home in many physics departments. This emergence has provided an increased need to pay attention to the international nature of this sub-discipline of physics. Thus, after 51 years since its founding, the International Commission for Physics Education continues to be active and vital to the improvement of physics teaching-learning worldwide and to the goals of the physics community.

Dean Zollman is University Distinguished Professor at Kansas State University and Secretary of IUPAP's Commission on Physics Education.

The Back Page

Developing a National Innovation Strategy

By Rush Holt

For most of the last 150 years, America's leadership in science, technology, engineering, and innovation was unquestionable. Our nation invented the light bulb, the telephone, the Model T, the personal computer, and the Internet. We discovered penicillin, abolished polio, and helped to rid the world of smallpox. America's capacity for innovation was not only the envy of the world; it was also the driving force behind the world's economic progress, helping to lift billions of people out of poverty. The sky seemed to be our limit–and, as Neil Armstrong proved in 1969, even that limit could be breached.

So what changed?

There is no doubt that America remains capable of extraordinary innovation. We are still the nation of Google and Facebook, of the iPhone and the Chevy Volt. Yet we are no longer the world's unquestioned leader. In 2009, the Information Technology and Innovation Foundation found that five other nations had pulled ahead of the U.S. in overall innovation and competitiveness–and we are falling further behind. Over the last decade, every one of these competitors has improved its innovation capacity faster than America has.

I suppose we should be heartened that other nations are making their own strides forward in science and technology. If a scientist in China were to cure AIDS tomorrow, it would be not merely a victory for the Chinese people; it would be a victory for all mankind. Yet America must not be content to piggyback on other countries' inventions. We have never accepted dependency. We have been proud of our status as a world leader, and we can still be the world's engine of economic and social advancement.

In 2005, the National Academies laid out the problems facing America's future competitiveness in an influential report titled *Rising Above the Gathering Storm*. The report described a nation at risk of falling behind our competitors: not educating our children in science, technology, engineering, and mathematics; not inventing at the same pace as other nations; and not producing new jobs in high-technology fields. The report was a call to action, and for a brief moment, it captured the attention of scientists, economists, think tank experts, government officials, and lawmakers.

And then the moment passed. Despite the attention devoted to the *Gathering Storm* report, most of the goals it laid out remain unaccomplished. The problems it described remain unresolved–in many cases, even unaddressed.

Yes, America has made some halting progress. Most notably, Congress passed the America COMPETES Act, which authorized a doubling of the budgets at many of our key science agencies. The same law created the Advanced Research Projects Agency–Energy (ARPA-E), a new program at the U.S. Department of Energy intended to identify and fund transformative energy research. The law also established a handful of new science, technology, engineering, and mathematics education programs, which have had varying degrees of success.

Yet although the COMPETES Act laid the groundwork for a new era of investment in science and research, that groundwork remains mostly bare. The law envisioned a doubling of science budgets, yet Congress has appropriated far less money than was authorized. ARPA-E received its first block of funding in the 2009 Recovery Act, yet Tea Party members of Congress are now calling for the agency's elimination. Some are even calling for the elimination of the entire Department of Energy. The COMPETES Act passed the House by a vote of 367 to 57 in 2007, yet in 2010, the House of Representatives needed three separate tries to reauthorize the law, and the final vote was far closer and more partisan.

The U.S. response to the *Gathering Storm* report was, in other words, uncertain and insufficient. The inadequacy of our efforts was recently laid out in the National Academies' five-year follow-up report. The Committee unanimously concluded that, since the issuance of the original report, "our nation's outlook has worsened"–and that the "*Gathering Storm* increasingly appears to be a Category 5."

How have other nations succeeded while America has stagnated? That question has no single answer, but one fact is telling. Each of the five nations ranked by the Information Technology and Innovation Foundation as "out-competing" the U.S. has implemented a national competitiveness or innovation strategy: that is, a unified plan to marshal their governmental and private resources to support new technologies and ideas. Worldwide, at least 30 countries have established their own competitiveness plans. Yet the U.S.–alone among the world's technological leaders–has failed to draw up a roadmap for innovation. Is it any wonder that, with no clear view of our destination, America has failed to make strides in the right direction?

During the most recent Congressional debate on the COMPETES Act reauthorization, I worked to address this shortcoming. I successfully offered an amendment requiring the White House Office of Science and Technology Policy to submit to Congress a comprehensive national competitiveness and innovation strategy. Further, the Secretary of Commerce must complete a National Competitive and Innovation study by early 2012, laying out recommendations on how America should invest in human capital, facilitate entrepreneurship and innovation, provide federal support for locally and regionally driven innovation, strengthen the economic infrastructure and industrial base of the United States, and improve the international competitiveness of the United States.

My amendment was included in the law signed by the President, and America is finally on course to implement a national innovation strategy. That's the good news. The bad news is that Congress has not demonstrated a willingness to make the investments necessary to implement such a wide-ranging, audacious plan. Too many members of Congress, obsessed with cutting the size of government, are hostile to the funding required to sustain America's leadership in science and technology. Despite evidence that investment in science can create jobs, these members have sought at every opportunity to slash funding for research, education, and infrastructure.

For example, the 2011 budget eliminated the summer Pell program I helped establish to support students who work while earning a college degree. The 2011 budget also eliminated 19 elementary and secondary education programs, including Even Start, Striving Readers, School Libraries, National Writing Project, and Reading Is Fundamental. The 2011 spending bill also reduced funding for Department of Energy research programs and loan guarantees that are critical for the development of sustainable energy technologies.

More evidence of Congress' skewed priorities can be seen in the debate over the nation's budget for Fiscal Year 2012. The House recently passed a bill that would slash funding for the Department of Energy Office of Science to $800 million below the levels envisioned in the COMPETES Act. During debate on the bill, I offered an amendment to restore at least a portion of that funding so the Office might maintain its ongoing operations. My amendment was defeated.

Now is not the time to be slashing federal investment in research and development in science. Investments in our federal science agencies and our national innovation infrastructure are minimal down-payments on our country's security, public health, and economic vitality that we cannot afford to postpone.

The hostility to scientific research extends unfortunately beyond direct federal funding. The new majority in Congress has also sought to repeal regulations that support energy efficiency and innovation. For example, in early July, the House of Representatives held a surreal debate on the so-called Better Use of Light Bulbs (BULB) Act. The BULB Act had one purpose: to repeal energy efficiency standards that had been enacted with bipartisan support in 2007 and signed into law by President Bush, requiring that new light bulbs use about 25 percent less energy than traditional incandescent light bulbs. (Most undergraduate physics students probably know that 90 percent of the energy from incandescent bulbs is wasted as heat.)

Opponents of these efficiency standards launched an all-out, unscientific attack, using rhetoric that bordered on the absurd. *The Wall Street Journal*, in a blistering op-ed that railed against the "light bulb police," falsely claimed that "Washington will effectively ban the sale of conventional incandescent light bulbs." This was, of course, untrue. No type of light bulb was banned. No consumers were forced to use one type of light bulb over another type. The new standards simply required that light bulbs be more efficient. As policy makers had expected and intended, lighting companies reacted to the 2007 standards by investing appropriate resources in research and development, producing for the consumer market new, more energy-efficient incandescent bulbs, as well as a variety of even more efficient fluorescent and LED lighting technologies.

The rhetoric surrounding the BULB Act is especially troubling because, if it continues unchecked, it could undermine America's tradition of supporting innovation by setting technological standards. That tradition dates back at least to 1838, when Congress first mandated regular inspections of steamboat boilers, which until then had caused frequent, deadly explosions. Since 1978, Congress has required auto manufacturers to meet fuel economy standards, leading to a near-doubling of the fuel efficiency of new automobiles. (Allan Hoffman, who was an APS Congressional Fellow in the 1970s, was instrumental in drafting this law.) Congress also has required manufacturers to create new, more energy-efficient refrigerators, air conditioners, and other appliances. If the BULB Act's proponents have their way, Congress could lose this important tool for promoting innovation.

Unfortunately, after some legislative wrangling, the U.S. House of Representatives adopted the language of the BULB Act. The legal status of the new energy efficiency standards is now in flux, creating expensive uncertainty in the lighting industry.

Yet there is hope that science and innovation may yet win the day on Capitol Hill. The President's proposed budget for fiscal year 2012 recognizes the need to support innovation. Even though the budget's overall spending is frozen at 2010 levels, it reflects a strategic decision to focus resources on the nation's innovation infrastructure, especially basic research agencies. Despite the House's hostility to the president's vision, the budget for Fiscal Year 2012 is not final. There is still time for both chambers of Congress to support innovation.

In the longer term, the White House's new innovation and competitiveness strategy will lay out, as required in the COMPETES Act, a path for future progress. The President and federal agencies are also working to create regulatory certainty so that manufacturers and inventors can make the long-term investments necessary for real innovation.

Thanks to these developments, and in spite of the "gathering storm," I remain hopeful. We must not forget that, although the 20th century is now remembered as the era of American innovation, it was also a time of missteps and misfortune. At any of the turbulent moments, Americans might reasonably have wondered whether our country would remain a global leader in science and innovation. Yet America always continued to lead, and when we look back on the last century, we barely remember our nation's tribulations and stumbles. We remember our successes, our breakthroughs, our giant leaps.

America has more giant leaps to come.

APS Fellow Rush Holt (D-NJ) is currently the only physicist serving in Congress. He has represented New Jersey's 12th district in the House of Representatives since 1999.