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Physicist in the Running for Congress
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Michael Turner Elected Next APS Vice-President

APS members have elected Michael Turner, current Director of the Kavli Institute for Cosmological Physics at The University of Chicago, as the Society's next vice-President. As the newest member of the presidential line, Turner will become APS President in 2013.

By a decisive margin, the voters also adopted an amendment to the APS constitution establishing four permanent international councilors. In addition, Pierre Meystre of the University of Arizona and Haiyan Gao of Duke were elected as general councilors. Lars Bildsten from the Kavli Institute for Theoretical Physics at the University of California Santa Barbara was elected Chair-elect of the Nominating Committee.

Turner assumes office in January of next year, replacing Robert Byer of Stanford, who moves up to become President-elect. At the same time, current President-elect Barry Barish of Caltech will succeed Curtis Callan of Princeton as APS President. Callan will remain on the APS Council and Executive Board as past-President.

Turner has been a faculty member at the University of Chicago since 1980. With training in general relativity and particle physics, Turner received his PhD from Stanford University. There, he began to explore the connections between particle physics and astrophysics and cosmology. In 1983, he and Edward W. (Rocky) Kolb created the Theoretical Astrophysics group at Fermilab. Turner also is the recipient of an honorary doctorate from Michigan State University.

Michael Turner

From 2003 to 2006 Turner led the Directorate for Mathematical and Physical Sciences at the National Science Foundation, and from 2006 to 2008 he was Chief Scientist of the Argonne National Laboratory. Currently, Turner is the Chairman of the Board of the Aspen Center for Physics, a member of the NRC's Board on Physics and Astronomy and of the Governing Board of the NAS, and a Director of the Fermi Research Alliance, which manages Fermilab for the Department of Energy.

"I am pleased, honored and humbled," Turner said, "The APS is the premier physics organization in the world, and I am honored that my colleagues think me worthy of this important position. That being said, I suddenly have the realization that I have my work cut out for me for the next four years."

Turner added that he plans on focusing on a variety of issues during his tenure. He said that he especially wanted to emphasize the importance of making physics an exciting and rewarding career for young people, and to ensure that the APS continues to be a strong advocate for basic research not just in physics, but for science as a whole. He also wants to look at ways to improve workforce diversity in the field of physics and continue to emphasize the importance of science to the public.

"The scientific opportunities to-

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Plans Afoot for Topical Group On the Physics of Climate

During the summer, APS received two independent requests for the formation of a topical group focusing on the physics of climate. One was presented by APS Fellow Roger Cohen, who had privately circulated a petition to that effect and obtained the 200 member signatures needed to bring it to Council. The other came as an initiative of Council itself, which at its April meeting had authorized APS President Curtis Callan to poll the membership on their support for such a group; an email petition sent by him to the members of DCP, DBP, DCOMP, DAMOP and DFD in early August quickly received almost 800 signatures.

"It's clear that there is a great deal of enthusiasm among the APS membership for the formation of a topical group on the physics of climate," said Kate Kirby, APS Executive Officer. "There are a number of opportunities for the physics community to make substantial contributions to science in this area."

Although the language of the two petitions differs in detail, with the Callan proposal defining the scope as the physics of "climate and the environment", and the Cohen petition emphasizing that the topical group should not be concerned with "matters of policy, legislation and regulation", both expressed a common goal (quoting the Cohen petition) of providing "a mechanism for physicists … to learn about and exchange views on the science, and to generally advance the physical understanding, of terrestrial climate.". Since Council would certainly not approve two separate topical groups on this topic, the leadership decided that it would be best to attempt to form a "joint" topical group, focusing just on the physics issues inherent in climate science. According to Callan "We wanted to address what is obviously the core concern of our members. I also have no problem with leaving the policy issues for another venue: the science is challenging enough, and worthy of our undivided attention."

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Member Input Needed for Historic Sites

The committee in charge of the APS Historic Sites initiative is reaching out to the membership and asking for future site recommendations. In doing so, the members of the committee hope to broaden their pool of potential sites to include places they may not have otherwise considered.

The initiative, started in 2005, aims to raise public awareness of the importance of physics by commemorating important people and landmarks. Already they have dedicated plaques at 19 sites across the country, with two more scheduled to be installed by the end of this year.

"The basic idea is that physics is probably as important as anything that has ever happened in American history, and people really don't understand it," said committee chair Ben Bederson, adding the aim was also, "to educate the public of what physics has accomplished in America and to give physicists pride in what they have accomplished."

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Two Women Chosen as Blewett Scholarship Recipients

APS recently announced this year's recipients of the M. Hildred Blewett scholarship. Chosen by the Committee on the Status of Women in Physics, the two are Natalia Drichko at The Johns Hopkins University and Marija Nikolic-Jaric at the University of Manitoba.

The scholarship is dedicated to helping women who are returning to research careers that had been interrupted for family or other reasons. The scholarship is a one-year grant, which can be renewed, of up to $45,000 for use towards a wide range of necessities, including equipment procurement, stipend, travel, tuition, and dependent care. This is the sixth year the scholarship has been awarded.

After taking time off to move half-way around the world and start a family, Natalia Drichko has returned to condensed matter research.

She is originally from Russia and earned her MSc from St. Petersburg State University in 1996 and her PhD from the Ioffe Physico-Technical Institute, also in St. Petersburg, in 2002. She was studying organic conductors and superconductors and traveling back and forth between Russia and Germany as part of the Alexander von Humboldt Foundation Fellowship for her postdoctoral research.

While at a conference in Europe, Drichko met Peter Armitage, an assistant professor at Johns Hopkins University. The two started traveling together and soon fell in love.

Natalia Drichko

"It's kind of a romantic story in a way. I was still living in Europe and he was living here," Drichko said.

The two decided to get married and move to the United States. It was a hard decision at first for Drichko to leave her research and move to the other side of the Atlantic. She had only been to the United States twice before, once for a conference, and once while visiting Peter. Back in Europe there was a clear path for her to follow with her career, but the move proved to be a serious interruption.

"You are changing your life completely in every possible kind of way," Drichko said, "The big thing was kind of just to find a way to adjust to everything."

A year and a half ago, Drichko gave birth to her daughter. Even after moving and while caring for her child, she continued working to finish up the projects she had started in Germany. However, taking care of her new family member meant Drichko would have to take time away from research. The whole time she knew that she would return to research; it was always just a question of when, not if.

She was fortunate that The Johns Hopkins University had a large condensed matter department and she would be able to carry on research similar to what she had been doing in Europe. She found the faculty at the University friendly and helpful, but starting up from scratch was a huge effort, and she needed funding to begin. She found information for the Blewett scholarship online and applied.

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Apker Finalists Meet in Washington

Photo by Shelly Johnston

Each year, APS selects two recipients of the Apker Award for outstanding research by an undergraduate. To determine the recipients, a number of finalists are chosen, and then interviewed by the selection committee. This year, the seven finalists met with the committee in Washington on September 3. They are, left to right: Chia Wei Hsu (Wesleyan University); Martin Blood-Forsythe (Haverford College); Erik Petigura (UC, Berkeley); Benjamin Good (Swarthmore College); Patrick Gallagher (Stanford University); William Throwe (MIT); and Christopher Chudzicki (Williams College). The recipients will be announced on the APS website and in a later issue of *APS News*.

Members in the Media

"We can only speculate what they mean and wonder just what adaptive advantage the (songs) may give the whales in their evolution."

***Roger Bland**, San Francisco State University,* UPI*, August 9, 2010.*

"To me, this challenges the integrity of science…They say they reached these conclusions that have enormous consequences on the political and international stage. As a scientist and scholar, I felt it was my duty to check their conclusion."

***Seung-Hun Lee**, University of Virginia, on why he disagrees with the South Korean government's assessment that a North Korean torpedo sank the battleship Cheonan in March,* Time*, August 18, 2010.*

"Maybe the huge black holes at the center of the Milky Way and other galaxies are bridges to different universes."

***Nikodem Poplawski,** Indiana University in Bloomington,* The Washington Post*, August 24, 2010.*

"The Earth is 4.7 billion years old and it has taken that long to accumulate helium reserves, which we will dissipate in about 100 years… One generation does not have the right to determine availability for ever."

***Robert Richardson**, Cornell,* UPI*, August 24, 2010.*

"It's an effect that no one yet understands…Theorists are starting to say, 'What's going on?' But that's what the evidence points to. It's a challenge for the physicists and a challenge for the solar people too."

***Peter Sturrock**, Stanford, on mysterious variations observed in radioactive decay that might be tied to the sun,* TheAtlantic.com*, August 25, 2010.*

"It's really about the question: to whom does the American Dream belong? Does it belong to all of us, or a privileged few?"

***Rush Holt**, US House of Representatives, running for reelection,* The Star-Ledger*, September 3, 2010.*

"It is perhaps a bit rich for Hawking to make God redundant after granting him/her/it a celebrity cameo at the end of his multimillion-selling 'A Brief History of Time'."

***Graham Farmelo**, Science Museum, London,* The Daily Telegraph*, September 3, 2010.*

"When dropped into a new environment, rats will explore for a while, form a mental map, then stop wondering. But humans ask, 'Why am I in this cage? How did I get here? Where's the nearest decent coffee?' To understand cosmology is to understand where we fit in."

***Leonard Mlodinow**, Caltech,* The New York Post*, September 5, 2010.*

PhysTEC Alumni Go Out and Teach

Thousands of physics teachers swarmed the streets of Portland Oregon in late July for the annual AAPT conference. Among them were graduates of the APS-run PhysTEC program, which seeks to raise the bar for physics teacher education programs across the country.

PhysTEC helps to support colleges and universities that have put together physics education programs aimed at undergraduates who plan on becoming science teachers. Led by APS in conjunction with the American Association of Physics Teachers and the American Institute of Physics, the program recruits future science teachers–mostly undergraduates–and prepares them with strong content and experience with interactive teaching methods.

All told, nearly 200 people have gone through the program since its inception in 2001. The education department of APS is now conducting a wide-ranging study to find out what people who have been trained by the program are doing. Past surveys, conducted each year by contacting the heads of the programs at participating universities, have shown that the large majority have gone on to teach science. The ongoing study will be more in-depth, and will contact past participants directly.

The most recent survey found that 84 percent of people who had gone through the program are either currently teaching or actively seeking employment as a teacher. In total, 62 percent of participants go on to teach physical science

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This Month in Physics History

October 18, 1933: Louis de Broglie elected to Academy

One of the weirdest aspects of life on the quantum scale is the fact that all particles sometimes behave like waves. Max Planck first proposed the notion of quanta in 1900 to explain blackbody radiation, and, with Einstein's additional insights in 1905, this led to the resolution of the longstanding debate over whether light is a particle or wave: it is both. But this strange characteristic is not limited to photons. The French physicist Louis de Broglie extended the notion of particle/wave duality to electrons in 1925.

Born in 1892 in Dieppe, Prince Louis-Victor-Pierre-Raymont was the younger son of the 5th duc de Broglie, one of the oldest noble families of France. He was a lively, charming, and precocious child, according to letters written by his elder sister, with a pronounced flair for the dramatic. He favored blue jackets with breeches and buckled shoes at dinner, and memorized entire scenes from classical theater to recite for guests of the family.

Prince Louis de Broglie

His sister envisioned a shining future as a statesman for the young Louis, given his love for history and politics. When his father died in 1906, his older brother Maurice took him in and sent him to study at the Lyćee Janson de Sailly. Louis excelled in French, history, physics and philosophy, "indifferent in mathematics," and not good at drawing and foreign languages, but no one subject held his full attention.

De Broglie studied history and law at the Sorbonne, thinking he would join the civil service, but then he became enthralled with theoretical physics, no doubt influenced in part by Maurice, also a physicist. In fact, Maurice maintained his own home laboratory at the family residence in Paris. Louis attended Henri Poincaré's lectures on electrodynamics, thermodynamics, and related subjects, but it was his chance reading of the report of the first Solvay Conference on quantum theory that ignited his imagination, and he chose to make physics his career.

But first Louis had to complete his mandatory military service, just as World War I broke out. Thanks to Maurice's influence, Louis spent much of the war at the radiotelegraphy station at the foot of the Eiffel Tower, maintaining the equipment for sending wireless transmissions. When the war ended, he worked with Maurice on the latter's experiments on x-rays and the photoelectric effect, so ably explained by Albert Einstein in 1905. He published his first papers on the underlying quantum theory of that work.

In 1923, de Broglie later wrote, "After long reflection in solitude and meditation, I suddenly had the idea… that the discovery made by Einstein in 1905 should be generalized by extending it to all material particles and notably to electrons." Even a simple water wave is granular at the atomic level, he reasoned, since it is composed of the coordinated motion of a horde of water molecules. All "particles" and all "waves" were in fact a mix of both. Because their "wavelengths" were so small, such "matter waves" wouldn't affect the macro-world; their effects would only appear at the atomic scale.

This work became his doctoral thesis, published in the *Annales de Physique* in 1925–all 100 pages. The paper made de Broglie's career, since he had thus far mostly been known as Maurice's younger brother. Word spread rapidly throughout the physics community, earning the admiration of Einstein himself, who wrote that de Broglie had "lifted a corner of the great veil."

A graduate student at the University of Gottingen named Walter Elsasser suggested a possible experiment to detect the matter waves: shining a beam of electrons through a crystal. The crystal's lattice-like structure provides a built-in array of "slits" narrow enough to scatter the electron waves.

The experiment was performed in 1927, by Bell Labs physicists Clinton Davisson and Lester Germer, and by George Paget Thomson of the University of Aberdeen in Scotland. The electrons didn't reflect from the surface along straight lines, like tiny balls. Instead, the crystal served as a three-dimensional diffraction grating and there were sharp peaks in the intensity of the diffracted beams that occurred at predictable angles.

The Nobel Committee praised de Broglie's courageous foresight in championing this view when it awarded him the 1929 Nobel Prize in Physics. "When quite young you threw yourself into the controversy raging over the most profound problem in physics. You had the boldness to assert, without the support of any evidence whatsoever, that matter had not only a corpuscular nature but also a wave nature. Experiments came later and established the correctness of your view."

In 1932, de Broglie became chair of theoretical physics at the Sorbonne University, where he taught for 33 years. His lecture notes were beautifully written, but he was deemed an uninspiring lecturer, preferring to read monotonously from his notes, although his weekly seminar in theoretical physics proved more popular. He continued his research in the field of wave mechanics, which gave rise to various applications, including the development of electron microscopes.

He later tried to develop a causal model to replace the probabilistic models of quantum mechanics, which was refined by David Bohm in the 1950s and known as the de Broglie-Bohm theory. While most of his colleagues embraced the notion that the statistical nature of atomic physics was all that could be known, de Broglie believed that "the statistical theories hide a completely determined and ascertainable reality behind variables which elude our experimental techniques."

On October 18, 1933, de Broglie was elected to the French Academy of Sciences, and became its permanent secretary when he was 50–a position he held until the age of 83. And he became the 7th duc de Broglie in 1960 when his brother Maurice died. He also published many popular books on physics, earning him UNESCO's first Kalinga Prize for popularizing physics in 1952. He never married, and died in Louveciennes on March 19, 1987; his title passed to a distant cousin. But his mark on physics remains.

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Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: Budget and Authorization Environment

Appropriations Update

As of the deadline for *APS News*, Congress has made very little progress on the Fiscal Year 2011 Appropriations bills. Neither the House Energy & Water (E&W) bill, which funds the operations of the Department of Energy (DOE), nor the House Commerce, Justice, Science (CJS) bill, which contains the funding for the National Science Foundation (NSF) and the National Institute of Standards & Technology (NIST), have passed the full Appropriations Committee.

The House E&W subcommittee bill provides $4.9B for the DOE Office of Science, a $4M decrease from FY2010 enacted level and $221M less than the Administration request. However, with Congressionally Directed Projects (AKA: earmarks) taken into account, the Office of Science actually receives a $55M increase. The House CJS bill provides $7.4B for the NSF, equal to the President's request and $497M above FY 2010, while the NIST Core Programs receive $674M, $35M below the Administration's request of $709M and $59M above FY 2010 with earmarks taken into account.

The Senate is more advanced in the appropriations process, with the full Senate Appropriations Committee having voted on most of their individual bills. The Senate E&W bill provides $5.0B for the DOE Office of Science, $142M above FY 2010 with earmarks taken into account. The Senate CJS bill provides $7.35B for NSF and $688M for the NIST Core Programs, again minus earmarks.

However the chamber is not expected to make any additional progress before the end of the fiscal year. Given the highly partisan environment in the House and Senate and the expectation that the majority will lose seats in the November mid-term elections, it is likely that Congress will pass a Continuing Resolution (CR) until the end of the calendar year. If either or both chambers of Congress change party control, the CR could remain in effect for the entire Fiscal Year 2011.

America COMPETES Reauthorization

In the July issue of *APS News*, we reported on a complicated series of events that accompanied a contentious House passage of America COMPETES Reauthorization. We also noted that before *APS News* went to press, the Senate had not yet taken any action. On July 22nd, after several delays, the Committee on Commerce, Science, and Transportation finally held a mark-up of S. 3605, the Senate version of COMPETES Reauthorization.

In contrast to a five-year authorization provided in the House version, the Senate Commerce Committee's bill provides only a three-year authorization. The reduction was meant to address Republican concerns that the House bill is too expensive. We have, since that time, heard that such concerns have not completely been satisfied. Limiting the authorization to three years reduces the amount provided for NSF and NIST by $18.9B. However, the cost of the three-year Senate bill is actually higher than cost of the first three years of the House bill. For example, at the end of three years, the House NSF authorization is $8.77B, while the Senate total is $9.94 billion. Therefore, the faster growth rate in the Senate bill compensates for the elimination of authorizations for FY14 and FY15.

The Senate Commerce Committee bill does not yet include authorizations for the DOE Office of Science or NSF science, technology engineering, and math education. The Energy and Natural Resources Committee and the Health, Education, Labor, Pension (HELP) Committee will attach titles covering those activities prior to any floor action.

The Senate bill does contain language on scientific publishing, as does the House bill. Both direct the Office of Science and Technology Policy (OSTP) to create an Interagency Public Access Committee. But the Senate bill provides more specific direction to the working group, requiring it to take into account the inherent variability among scientific disciplines, the distinction between scholarly publications and digital data and the role that scientific publishers play in the peer review process including the attendant costs and added value. The bill also stipulates that any new public access policies cannot supersede existing public laws applied to federal science agencies. The APS Washington Office–as it did in the case of the House bill–played a key role in having the Senate bill direct OSTP to recognize "the role that scientific publishers play in the peer review process in ensuring the integrity of the record of scientific research, including the investments and added value that they make".

Commerce Committee staff have said that the full Senate will not take up S. 3605 before the November mid-term elections, leaving little time for consideration before the end of the session in December.

Be sure to check the APS Washington Office's Blog, *Physics Frontline* (http://physicsfrontline.aps.org/), for the latest news on the FY11 Budget.

ISSUE: POPA Reports

The Energy Critical Elements Study Group, which is examining the scarcity of critical elements for new energy technologies, held its second meeting in September at the APS Washington Office. The meeting focused on policy considerations and the development of the report recommendations.

The Electric Grid Study Group, which has examined the technical challenges and priorities for increasing the amount of renewable electricity on the grid, finalized its report over the summer. It received unanimous approval from POPA. The report will be released this fall and can be found on the APS website at that time.

The Direct Air Capture Study Group's report is currently going through the external review process.

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

ISSUE: Media Update

APS members were busy during the past several months writing op-eds and letters to the editor in support of funding for science.

In July, the *Arizona Star* and *Lincoln Star* newspapers published letters by Pierre Meystre, professor at the University of Arizona, and Timothy Gay, professor at the University of Nebraska. In their letters, they urged their senators to support the reauthorization of the America COMPETES Act.

That same month, the *Salt Lake Tribune* newspaper published an op-ed by William Evenson, a retired physics professor and university administrator at Brigham Young and Utah Valley universities. He also called upon his senators to support the COMPETES legislation.

In September, the *Honolulu Star Advertiser* featured an op-ed by Pui Lam, chair of the Physics Department of the University of Hawaii (Manoa-Honolulu), on the importance of funding key scientific agencies to meet the state's 70 percent renewable energy goal by 2030.

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

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The committee is specifically looking to the membership for more suggestions than the five-members of the committee may have been able to come up with themselves.

"We're only five people, what do we know?" Bederson said, "There are thousands of APS members and there may be vital sites that we don't know about, or may be only vaguely aware of."

The committee members are looking for sites with either a national or local significance to the history of physics. Such sites can include places associated with either experimental or theoretical work that dramatically impacted the field. Sites can also highlight the lives of individuals who have played major roles in physics history.

So far the sites chosen have reflected a wide range of physics disciplines. The committee members have also made an effort to include less well known sites that have historic merit that the public might not necessarily be aware of. One such site, due to be dedicated on October 15th, is the Bronx High School of Science in New York, which has produced an astonishing seven Nobel laureates in physics.

"That's more than most countries," Bederson said.

Another site recently commemorated was the Hughes Research Laboratories in Malibu California where Theodore Maiman built the world's first working laser. The plaque honoring this achievement was installed on May 16th, 2010, the fiftieth anniversary of the first successful demonstration of the laser. A picture of the event appeared in the July *APS News* (available online).

Other sites have included the birthplace of the *Physical Review* at Cornell, the first cyclotron at University of California Berkeley, the invention of the transistor at Bell Labs, and the discovery of the first antiparticle at Caltech. The full list of selected sites can be found on the initiative's website at http://www.aps.org/programs/outreach/history/historicsites/

Members who are interested in suggesting a location for the committee to look at can find a link on the initiative's website or can send an email to any of the members of the committee. The official nominating form can be found at http://www.aps.org/programs/outreach/history/historicsites/nomination.cfm.

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to students in grades K-12, while another 15 percent are teaching another subject to K-12 students.

The program emphasizes teaching techniques that draw students into an active learning role. Jessica Clanton went through the program while at the University of Arkansas at Fayetteville. After she graduated with a masters in physics in 2007, she took a job teaching courses at the college level at the Arkansas State College Mountain Home.

"It gave me a student-centered approach to teaching," Clanton said. "Students have to be involved in the classroom in order to learn…The idea of having students participate in the classroom came from PhysTEC."

Vera Ananda went through the two-year program at the University of Colorado at Boulder graduating in 2006 with a BA in physics and a teaching certificate. Today she is teaching science to sixth, seventh and eighth graders at the Greenlee K-8 School in Denver. She received the Noyce scholarship offered to juniors and seniors in PhysTEC programs in 2005.

"If it weren't for the Noyce program, I probably would have had to take out loans and possibly wouldn't have been able to finish college," Ananda said. She added also that "I really enjoy how the PhysTEC program keeps you connected after you graduate." She has traveled to the AAPT meeting in Alberta, Canada in 2008 and the Physics Teacher Education Coalition conference earlier this year in Washington, DC with the help of the program.

The PhysTEC program started as a response to growing concerns about the state of science education in grades K-12. Research conducted by the American Institute of Physics and the Department of Education respectively has shown that two-thirds of new physics teachers have no degree in physics, and less than 15 percent of middle school teachers teaching a physical science majored in the subject.

Gay Stewart of the University of Arkansas has been with the program since its inception and has kept tabs on the issues that her PhysTEC graduates have faced. She said that oftentimes graduates have had to confront both budget issues in the schools where they teach and the lack of an existing science education infrastructure.

"A high quality science classroom takes a lot of effort," Stewart said, "A lot of administrators don't seem to realize what they're doing when they give someone four different science classes to teach."

Photo courtesy of Vera Ananda

Vera Ananda in the classroom

PhysTEC has grown and evolved over time as more institutions have gotten involved. It has grown to include the dissemination of materials and models for successful physics teaching, the greater integration of physics departments into the training of physics teachers and the establishment of a network for physics teachers, to interact and share techniques with each other.

"The PhysTEC Program has developed into a successful program that should be widely emulated." said Valerie Otero, an associate professor of science education at the University of Colorado at Boulder.

"It's an effort to improve the physics teacher preparatory programs across the United States, primarily by working with our constituents across the physics community," said Monica Plisch, the assistant director of education at APS. "Ultimately we're hoping for a change in attitude in physics departments to see physics teacher education as a part of what they do."

Letters

Internationalization Insults Professionalism

As discussed in the June 2010 *APS News*, the recently proposed constitutional amendment seeking to address the alleged problem that the APS has a governing body which is "overly domestic" certainly seemed to solve a problem. Unfortunately, it struck me that the problem being solved was a perceived "political correctness" issue and not a problem of intrinsic deficiency in the structure of the APS governing body. The society is, after all, the American Physical Society. Moreover, a key element in the Society's mission statement clearly mandates that we "... cooperate with international physics societies to promote physics, to support physicists worldwide and to foster international collaboration."

I see absolutely no point, except perhaps from some artificial politically-correct optical perspective, to internationalize our governing body any more than it already is. The logical conclusion seems to be that we are unable to sensibly cooperate with other national or international entities because our governmental structure isn't sufficiently international. Frankly, I find that insulting to the professionalism that our Society has historically displayed.

Robert G. Lanier
Livermore, CA

Bury, Don't Burn

Many promising high-tech methods for carbon sequestration are presently being developed, but one low-tech method is as simple as deciding to bury discarded wood rather than burn it. Cleared brush, old pallets, wood from demolished buildings, etc., are commonly burned worldwide as a means of disposal. When wood decomposes or burns, short-term sequestered carbon is returned to the atmosphere. Nothing is more low-tech than digging a hole, and if it is deep enough and/or capped to stay dry, approximately 50% of the buried wood would represent long-term sequestered carbon. The industrialized world has been inadvertently sequestering carbon for some time by including discarded wood in dry landfills. As a complement to the present scientific and engineering efforts, encouraging people everywhere to "bury, don't burn" discarded wood would be a relatively cheap and easy way to sequester carbon.

Philip Ugorowski
Manhattan, KS

Carbon Tax Unrealistic

Roger W. Cohen's letter in the July *APS News* suggests that there are two reasons for favoring a carbon tax over a cap-and-trade system. Cohen first cites a Yale study into an optimal economic policy for reducing CO_2 emissions, which favors a progressively increasing carbon tax, and secondly calls cap-and-trade schemes "wasteful and corruption prone". This second point is disingenuous; to attribute these two adjectives solely to cap-and-trade proposals prevents a serious and honest comparison.

If not simple and prepared well, taxes (carbon or otherwise) are also wasteful and corruption prone. The number of businesses and individuals involved in tax fraud or avoidance is evidence enough of a system susceptible to dishonesty. Even if properly designed, poor implementation and enforcement of a carbon tax would open the scheme to further corruption and exploitation. In short, there is no guarantee that the carbon tax will be any more efficient than the current tax system with its multitude of rebates, refunds, and loopholes. Let the two suggestions win or lose (or even co-exist) on their own merits, such as the economic study Cohen cites.

Misleading adjectives aside, all proposed policies to mitigate CO_2 emissions must necessarily be viewed in light of the ability of Congress to pass them. Could you convince everyone, in today's economic climate, to accept another tax?

Tomasz Kott
Silver Spring, MD

Column Displays Faulty Reasoning

In his Inside the Beltway column "The Passion of Politics" in the August/September A*PS News*, Michael S. Lubell asserts that Republicans' opposition to the extension of unemployment benefits (without incurring new spending) contradicted their desire to keep the Bush tax cuts in place–and therefore was based on "emotional" thinking. After all, he reasons, "both inject money into the economy." According to this logic, cashing my paycheck and stealing someone's money after beating him to death should rationally be considered on the same footing–both "inject money into my pocket." Of course,this ignores the morality of obtaining the money and the long-term consequences of either action, while just connecting similar sounding strings of words, out of context.

In the case of the unpaid-for benefits, yet more money is taken, by government force, from people who earned it and given to those who did not earn it. In the case of keeping the tax cuts, the people that produced the wealth keep it.

Frank Loreti
Pittsburgh, PA

Business Majors Need to be Seduced

I would like to add to the beautiful article by Sacha Kopp [Back Page, August/September *APS News*] that another attraction of a physics education is that physics is arguably the most quantitative discipline of the natural sciences.

He should however not try to lure away prospective biology and engineering majors, but rather the all too many future business majors. No need to tell them anything else, but that many of the "quants" on Wall Street are PhD's in physics, making piles of money (and having neatly contributed to the financial meltdown).

Maria Ronay
San Francisco, CA

Ed. Note: *A discussion of whether physicists contributed to the financial meltdown can be found (online) in the December, 2008 Back Page by H. Eugene Stanley.*

Need to Cut Back on Production of Physicists

I would like to offer a contrarian viewpoint regarding Sacha Kopp's interesting Back Page article on enlarging physics programs. I completed my PhD in High Energy (Neutrino) Physics in 1998. I elected not to stay in academia and instead pursued a career in private enterprise. While in school I initially sympathized with the goals of the academic community to increase interest and enrollment in undergraduate and graduate physics. As I've become older and hopefully wiser (and started educating my own children) my perspective has come full circle.

There are far too many physics programs & physicists (both undergrad & grad) being produced that are pursuing too few job opportunities, and sustained efforts to increase enrollment only serve to make matters worse for both graduates (at all levels) and faculty.

To alleviate this problem, and greatly enhance study in the field, the physics community would be better served by adopting a model similar to the medical profession, where there is no undergraduate equivalent degree (or perhaps some loosely coupled "pre-physics" degree), application to the graduate level is highly competitive, and accrediting new graduate PhD programs is deliberately constrained by the community.

Consider the pre-med student. They know a priori they cannot practice in the medical field unless they pursue some form of post-graduate work. Similar facts hold true for the physics undergrad, yet the departments feel compelled to contrive a message as to why it's worthwhile–rather than address it for what it frankly is in reality: a pre-physicist degree.

With respect to faculty and staff the current push-for-numbers mode undermines them at every turn. Churning out new graduates and PhD's at a rate 10-15x greater than the community requires them has driven down real remuneration, job satisfaction, and willingness to promote physics. The tenacious and fortunate who have stable positions have paid very dearly to get them–be it at university, national lab, or otherwise. This only fosters that lack of passion that the author so eloquently touches on in his article.

In short, this get-the-numbers game has not benefited physics nor physicists. I am certain ALL of your readers have colleagues who have yet to find job satisfaction after 10, 15 or even 20 years in the field.

So how realistic is it to expect them to sincerely recommend a degree (not to mention a career) in physics? We physicists are throwing sand in the wind by increasing enrollments. We should be DECREASING them for the betterment of all.

Jean George
Austin, TX

BLEWETT continued from page 1

"This is an amazing opportunity," Drichko said. "It helped enormously because I can do the research I am very much interested in at a great university."

She has started researching magnetic ordering in materials related to unconventional superconductivity. With the funds she plans to set up a lab to investigate the properties of these superconductors, including a Raman spectrometer that other researchers in the university could use as well.

The second Blewett scholarship recipient, Marija Nikolic-Jaric, after completing her long delayed PhD, has been able devote herself to her research and is looking forward to a career as a physicist. She is currently a post-doctoral research fellow at the University of Manitoba in Winnipeg, where she is studying biophysical flow cytometry. This is her second year being awarded the Blewett Scholarship.

In 1996, Nikolic-Jaric was just weeks away from defending her thesis when she and her husband received devastating news. He had been diagnosed with a rare and terminal type of brain tumor. Already juggling her thesis, pulling together academic credits from multiple universities and caring for her four-month-old son, Nikolic-Jaric made the difficult choice to put her degree on hold for a while. After her husband's death the following year, she moved back to Canada to be closer to her parents.

While away, she volunteered at her son's elementary school, helping to teach math through games. Though she enjoyed working with the students, she wanted to finish her degree and return to research.

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

Nikolic-Jaric continued to work at pulling together her credits at Simon Fraser University in Vancouver. In 2007, the death of her step-father delayed her PhD defense an additional semester. In January of 2008, she was able to defend her thesis and earn the PhD started years earlier.

She said the Blewett scholarship had given her a tremendous psychological and financial boost.

"One of the big worries, which is how are we going to pay for the research, is gone now," Nikolic-Jaric said.

After receiving her PhD, she started her post-doctoral work at the University of Manitoba researching the behavior of rotating asymmetrical particles in electrical fields. Since then she has moved into other aspects of biophysical flow cytometry, exploring the physical properties of biological material in the context of microfluidics.

With the scholarship she has been able to travel to different academic conferences, including the APS March Meeting and the upcoming MicroTAS in the Netherlands. She also attended the Summer School of Nanotechnology in Edmonton.

In addition to her research as a postdoc, Nikolic-Jaric has been helping the graduate students she is working with. Many of them, especially the women, have the same questions about juggling careers and families that Nikolic-Jaric confronted as a student.

PLANS continued from page 1

A topical group is like a mini-division: it organizes sessions at the March and April general meetings of the society and often puts out a newsletter for its members. It has a governance structure similar to that of a typical APS unit and its officers are elected by the topical group membership. The next step in the creation of the new topical group is to constitute an organizing committee whose charge will be to define the precise "area of interest" (and name) of the topical group, draft its bylaws and determine how it will initiate its activities. Once these plans have been approved by Council, APS members will be invited to join (upon payment of dues of $8!) and once there are at least 200 paid-up members, elections for officers can take place and the new topical group can commence its independent existence.

Callan said that his first step in constituting an organizing committee was to recruit a distinguished and effective chair, and that he was fortunate in having been able to convince Nobel laureate and former APS President Jerome Friedman of MIT, one of the signers of the Cohen petition, to serve in this important capacity. With this key element in place, Callan proceeded to ask other signers of the two petitions to serve as members of the committee. The response has been very positive and he expects to have a committee of about eight members in place, representing a range of APS units.

Committee chair Friedman says that he is hopeful that it will be possible to submit bylaws for approval at the November meeting of APS Council. Given the enthusiasm for this initiative that has been expressed by APS membership, a new topical group on the physics of climate could be open for business sometime early in 2011. Callan commented that he hoped this TG would go a long way toward reducing the tensions that had been raised within the society by the climate issue …. and also that its services would no longer be needed by the time the year 2111 rolled around!

Run For Office: Just Follow the Law and Leave the Spherical Cow Jokes Behind

By Alaina G. Levine

Politics, says Ruth McClung, physicist and Republican candidate for the House of Representatives in Tucson, Arizona (7th district), is like "A Tale of Two Cities": it is the best of times and the worst of times. "You meet some people who are the best people in the world," she explains, such as a Tribal Council member who "I knew cared and wanted to do the best for his people."

And there is also the seedy side. "I've had people try to buy my vote off," she admits. "[That's] something that really hit me hard."

But McClung is undivided in her resolve to serve her district, an area in southeast Arizona covering 22,872 square miles and larger than Rhode Island, Delaware, Hawaii, Connecticut and New Jersey combined. And since August 24, 2010, when she emerged victorious from the primary, garnering 50% of the votes in a five-person field, she is more

Ruth McClung

than looking forward to an exciting race when she faces incumbent Democrat Raúl Grijalva in November. "I'm glad grassroots beat money," she says.

The 28-year-old, who works for a government contractor, threw her hat in the ring because she didn't care for the selection of candidates who consistently vied for her vote, she says. It was a gradual decision to run because "I was very tired of no one on the ticket who even remotely represented me," she continues. "It's extremely frustrating on election day that there is no one to vote for".

So she set her sights on Capitol Hill, and already her physics skills have come in handy. She senses that her sharpened ability to delineate facts and distinguish problems from as many viewpoints as possible gives her an edge: "You can't always have a perfect solution because problems [in politics] are extremely complex," she posits. "In Washington, they don't look at [problems] from 360 degrees, they look at [them from] one angle…physicists like to look at problems from 360 degrees, lay out the facts and see what's going on."

And there's another positive –good PR. Her campaign slogan, "Maybe it does take a rocket scientist," stands out among the hackneyed "Vote for" cacophony that has become all too common in every race. And McClung, really is a rocket scientist. But just how beneficial or essential is being a rocket scientist and/or a physicist to serving the public as an elected official?

Nat Fortune, a 49-year-old associate professor of physics at Smith College running for Auditor of Massachusetts, doesn't think it's necessary, but grabs at the chance to make a good-natured point. "I know you don't have to be a rocket scientist for this post," he jokingly argues, "but I know it couldn't hurt."

Fortune references his former professor, Congressman and physicist Rush Holt, who "makes the case…that a scientific background is needed. So many issues that Congress deals with have a scientific or technological issue associated with them" that it's valuable to have representatives who are well-versed in the sciences, he says.

"There is no requirement that the Auditor come from a particular profession…The current Auditor retiring used to be a professional boxer," Fortune says. But "you need someone analytical,

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Symbolic farewell

By Lidia Smentek

Editor's Note: *This article by Lidia Smentek is a sequel to her earlier discussion of Copernicus's remains in a Viewpoint column in the May, 2009* APS News *(available online).*

Recently Wiesław Bogdanowicz of the Polish Academy of Sciences, together with his team, wrote in the *Proceedings of the National Academy of Sciences* [1]:

Taking all data into consideration, i.e., the identical genetical profiles in the skeletal remains and reference hairs along with the other anthropological and archeological information, we conclude that the skeletal remains derived from the St. Cross Altar tomb at Frombork Cathedral are those of the great Polish astronomer, Nicolaus Copernicus. This is the end of a search that has lasted for at least 2 centuries…

Is it really the end of the search?

The reference hairs mentioned above were found by chance in the books stored in Uppsala, Sweden, since they were taken as a war trophy in 1626 from Frombork, Poland; they previously belonged to Copernicus while he was a canon there. The same sequence of mtDNA was found in the hairs and bone remains, catalogued anonymously as 13/05, found in the Frombork cathedral.

However, since mtDNA is inherited only from the female line, the genealogical tree of Copernicus leads to the conclusion that three persons who were associated during their lives with the cathedral in Frombork inherited the same sequence of mtDNA. These are: bishop Łukasz Watzenrode (brother of the astronomer's mother), Andrzej Kopernik (astronomer's brother) and Nicolaus Copernicus. It is therefore impossible to distinguish the genetic material of these three persons.

Copernicus' brother's burial place has not been definitely established, but after he had officially moved from Rome to Frombork in 1506, he still spent the majority of time back in Rome; and it is speculated that he died there. It is known for sure, however, that Bishop Łukasz Watzenrode and Copernicus were buried in the Frombork cathedral!

One does not need to be an expert to see that the only conclusion that may be derived from the match of mtDNA of both samples (hair and bones) is that they belonged to either the same person, or to two different persons who were related via the maternal branch.

As a consequence, even assuming that somehow it is possible to prove that the hairs found in Uppsala are indeed those of Copernicus (which has not been done), the match of their mtDNA with those of 13/05 does not answer the question whose remains were found, the astronomer's or his uncle's, since the two men share the same genetic code. The mystery of Copernicus' grave is still NOT solved! How was it possible then to announce to the world that Copernicus' grave has been found?

More than a century lapsed between Copernicus's death in 1543 and the middle of the 17th century, when the so-called Swedish flood covered Varmia (the district of Frombork), and Copernicus' library was stolen. In the context of these historical facts, a new question arises: did no one during these 100 years read or look at these books stored now in Uppsala? Is it not possible that the hairs and the remains 13/05 belonged to a different canon, a successor of Copernicus, or another bishop, who was studying the books, and eventually was also buried in the cathedral?

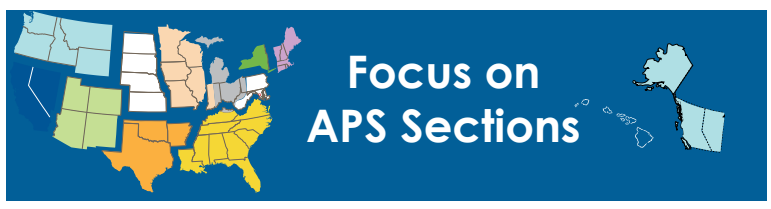
As a consequence the probability that indeed Copernicus's remains have been found is lower than 33.3%, even assuming that the genetic analysis was performed with 100% reliability.

On the 19th of February 2010 in Toruń, Copernicus' birthplace, in the same cathedral where he was baptized, the sarcophagus with the remains was guarded by a delegation of different professions and ages, including representatives of the young generation. There were flowers, candles, coat of arms and Gregorian hymns in the background. A crowd paid respect to Copernicus, the pioneer of a new intellectual era. The remains were on their way to Frombork Cathedral to be finally put to rest forever.

Now we know that it was only a symbolic farewell organized for Copernicus by citizens of Toruń; just a symbolic good-bye from his town.

Lidia Smentek is at the Institute of Physics, Nicolaus Copernicus University, Toruń, Poland and the Department of Chemistry, Vanderbilt University.

1 W. Bogdanowicz, M. Allen, W. Branicki, M. Lembring, M. Gajewska and T. Kupiec, *Genetic identification of putative remains of the famous astronomer Nicolaus Copernicus*, PNAS **106**, 12279 (2009).



New England Section Played Trailblazing Role

By Eric Betz

Editor's Note: *This is the first of an occasional series of columns highlighting the history and achievement of APS Sections. There are currently nine sections, covering most of the United States and parts of Canada.*

For many students and researchers working in isolated areas, regional sections define the APS experience, but the idea wasn't in place from the society's beginning. It wasn't until February of 1932 that an APS council approved a constitutional amendment–as proposed by the then 29 year old MIT Faculty member Philip M. Morse–to allow a New England section as the first regional group. Sections were his brainchild from start to finish and he laid out the roles of the officers, drafted the section's purpose, wrote its first set of by-laws and then lobbied to get it accepted.

"The currents have turned in the American Physical Society," wrote APS Treasurer George Pegram at the time. "The constitution now provides and the council will encourage the establishment of regional sections."

As Morse described it in an open letter to APS members that year, the focus of sections should be two-fold: "to provide a point of contact between research workers in physics and workers in fields allied to physics (i.e. teachers); and to relieve the overcrowding of the national meeting programs."

A distinguished administrator, Morse was a strong first leader of the New England Section and his groundwork was copied by all the sections that would follow. Later in life Morse would also co-found the MIT Acoustics Laboratory, become the first director of Brookhaven and the MIT Computation Center, and eventually serve as President of APS, President of the Acoustical Society of America and board chair of the American Institute of Physics. He had imagined a format that would have two distinct groups of talks at each meeting, one for 10 minute contributed talks and another for invited speakers, and the *Physical Review* would then print each speaker's abstract for the society as a whole to read.

"The meeting was a very successful one," Morse wrote to a colleague the week of the section's first meeting in Amherst, Mass., "the day was fine and the trees had a grand colouring. People came from all over, several from Maine, a number from Troy and several from New York City. There was considerable discussion of most of the ten minute papers, and a lot of discussion of all the invited papers."

Among those ten minute talks was one given by Karl Compton and another by Percy Williams Bridgman on the effects of pressure on the electrical resistance of various metals. Nearly 15 years later Bridgman would win the Nobel Prize in physics for related work. Other Nobel Prize winners like Nicolaas Bloembergen and Edward Purcell have also called the section home.

While the dues have increased substantially from the initial 75 cents and membership has grown from 79 to well over two thousand,

NEW ENGLAND continued on page 7

Congressman Ehlers Retires

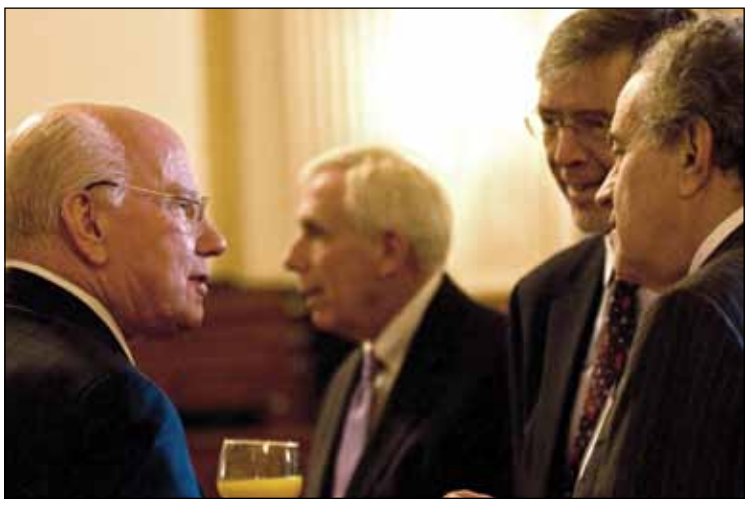


Photo by Brian Mosley

There are currently 3 physics PhDs serving in Congress. The longest-serving is APS Fellow Vern Ehlers, Republican from Michigan, first elected in a special election on December 7, 1993 and to eight full terms thereafter. Ehlers recently announced his decision to retire after his current term ends, and a reception was held in his honor this summer on Capitol Hill. In the photo, Ehlers (left) chats with APS President Curtis Callan and APS Director of Public Affairs Michael Lubell, while Congressman Frank Wolf of Virginia (center) passes by.

Forty-one Students Receive Minority Scholarships

APS has announced the recipients of its Scholarship for Minority Undergraduate Physics Majors for the 2010 school year. Forty-one students from schools across the country have been assigned mentors and given some financial support to assist them as they pursue their physics degrees.

The scholarship, first set up in 1980, aims to raise the number of underrepresented minority students in physics. It is open to students who are majoring or planning to major in physics and are African-American, Hispanic American, or Native American US citizens or permanent residents.

"It's important because it encourages and supports minority students' interest in physics," said Arlene Modeste Knowles, the scholarship administrator. "I think it also helps the students' confidence in themselves to know that APS, a leading physics society, recognizes and supports them."

All the scholarship recipients get a pair of mentors to help guide them through the first two years of school. One mentor is a member or former member of the APS Committee on Minorities in physics. The other is someone from the university's physics department to be on hand to help guide the student as he or she works towards a bachelor's degree. In addition, Modeste Knowles stays in close contact with the recipients, each of whom is required to meet the chair of their physics department.

The scholarship is merit-based. The APS Committee on Minorities, which picks the recipients, looks for candidates with strong grades, good recommendations, and either formal or informal research experiences.

"Also the enthusiasm and passion for physics and a potential physics career is always helpful," said Modeste Knowles.

Students who received the scholarship have said that having mentors is a big help.

"It's really nice to have that extra support because it can be kind of scary going into your first year," said Sarah Leu, a freshman at MIT from Pasadena, California. "It's nice having the support that you need."

Leu first heard about the scholarship from a website that lists available scholarships. Having long been interested in seeing how the universe works, Leu wanted to go into physics and possibly become a researcher for NASA. Two summers ago, she participated in MIT's Women's Technology Program, a four week course for female high school students to get hands-on engineering experience.

Over this last summer, she had an internship at NASA's Jet propulsion lab, where she was able to work on three different projects. She contributed to the design of the landing radar for the next Mars rover, took temperature and pressure readings of the surface of the red planet, and helped collect data from a live experiment as the Cassini probe sent radio signals through the atmosphere of Saturn.

"It was really nice to see physics in the real world," Leu said.

Another recipient, Olivia Smarr, likewise is looking towards the skies with her physics degree.

"I really really like astrophysics; I think that physics is a field that has endless possibilities for learning," Smarr said. "Physics is the study of everything."

A native of the D.C. Metropolitan area, Smarr is starting her first year at Stanford University. She said that while the physics program at her high school was not the strongest, she's been able to augment it with extracurricular activities. For the last three summers she's been interning at NASA's Goddard Space Flight Center in Maryland. There she contributed to the search for exoplanets, helped analyze the binary star system PDF-144, analyzed data from high energy x-ray binary stars and plotted the interactions of comets with the Sun. In October 2009 she was invited to the lawn of the White House to help teach astronomy to middle school students for President Obama's star party.

She said that the scholarship will both help her out financially, and provide a strong support network through her mentors.

"I think it was also a good way to get involved with the American Physical Society because I know it's something I should get involved with as a physics major and as a physicist," Smarr said.

2010-2011 APS Minority Scholarship Recipients

New Students

Alexander, Ronald Deshaun
Allen, Eric Pierre
Batie, Margo Alexandra
Boyd, Clifton Samuel
Calhoun, Richard Andrew
Chaves, Jason Reis
Cook, Brent Keith
Cruz, Peter J
Emerick, Andrew James
Gray, Iris
Johnson, Carrine Marie
Jones, Jeremy
Kretz, Ian David
La Placa, Rolando Luis
Leu, Sarah Noelle
Martinez, Daniel D
Medina, Michael Karl
Ndousse, Kamal Kuango
Pardo, Kristina M
Planell-Mendez, Ivette Mylette
Resendiz, Gustavo
Rodriguez, Roberto Alexis
Rowe, Ebony Nicole
Segert, Simon Nicholas
Smarr, Olivia Kamil
Soto, Priscilla Nicolette
Turner, Brandon
Villar, Victoria Ashley
Wagner, Alan Benjamin
Williams, Benjamin Michael

Renewal Students

Catanach, Thomas Anthony
Easley, Justin
Frasier, Johari Menelik
Geyer, Guy
Kelsey, Ashley Simone
Lee, Christina C.
Molina, Mallory Elyse
Ojeda, Steven Matthew
Quintana, Chris
Reyna Liriano, Maritza Del Carmen
Starr, Jessica Montoya

LAW continued from page 5

thorough, [who is] working from basic principles of what ought to be accomplished and reasonable to achieve. A physicist has all those skills particularly in the broader modeling of the process and sense of the process." In addition, it helps to have patience and familiarity with law, and the, um, *Law*: "Someone who's ever taught thermodynamics knows it will never be completely efficient."

Fortune, a member of the Green-Rainbow Party, has also discovered that his teaching experience has helped him better articulate messages to his constituents. "Being a physics teacher, I certainly have some confidence in public speaking," he states. "I know there are many ways to communicate and each person has different ways of communicating… I have to pay attention. Students and voters are not blank slates–they have their own opinions and ideas and you have to understand those…"

McClung has found encouraging and humorous elements in her pursuit for office. "For the most part, it's been very positive to be a scientist running for office," she declares, but laughs that there have been some interesting moments that only a fellow physicist may understand. "I'm a geek–I tend to act like a geek," McClung confesses. This involves, among other concerns, tending to concentrate more on facts than one's appearance. "You wake up [and] don't always care what your hair looks like" because you're thinking about an issue, she says. And as a scientist, she approaches political problems from a stance that is more "in depth, more geeky."

McClung received her bachelors in physics in 2004 from the University of Arizona, is the daughter of a physicist who worked for the DOE, DOD, and private industry, and is married to a physicist with a master's in the subject and an MBA. She has not encountered resistance concerning her pedigree, although "being in physics I want to use examples from physics, and people [have told me] to tone down the 'science-type' talk." She recalls how in one of her first speeches, an awkward aura arose in the room after "I told a science joke (the spherical cow joke) and nobody got it...People came up to me afterwards and said you know, 'Ruth, that's too geeky. You have to lay off that.'"

The most surprising and perhaps unsettling aspect of running for office, McClung concedes, has been her encounter with blatant sexism. "I'm a physicist and I've been in a very male-dominated area but have not felt sexism," she says. In fact, she has found physics to be "open to women," especially young women like her.

But politics has been another matter. "I told someone I was running for office and they said 'there are too many women in Washington'." Another time, "I was told if I want to be in politics I can't have children, that a woman in politics has no business with children. I never heard that in science and can't imagine that being told to a man," she says.

Yet the small-mindedness of a few of the people is clearly not enough to shake her.

"It's a very rewarding experience, running for office," McClung acknowledges. "You will learn a lot more than you thought, some of it good, some of it bad. And we all grow as people the more we learn."

As a physicist, she already is counting on her unique background to aid her in helping her constituents. Her scientific priorities include support for diverse energy sources, NASA, and science and mathematics education. "I'm a huge proponent of nuclear energy," McClung says. "You can't get cleaner energy than nuclear energy and it's the second cheapest form." With the Palo Verde Nuclear Generating Station located in her district, "I would like to sell the power to other states." Additionally, she would like to investigate using nuclear power for desalination, something that could be practical in a state noted for its arid lands and limited water supply.

She's supportive of research she calls "off the grid": The hammering, tinkering, and investigating of the off-the-clock geeks who contribute to major technological innovations, such as the personal computer or even the airplane. "You never want to discount what someone's working on in their garage or lab," she remarks. "The government doesn't even have to get involved."

And as for the cosmos, she says "I'm a huge fan of NASA. I want to balance the budget, but I don't think we should give up space, if for no other reason the technology we get from NASA… NASA and the military are the two areas of the government that give us wealth (both monetary and intellectual) in society."

In addition, McClung affirms that space, and in particular, lunar projects, must be pursued (with fiscal responsibility) for another crucial reason: national security. "We don't want countries we don't like looking down on us from space–it's a defense issue," akin to holding a higher ground in a battle, she says. "I believe it would be a mistake to ignore space."

McClung has already started contemplating the committees on which she would serve if elected. Unsurprisingly, she covets decidedly-scientifically-slanted House committees, such as Science and Technology, Energy and Commerce, and the House Select Committee on Energy Independence and Global Warming. She says that this is where her physics education will be singularly valuable. "I think my services could be very useful because of the scientific background I bring and I can talk to experts…I don't know much about geology, but I could definitely understand what a geologist is saying."

For the scientists who want to serve their fellow citizens through elected office, McClung has simple advice: "If you want to run," she offers, "surround yourself with good people. It's too big–it has to be more than you. I could not do it alone."

Nat Fortune

Fortune, who was first elected to his town of Whately's school committee in 2003, was re-elected in 2006 and 2009, and currently serves as its chair, has further suggestions for politically-minded physics pros. "I would encourage everyone to run for school committee or town committee. Or get appointed to a general office–not so much because you're a physicist but because of civic duty," he says.

But he cautions: "Running for office is a lot like doing research. It takes several times to actually do it right."

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

ANNOUNCEMENTS

Membership Benefit Highlight:

What is APSIT and how could it benefit me?

Each year APS members may receive a letter in the mail from **APSIT, the American Physical Society Insurance Trust,** offering a range of insurance products. APS is the original society of the Insurance Trust, established in 1969, to provide early and mid-career members with a convenient source for high quality insurance coverage at an affordable price.

APSIT offers six insurance products:

- **term life**
- **10 year level term life**
- **disability income**
- **personal accident**
- **hospital indemnity**
- **long term care**

Insurance plans are underwritten by the New York Life Insurance Company and administered by Herbert V. Friedman, Inc. Both in terms of the coverage offered and the low-cost premiums, APSIT products are very competitive with other providers and are worth consideration. APS believes that the Society's continued participation in APSIT is a benefit to our members and encourages everyone to learn more about the products.

www.apsitinsurance.org

Reviews of Modern Physics

Recently Posted Reviews and Colloquia

Quantum information with Rydberg atoms

M. Saffman, T.G. Walker and K. Mølmer

The hyperfine states of most atomic systems are well isolated from the environment and can thus store quantum information reliably. However, in order to process such information (to build, for instance, a quantum computer), atoms must interact with each other. In typical atomic systems, those interactions are too weak. This review shows how by exciting the atoms to Rydberg states one can obtain very strong interactions which can then be used to carry out quantum gates, or to generate many-particle entangled states. The paper also explains recent exciting experiments in which some of those features have been demonstrated.

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APS Congressional Science Fellowship 2010-2011

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

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All application materials must be submitted online by January 14, 2011.

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day are different, but just as exciting as ever, from building a quantum computer to figuring out dark energy to solving the biggest problems our planet faces – energy and climate. But there are issues that must be addressed on the practical side if physics is to remain attractive and rewarding, including workforce diversity in physics, the bumpy and uncertain career path from postdoc to a permanent position, and modernizing the physics curriculum," Turner said.

The new amendment to the constitution will increase the number of international councilors that serve on the Council. Currently a single councilor representing all the international members of APS is elected every two years. The amendment will eliminate this position, and instead convert four of the eight general councilors to international councilors who will serve full four year terms. This way, members will be asked to elect one new general councilor and one new international councilor each year.

APS international programs administrator Michele Irwin said the change was prompted in large part by the fact that 25 percent of the society's membership lives outside the United States.

"Our international members, of which we have a lot, didn't feel that they were represented and their needs were met," Irwin said.

Bildsten is a permanent member of the Kavli Institute for Theoretical Physics and a professor at the University of California, Santa Barbara. He received his PhD in theoretical physics from Cornell University in 1991. Bildsten served on two panels during the previous Decadal Survey of Astronomy and Astrophysics and is a member of its current committee. He has served on many recent NRC panels. He was a member of the NSF's Mathematical and Physical Science Advisory Committee from 2004 until 2007. Bildsten teaches an upper level physics course and is a member of the Board of Directors of the Dos Pueblos Engineering Academy Foundation. Bildsten's theoretical research spans the fields of stellar astrophysics, gravitational wave phenomena, and stellar explosions.

"Leadership matters, and I will work to identify those capable of addressing the breadth of issues facing society today, from educating our youth, to ensuring that scientific breakthroughs continue to sprout from our colleges, universities and national and private laboratories. Candidates for election to leadership positions in the APS must have this breadth," Bildsten said in his candidate's statement.

Gao is a professor of Physics at Duke University, and a Changjiang Lectureship Chair Professor at Tsinghua University. She received her Ph/D in Experimental Nuclear Physics in 1994 at Caltech. She joined Duke University in 2002. Her research focuses on understanding the structure of the nucleon and exclusive nucleon and nuclear processes at high energies in terms of quark and gluon degrees of freedom.

She has served on the Program Committee and Fellowship Committee of the Division of Nuclear Physics of APS, Panel on Public Affairs of APS, and the Advisory Committee of the Institute for Nuclear Theory. Currently, she is a member of the editorial board of *Progress in Physics*, and is an associate editor of the *European Physics Journal A*. She is the Vice President of the Overseas Chinese Physics Association, and a Fellow of the APS.

"Interdisciplinary research, international collaborations and cooperation among scientists across the world are becoming ever more important. Physicists have a long and productive tradition for fruitful international collaborations, but many more possibilities abound," Gao said in her candidate's statement.

Meystre is currently a Regents Professor of Optical Sciences and Physics at the University of Arizona. He holds the Chair of Quantum Optics, and is Director of the B2 Institute. He received his PhD from the Swiss Federal Institute of Technology in Lausanne, and the Habilitation in Theoretical Physics from the University of Munich. Following a postdoctoral position at the University of Arizona Optical Sciences Center and nine years as a staff scientist at the Max-Planck Institute for Quantum Optics in Germany, he returned to the University of Arizona in 1986. His research includes theoretical quantum optics, atomic physics, and ultracold science as well as renewable energy and smart grid research and development. He has published over 280 refereed papers. Meystre is past-Chair of the Division of Atomic, Molecular and Optical Physics of the American Physical Society, past-Chair of the National Research Council standing committee on atomic, molecular and optical science, and currently serves on the NRC Board on Physics and Astronomy

"Physics is going through extraordinary developments, with exciting advances at all frontiers of our field, from the lowest to the highest extremes of energy and power, from the smallest to the largest spatial dimensions, and from the shortest times to the age of the Universe," Meystre said in his candidate's statement.

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Morse's original vision of lively discussion and promoting "the diffusion of the knowledge of physics" continues to guide the New England section–and indeed every other APS section–to this day. As current New England Chair and Yale Professor Peter Parker describes it, the twice-yearly meetings are of course the group's main purpose, but physics education is also still a priority.

"People come to see their colleagues, hear plenary talks, and give their students the chance to present," said Parker, "but a side purpose is to support the development of teachers, and we frequently meet jointly with AAPT."

The section now includes members at more than 40 universities in six states including storied institutions like Yale, Harvard and MIT, as well as a number of smaller distinguished schools like Middlebury and Wesleyan. "It's an interesting section in that it covers a diverse area and a diverse range of schools," said Parker.

This year's October meeting will be at Brown University in Rhode Island and will focus on issues in Nanobiophysics. According to the program "plenary sessions will highlight leading research in the manipulation, imaging, and study of biological systems at the nanoscale. Recent insights into the teaching of physics, as well as teaching workshops, will also be showcased. "Another New England Nobel Laureate, Leon Cooper, will be the banquet speaker.

The Back Page

Invisible Nukes

By Irving A. Lerch

In April, 2010, Defense Secretary Robert M. Gates, released the *Nuclear Posture Review Report*, part of the ongoing process of periodic reviews of US defense strategy, arsenals, and deployments.[1] In May, the Administration published an inventory of its strategic weaponry. And, of course, political figures on the right immediately criticized the review as an impermissible weakening of US defense while many on the left saw it as more of the same old saber rattling.

The report was notable more for what was left unsaid than for any tweaking of the nation's strategic nuclear posture. An entire class of nuclear weapons–tactical nukes–was exempted from the review.

Historians David G. Coleman and Joseph M. Siracusa report a conversation recorded in the Kennedy Administration cabinet room between the President and General Shoup, Commandant of the Marine Corps, October 29, 1962, the day after Nikita Khrushchev formally agreed to pull Soviet nuclear missiles out of Cuba.[2] General Shoup wondered aloud whether the Russian defenders on the ground in Cuba would have used tactical nuclear weapons against US forces. No one knew whether such weapons were stationed in Cuba but the possibility could not be ignored. Kennedy's response was, "… my guess is, well, everybody sort of figures that, *in extremis*, that everybody would use nuclear weapons. The decision to use any kind of nuclear weapon, even the tactical ones, presents such a risk of getting out of control so quickly, that there's a …" The unspoken conclusion is clear: the consequence would be nuclear holocaust.

Implicit in this exchange and in the scholarly literature purporting to examine the tenets of nuclear war, analysis and theory are the only tools available to attempt to depict the steps leading to and the consequences resulting from the use of nuclear weapons–strategic or tactical (after all there is only one historical example extant). Entire strategies and arsenals of necessity are based on theory. The post WWII era is punctuated with the rise of game theory and other forms of scholarship designed to define, predict, and prepare for nuclear war. But as one scholar has warned: "Because they are essentially men of ideas, the civilian scholars of strategy have been over impressed with the potential transferability of theory to the world of action."[3]

In the early 1960s the 101st and 82nd airborne divisions were organized into a rapid-deployment force (called the Strategic Army Corps) to respond to "brush-fire" wars that were beginning to bedevil US military planners. Hot spots were flaring in Southeast Asia, the Middle East, Africa, South America, and the Caribbean (Cuba). In order to test the capabilities of these ground forces, periodic exercises called "Swift Strike" were conducted, which invariably included mass parachute jumps of both airborne divisions.

In 1962 I was a young infantry officer in the 101st temporarily assigned as liaison with airborne corps headquarters during a "Swift Strike" exercise in North Carolina. My duties as liaison obliged me to attend the daily corps operations briefings and planning sessions and I was on hand when the corps commander, a three-star general, approved a plan of attack for the following day. The scenario had the two divisions deployed in a foreign country confronting an opposing heavily armored force of larger size although presumably we had the advantage of sizable naval and air support units. The objective was to break out of battlefield containment and to move onto terrain more congenial for maneuver and resupply. To do this, the operations staff recommended the use of five tactical nuclear weapons to isolate the battlefield, destroy enemy reserves and immobilize the enemy's main formations. I was surprised to learn that the ground commander had authority over nuclear weapons. The general concurred with his operations staff and the mock attack went forward. The exercise umpires unanimously agreed that the corps had won the day.

Except … there was never any discussion of what the enemy would do when his forces were destroyed, or what the political leadership of the invaded country would do in response. Certainly, countless war games played at that time suggested that such an attack with tactical nuclear weapons would escalate uncontrollably. Why was the corps commander allowed to fantasize this outcome? Perhaps the designers of the exercise decided that the "enemy" had no allies and was certainly not part of the Soviet bloc. Then, too, the tactical nuclear weapons of the day assigned to corps and divisions were small, nominally well below a kiloton in yield and presumably below the danger threshold for nuclear war (although some larger warheads–as large as a megaton–had been proposed for "tactical" use by theater commanders).

Fast forward two months, to October, 1962.

Just after midnight sometime during the third week of October, 1962, I was ordered to McCoy AFB just outside Orlando to help prepare for an airborne assault. The air transport was to stage at McCoy and I was to join my airborne infantry company en passant enroute to the combat drop zones in Oriente Province in the Republic of Cuba. This was my introduction to the Cuban Missile Crisis.

Photo by Barrie Ripin

McCoy was the assembly point for the various staffs–air force, navy, army–and U2s flew in and out on routine reconnaissance missions over Cuba. Successive waves of paratroopers were to assault the missile storage and deployment sites roughly a day in advance of the main seaborne assault. The C-130 and C-123 troop transport squadrons had been mobilized from reserve units with little airborne operations experience and every detail had to be checked multiple times. But on this occasion, none of the commanders mentioned tactical nuclear weapons. No one dreamed of deploying let alone using them. Presumably this was a reflection of Kennedy's caution against the provocative deployment of such weapons in an emergency operation.

The situation turned increasingly grim on October 27 when a U2 out of McCoy was shot down over Cuba. The pilot, Major Rudolf Anderson Jr., was killed. He would be the first–and as it turned out–the last casualty of the crisis. The war had turned "hot" and we were convinced that the invasion order was imminent. We did not anticipate Khrushchev's offer the following day to dismantle the missiles (for some vague *quid pro quo*) and that Russian ships were turning away from the quarantine line.

Also, we did not know that a heavily equipped Russian division occupied the area our airborne units were to assault. But even more dangerous was the fact, subsequently acknowledged by the Russian commander on the ground in Cuba (in a conference in Moscow, 1989, attended by senior US, Cuban and Russian participants in the crisis),[4] that he had an arsenal of tactical nuclear weapons and was prepared to use them on the seaborne troops that would storm ashore the day after the airborne assault. There could be no doubt that the airborne troops could have been destroyed on the ground by the heavily armored and entrenched Russians and the follow-on seaborne invasion could have been vaporized.

The question attending all deployments of tactical nuclear weapons–and a topic of intense discussion on the day that General Shoup and President Kennedy had their exchange was who was in control? Who would decide if and when to use them? If not the commander on the ground, then who? If the decision was in the hands of the political leadership, wasn't this a tacit admission that the use of any nuclear weapon, however small, was of strategic import? Indeed, subsequent studies would demonstrate that if the President had to authorize the use of tactical nukes in a war zone, then the situation on the ground would radically change in the time it took to study and authorize a request for use. For example, if a command was being assaulted by superior forces it was unlikely that a decision would be forthcoming before the enemy would close with our forces or occupy proximal urban areas, thus barring a nuclear response (for practical and policy reasons, cities were considered strategic targets). In short, there is no such thing as a tactical nuclear weapon. In fact, the rapid response force itself was a strategic tool.

President Kennedy would have been forced into a nuclear exchange had the invasion of Cuba gone forward (as he feared). The strategic game would have played out on the ground with tragic consequences. In this light, Kennedy sought to avoid a nuclear confrontation at all costs short of fatally compromising US security. What he could not have known is that similar restraint on the opposing side was lacking. In short, the opposing commander would have seen even a conventional threat against his position as sufficient cause for a nuclear response simply because *he was assigned tactical nuclear weapons as part of his arsenal and had the authority to use them to accomplish his mission*.

So why does the *Nuclear Posture Review* avoid any mention of tactical nuclear weapons? Russia has an estimated arsenal of 3,000-4,000; the US 1,700-3,300 (a few hundred of which are stationed in several NATO countries); China about 400; with another 300-400 in the hands of Israel, France, India and Pakistan.[5] The future is unbounded with Iran and North Korea joining the club.

Ostensibly our European allies are nervous should we tamper with this arsenal because the NATO force structure and operations plans assume the availability of tactical nuclear weapons. But if the use of even small nuclear weapons inevitably brings on incalculable escalation, how can we afford not to confront the issue? What madness prompts us to pretend that Armageddon comes in labeled packages of 10 kilotons or larger?[6]

Fifty years ago, the US had a dizzying array of so-called battlefield nukes, ranging in yield from a little over 10 tons of TNT to a kiloton (with larger munitions being considered). These munitions were fired from medium range artillery commonly found in Division and Corps formations to 2-man munitions teams. Some warheads were designed for use in modified rocket-propelled anti-tank recoilless rifles such as those deployed in an airborne infantry company (called the Davy Crockett, the warhead weighed 23 kg and had an explosive yield of 10 tons). Such devices are light-weight, small and therefore portable and easily concealed. The field artillery assigned to infantry divisions consisted of 155 mm towed and self-propelled howitzers, and the atomic shell they fired (the W48 linear implosion-type warhead) weighed a mere 58 kg and had a yield of 72 tons. Today there are many thousands of these weapons spread over several continents (some in the inventories of unstable states) and their whereabouts are difficult to divine. And while strategic warheads are encumbered with complex fail-safe mechanisms engineered to prevent unauthorized detonation, the same cannot be said of tactical weapons.

Nonetheless Vietnam and the wars we are fighting today were and are played out in nuclear-free precincts. Yet the frustrations of Vietnam caused many to push for the use of tactical nuclear weapons to seal the South from the North and to prevent the invasion of large formations of North Vietnamese military units (a reality only at war's end after US forces had withdrawn). This issue was addressed with uncompromising finality in a famous Institute for Defense Analysis report dated 1967.[7] The conclusions of the study were recorded in the first several pages and were unequivocal:

The overall result of our study is to confirm the generally held opinion that the use of TNW [tactical nuclear weapons] *in Southeast Asia would offer the US no decisive military advantage if the use remained unilateral, and it would have strongly adverse military effects if the enemy were able to use TNW in reply. The military advantages of unilateral use are not overwhelming enough to ensure termination of the war, and they are therefore heavily outweighed by the disadvantages of eventual bilateral use.*

For the moment we are permitted to bleed our enemies and be bled in return without the ominous shadow of tactical nukes obscuring the battlefield. The risk, however, has been relocated from the war zones to the homeland. We must ask anew whether the threatened use of such weapons against states like Iran or North Korea provides any military or political benefit. It is here we should be considering reductions–or better yet a total ban–if we are to reduce the danger of nuclear proliferation.

While we wait for an answer, time does not favor us.

Irving A. Lerch served as APS Director of International Affairs from 1993 to 2003.

1. http://www.defense.gov/npr/docs/2010%20Nuclear%20Posture%20Review%20Report.pdf

2. David G. Coleman and Joseph M. Siracusa, *Real-world nuclear deterrence: the making of international strategy*, Praeger (June 30, 2006)

3. Colin S. Gray: *What RAND Hath Wrought*, Foreign Policy, 4 (1971), pp. 111–129

4. Allyn, Bruce J., James G. Blight and David A. Welch, eds. (1992) *Back to the Brink: Proceedings of the Moscow Conference on the Cuban Missile Crisis*, January 27-28, 1989, Lanham: University Press of America.

5. http://www.nti.org/e_research/e3_10a.html

6. See the November 2001 Fourth Freedom Forum Report, *Uncovered Nukes: Arms Control and the Challenge of Tactical Nuclear Weapons*, at http://www.fourthfreedom.org/Applications/cms.php?page_id=27&exp=1

7. F.J. Dyson, R. Gomer, S. Weinberg and S.C. Wright, *Tactical Nuclear Weapons in Southeast Asia*, Institute for Defense Analysis, Jason Division, March 1967 (available http://www.nautilus.org/archives/VietnamFOIA/report/dyson67.pdf)

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