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Members Tell the Board What They Think About A Possible APS Name Change

Should APS change its name from the American Physical Society to the American Physics Society?

That question was posed by APS President Marvin Cohen to all APS members in an email message asking them for their reaction. The email, sent out in late June and early July, directed members to a website where they could record their opinion on a scale from one (strongly opposed) to five (strongly in favor), and also express their views in a comment box. All members with a valid email address should have received the message, and the website remains open until August 19. The final results of the survey will be available to the APS Executive Board at its September meeting.

The initiative for the survey arose from discussions at the Board's June meeting on how APS could be more effective in representing the physics community to the public. Many Board members felt that the confusion over the meaning of the word "physical" was a serious problem. As stated in Cohen's email, "the word 'physical' means several things to the general public, most often not physics. This causes confusion and uncertainty regarding what kind of organization APS is, and dilutes the impact APS can have in representing the physics community to the media, the government, and the public at large."

As *APS News* goes to press, member sentiment is running heavily in favor of the Board's proposal. Seventy-six percent of members are either strongly or moderately in favor, with eighteen percent strongly or moderately opposed. The remaining six percent are neutral. The survey response rate is close to 20%, slightly lower than the percentage that has voted in the annual Society-wide elections in recent years.

Name Change continued on page 3

It Ain't the Grammar

A large number of comments in opposition to the proposed APS name change were devoted to the issue of whether "American Physics Society" is grammatical. A few of these comments, randomly chosen from among many:

–"Physical" is an adjective to modify "Society". "Physics" is a noun and thus the wrong part of speech.

–This is more than a little silly. An adjective is an adjective and a noun is a noun.

–"Physics" is not an adjective, and should not modify a noun.

–The changed wording is illiterate and would give the public a very bad impression of our education.

–American Physics Society is...poor grammar.

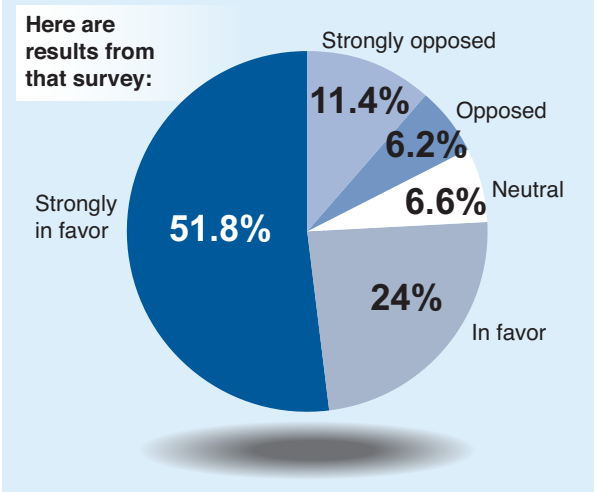
–I do not believe that "American Physics Society" is correct English.

This from people who work in physics departments, do physics experiments, teach physics courses using physics text books, go to physics conferences, attend physics lectures, solve physics problems and belong to the physics community. There is nothing wrong grammatically with "physics society". One may complain (and many did) that it doesn't sound as good as "physical society", or that it's hard to pronounce the two s's one right after the other. Appeal to your sensitive ear and less than nimble tongue if you must, but don't blame it on the grammar.

–Alan Chodos

APS name change?

At its June meeting, the APS Executive Board endorsed conducting a survey of the APS membership on their views of possibly changing the name American Physical Society to American **Physics** Society.



Source: APS survey

APS News staff

Committee Selects Twenty-six Undergraduate Minority Scholars

The APS Committee on Minorities has selected 27 students to receive its Scholarship for Minority Undergraduate Physics Majors for 2005-2006. The recipients include 16 new scholars and 11 renewal scholars.

Each new scholarship consists of $2,000, which may be renewed once, for $3,000. The scholarship may be used for tuition, room and board, and educational materials. In addition, minority scholars are paired with two mentors, one at their university and one from the Committee on Minorities. Physics departments that host a minority scholar each receive $500 for programs to encourage minority students.

The program, formerly known as the Corporate-Sponsored Scholarship for Minority Undergraduate Students Who Major in Physics, began in 1980. Since then, more than 300 students have received the scholarship, many of whom have gone on to receive PhDs in physics and are now working as physics faculty members in universities, as well as at corporations and national labs. Some past scholars have also become high school physics teachers.

The new minority scholars for 2005-2006 are a diverse group. They come from all over the country, including Puerto Rico. Among the 16 new scholars, four are women. They have all amassed an impressive number of awards and honors. Some have already engaged in physics research projects. In addition to their scholarly pursuits, these students participate in a dizzying number of activities, from sports to music to student government to volunteer work. The Scholars will attend diverse institutions, including Ivy

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Extravaganza on the Hill

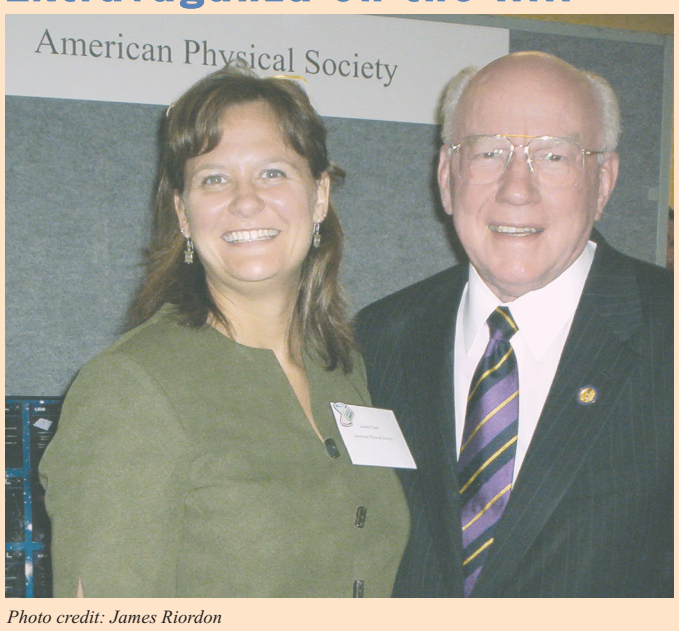

Photo credit: James Riordon

Representative Vernon Ehlers (R-MI) and APS Public Outreach Coordinator Jessica Clark stand in front of the APS World Year of Physics booth at a June 21 event on Capitol Hill promoting the National Science Foundation. Members of Congress and congressional staffers were able to see displays by universities, national labs and other organizations describing their NSF-funded projects. Ehlers is one of two physics PhD's in Congress, and is a Fellow of the APS. He introduced the resolution in the House of Representatives last year proclaiming 2005 the World Year of Physics.

Nuclear Physics Facilities Confront Funding Crisis

By Ernie Tretkoff

The US nuclear physics community appears to have survived a critical funding challenge this year, but prospects for continued operation of both its major experimental facilities in future years could still be in jeopardy.

In February, the President's budget request included funding cuts in the Department of Energy's budget for nuclear physics to $370.4 million, a reduction of 8.4% from FY05. The majority of the DOE budget for nuclear science is dominated by two large facilities—RHIC at Brookhaven and CEBAF at Jefferson Lab.

The level of funding recommended by the Bush administration would not have been enough to sustain both of these facilities, so it appeared that one would have to be shut down.

In March, the Director of DOE's Office of Science, Ray Orbach, and the NSF's Assistant Director for Mathematical and Physical Sciences, Michael Turner, jointly asked the Nuclear Science Advisory Committee (NSAC) for a plan to deal with the reduction in funding. In late June, a 23-member NSAC subcommittee, chaired by Robert Tribble of Texas A&M, came out with a recommendation–a slight preference for RHIC over JLab.

Congress has now voted for increased funding for nuclear physics, probably enough to continue to operate both labs in FY06, but a final budget has yet to be determined. And the Presidential requests in succeeding years are cause for additional concern.

At the level of the President's budget request, especially if that level of funding continued for several years, "it's really not possible to run these two large facilities," said Tribble. The subcommittee also studied priorities for several better budget scenarios.

RHIC and JLab both probe the workings of nuclear matter, but with very different approaches. RHIC smashes heavy ions together with the aim of creating a new form of quark-gluon matter, while CEBAF uses a continuous beam of high energy electrons to study the structure of nucleons.

"There's a lot of science going on. [RHIC and JLab] are unique in different ways. It's not obvious how to proceed," said Tribble. "There is a huge crisis if we have to turn one of the two machines off."

"Both are very young facilities that are beginning to produce exciting results," said Brad Sherrill, chair of the APS Division of Nuclear Physics and a subcommit-

Nuclear Physics continued on page 3

Highlights

Members in the Media

"There are theories that predict that we shouldn't get rays of this high energy on Earth. If they do exist, it's a sign we need some new physics."

–Patricia Rankin, University of Colorado, on an ultra high energy cosmic ray detector planned for Colorado, Denver Post, June 8, 2005

"If somebody hands you a watch and you want to know how it works, what we do is smash the watch and see what's left on the floor. We don't have a screwdriver to take apart atoms. So that's how we have to look at them."

–Stephen Pate, New Mexico State University, on the quark-gluon plasma created at RHIC, Albuquerque Tribune, June 13, 2005

"It sounds absolutely crazy. You send it up on a helium balloon the size of a football stadium to a height of 25 miles and it's floating around with the winds. But it's as reliable as launching a satellite and a lot cheaper and faster."

–Simon Dicker, University of Pennsylvania, on a balloon-based telescope, The Guardian, June 15, 2005

"It has been, let me say, a bad few years."

– Benn Tannenbaum, AAAS, on radiation detection systems and US border security, The New York Times, June 22, 2005

"His government funding sources told him in effect that 'You have shown that atmospheric carbon dioxide is increasing, now find some other interesting science to do.' He fought to continue his measurement series, with support from many other scientists, and was back taking data in May of 1964."

–F. Sherwood Rowland, University of California, Irvine, on global warming researcher Charles D. Keeling, who died recently, The New York Times, June 23, 2005

"There isn't a clear task. If you are a researcher you are trying to figure out what the question is as well as what the answer is. You want to find the question that is sufficiently easy that you might be able to answer it, and sufficiently hard that the answer is interesting. You spend a lot of time thinking and you spend a lot of time floundering around."

–Edward Witten, Institute for Advanced Study, on what he does all day, CNN.com, June 27, 2005

"We have, what? Thunder, the sound of waves, wind? There are dozens of weird sounds in space."

–Donald Gurnett, University of Iowa, on sounds in space, Chicago Sun Times, June 29, 2005

"In order to do the experiment, we needed a more powerful radar transmitter. The director of Lincoln Laboratory called the Air Force and got $500,000 for funding simply over the phone. He called it a Christmas present."

–Irwin Shapiro, Harvard University, on experiments he did in 1966-67 confirming Einstein's predictions, Boston Globe, June 30, 2005

"NASA is good at fixing the last accident."

–Douglas Osheroff, Stanford University, on the space shuttle, Los Angeles Times, July 4, 2005

"By changing we're talking about a millionth of a second per day. But long term slowing is due to the moon. It's about 1.5/1000th of a second slower per century. The day is longer today than it was in 1905."

–Tom O'Brian, NIST, on the leap-second to be added at the end of 2005, LiveScience.com, July 5, 2005

"It's like Columbus sighting land and then saying, 'Okay, let's go back.'"

–Stamatios Krimigis, Johns Hopkins University, on the possible canceling of the Voyager mission, Scientific American, July 4, 2005

"Newton easily is the best physicist, and arguably the best mathematician of all time."

–Sean Carroll, University of Chicago, Chicago Sun-Times, July 3, 2005

"We thought that was so amazing, we held a big party."

–Robert Goldston, Princeton Plasma Physics Laboratory, on using fusion in 1972 to generate one tenth of a watt of electricity for one hundredth of a second, Newsweek, July 11, 2005

This Month in Physics History

Einstein Predicts Stimulated Emission

The laser's invention launched a multi-billion dollar industry. Lasers are used to remove unwanted tattoos; to correct vision defects in laser eye surgery; to cut through steel and other materials in industrial assembly lines; to scan prices in supermarkets and department stores; for optical communications and optical data storage; and in electronic devices like CD and DVD players. The root of all this technological innovation lies in fundamental physics research, specifically, a 1917 paper by Albert Einstein on the quantum theory of radiation.

Einstein with his second wife, Elsa.

"Laser" is an acronym for Light Amplification by Stimulated Emission of Radiation. It describes any device that creates and amplifies a narrow, focused beam of light whose photons are coherent. In a laser, the atoms or molecules of the lasing medium–either a crystal like ruby or garnet, or a gas or liquid–are "pumped," so that more of them are at higher energy levels than at the ground state.

The end result is a sudden burst of coherent light as the atoms discharge in a rapid chain reaction. This process is called "stimulated emission." Albert Einstein first broached the possibility of stimulated emission in a 1917 paper, having turned his attention the year before from general relativity to the interplay of matter and radiation, and how the two could achieve thermal equilibrium. Einstein devised an improved fundamental statistical theory of heat, embracing the quantum of energy.

First, Einstein proposed that an excited atom in isolation can return to a lower energy state by emitting photons, a process he dubbed spontaneous emission. Spontaneous emission sets the scale for all radiative interactions, such as absorption and stimulated emission. Atoms will only absorb photons of the correct wavelength: the photon disappears and the atom goes to a higher energy state, setting the stage for spontaneous emission. Second, his theory predicted that as light passes through a substance, it could stimulate the emission of more light.

Einstein postulated that photons prefer to travel together in the same state. If one has a large collection of atoms containing a great deal of excess energy, they will be ready to emit a photon randomly. However, if a stray photon of the correct wavelength passes by (or, in the case of a laser, is fired at an atom already in an excited state), its presence will stimulate the atoms to release their photons early–and those photons will travel in the same direction with the identical frequency and phase as the original stray photon. A cascading effect ensues: as the crowd of identical photons moves through the rest of the atoms, ever more photons will be emitted from their atoms to join them.

It wasn't until the 1940s and 1950s that physicists found a use for the concept, even though all that was required to invent a laser was finding the right kind of atom, and adding reflecting mirrors to fortify the stimulated emission process by producing a chain reaction. Charles Townes had worked on radar systems during World War II. After the war ended, he turned his attention to molecular spectroscopy, a technique that studies the absorption of light by molecules. Just like radar, molecular spectroscopy bombards the surface of molecules with light and analyzes the scattered radiation to determine the molecule's structure.

But the technique was limited by the wavelength of the light produced: in this case, the microwave regime of the electromagnetic spectrum. Townes noticed that as the wavelength of the microwaves shortened, the more strongly the light interacted with the molecules, and the more one could learn about them. He thought it might be possible to develop a device that produced light at much shorter wavelengths. The best way to do this, he thought, would be to use molecules to generate the desired frequencies through stimulated emission.

Townes mentioned the idea to a colleague (later his brother-in-law), Arthur Schawlow, who proposed that the prototype laser be fitted with a pair of mirrors, one at each end of the lasing cavity. Photons of specific wavelengths would then reflect off the mirrors and travel back and forth through the lasing medium. By doing so, they would in turn cause other electrons to relax back into their ground states, emitting even more photons in the same wavelength. So only photons in the selected wavelength and frequency range would be amplified.

The two men wrote a paper detailing their concept, published in the December 1958 issue of the *Physical Review*, although they had yet to build a working prototype. They received a patent for their design two years later–the same year that the first working laser was built by Theodore Maiman at Hughes Aircraft Company.

Further Reading:

Pais, Abraham. Subtle is the Lord: The Science and the Life of Albert Einstein. New York: Oxford University Press, 1982.

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Blume, Ginsparg Receive Meritorious Achievement Award

The Council of Science Editors has presented its highest award, the Meritorious Achievement Award, to two co-recipients, Martin Blume and Paul Ginsparg. Blume is APS editor in chief, with responsibility for all of the *Physical Review* journals, *Physical Review Letters*, and *Reviews of Modern Physics*. Ginsparg is a professor of physics and computing and information sciences at Cornell University, and founder of the Los Alamos Electronic Preprint Archive.

The CSE's primary mission is promoting excellence in the communication of scientific information. According to a CSE statement, Blume and Ginsparg were honored "for their unique contributions, vision, leadership, integrity, and passion," which "have forced editors and publishers to re-evaluate old and current procedures, policies, and modes of disseminating information… helping to ensure the viability of science journals, in whatever form they may take, as well as the work of science editors and publishers."

Ginsparg received a PhD in physics from Cornell. He has held academic and research positions at Harvard, Los Alamos National Laboratory, and Cornell, specializing in quantum field theory and string theory and digital knowledge networks.

In 1991, he developed the Los Alamos Electronic Preprint Archive, now called arXiv, an open eprint service with more than 1 million articles in physics, and tens of thousands of articles in mathematics, nonlinear science, computer science, and quantitative biology.

Blume received a PhD in physics from Harvard. Following a Fulbright Fellowship at Tokyo University, he held positions at the Atomic Energy Research Establishment in England, Brookhaven National Laboratory, and the State University of New York at Stony Brook.

Blume helped develop the APS Guidelines for Professional Conduct, including supplementary guidelines on Responsibilities of Coauthors and Collaborators, Research Results, and References in Publication. He frequently writes and speaks about the challenges of electronic publishing.

I'm Shocked, Shocked

As part of the World Year of Physics outreach effort organized by APS, 20 "physics on the road" teams are traveling the country supported by funds from NSF, DOE and NIST, bringing physics to the public arena. Here a passerby in a Syracuse, NY shopping mall has a chance to place her hand on a charged Van de Graaf machine, with hair-raising results. The event was organized by the "Orange Physics" team from the physics department at Syracuse University.

Washington Dispatch

A bimonthly update from the APS Office of Public Affairs

ISSUE: RESEARCH FUNDING

Congress has begun drafting its appropriations bills and the news is generally good for science funding given the current fiscal environment and the presidential request. The exception is the National Science Foundation (NSF), for which the Senate Appropriations Committee approved only a 1.1% increase over the FY05 budget of $5.47B but $74M less than the President's request of $5.61B. The House approved a 3.1% increase for NSF, $38M more than the request. The Department of Energy Office of Science has fared much better in Congress than in the President's budget, which requested a cut of 3.9% from FY05 budget of $3.6B. The Senate bill would increase the budget by 2.8%, while the House bill would increase the budget by 1.8%. The NIST Scientific and Technical Research and Services (STRS) account would see an increase from the FY05 level of $378M to $398M (5.3%) in the House bill and to $400M (5.8%) in the Senate bill. For the Department of Defense basic and applied research accounts, the House reversed the deep cuts in the presidential request and approved a 2.2% increase over the FY05 level of $6.36B. The Senate has yet to mark up its Defense spending bill.

After both the House and Senate have approved an appropriations bill, the two versions are sent to a "Conference" committee composed of members from both chambers. The reconciled bill is then sent back to both chambers for approval before going to the President for his consideration. The progress of all spending bills is tracked at the AAAS website: http://www.aaas.org/spp/rd/approp06.htm.

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ISSUE: ENERGY AND NATIONAL SECURITY

As previously reported, the APS Panel on Public Affairs (POPA) issued a Discussion Paper on nuclear power and proliferation resistance titled, "Securing Benefits, Limiting Risk." The chair of the study, Dr. Roger Hagengruber of the University of New Mexico, testified before the House Science Subcommittee on Energy on June 16th at a hearing on nuclear waste reprocessing. Hagengruber noted that the POPA report, although not ruling out the eventual need for reprocessing, concludes that no immediate decision is necessary and that a rush to implement it could "threaten future growth of the use of nuclear energy." Referencing the West Valley debacle (the only US attempt at commercial reprocessing that took place in the 1960's), Hagengruber said that "we must be cautious and not rush into reprocessing again until the safety, proliferation and cost issues are well understood and addressed properly." The POPA position is at odds with the House Energy and Water Subcommittee report, which calls for reprocessing by 2007. To view the testimony, please go to House Science Committee website (http://www.house.gov/science/welcome.htm) and go to the Webcast link. To view the study report, please go to http://www.aps.org/public_affairs/proliferation-resistance/.

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ISSUE: GLOBAL COMPETITIVENESS

Rep. Frank Wolf (R-VA 10th), Chairman of the Appropriations Subcommittee on Science, State, Justice, Commerce and Related Agencies, has called on President Bush to triple the innovation (basic research) budget for the physical sciences, math and engineering in order to address high-tech competition from abroad. He has also directed the Department of Commerce to hold an Innovation Summit in Washington this fall, which will be organized with help from the House Science Committee. At Wolf's suggestion, a group of high-level industrial CEOs and former CEOs has petitioned the White House for a meeting with President Bush to discuss the need for a national innovation initiative.

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

NUCLEAR PHYSICS CONTINUED FROM PAGE 1

tee member. "There are large user communities, including people from overseas, who rely on these facilities." No comparable facilities exist overseas, he said. Losing either of these labs would be a huge blow to the field, he said. "From a broader perspective, if you took out one piece, you're missing an important piece of the science."

The DNP urged its members to share their views on the potential crisis at a town meeting at the APS April Meeting, and on a web forum, said Sherrill.

Under the worst-case budget scenario, the subcommittee recommends a "slight preference" for RHIC over JLab, reasoning that RHIC is still in a "discovery phase." RHIC has produced evidence for quark-gluon matter, in which quarks and gluons, normally confined into nucleons, come unbound. RHIC scientists are only beginning to investigate the properties of this strange new state of matter, which some say may resemble a state that existed in the very early universe.

Even though not everyone will be happy with the recommendation, Sherrill said he thought the nuclear physics community responded well to a very difficult situation. "I think it was a very thoughtful response. Obviously, declining budgets threaten a lot of people in the field. The community as a whole worked together without a lot of divisive infighting," said Sherrill.

Now that the difficult choice has been made, it looks like the worry may have been premature. In June the House voted to increase the DOE budget for nuclear physics by about one percent over FY05, to $408.3 million, and the Senate voted for an even larger budget of $419.7 million. In its report, the NSAC subcommittee also considered budget scenarios close to what Congress has passed. Under these circumstances, neither RHIC nor the JLab facility would have to be shut, said Tribble. The subcommittee also recommended that with the higher levels of funding, JLab should be able to proceed with its planned upgrade to 12GeV.

This response from Congress may be due in part to efforts by the nuclear physics community to inform lawmakers of the importance of funding nuclear physics. Nuclear physicists took the potential crisis very seriously, said Sherrill. They wrote letters, visited congressional offices, and participated in the town meeting to share their views, he said. APS also had a general letter-writing campaign, in which members wrote letters urging Congress to support funding for physical sciences.

Congressmen were receptive to these efforts, said Sherrill. "Generally we had a very good response from lawmakers. It's really encouraging that both the House and Senate are recommending increases over the President's request," he said.

NAME CHANGE CONTINUED FROM PAGE 1

Another issue raised implicitly by the Board was whether the name American Physical Society should be retained for internal purposes. In Cohen's email message, members were informed that "the Board is mindful of the 106-year history of the American Physical Society, and would continue to use this name for internal purposes, such as our journals and prizes."

However, in their comments, both those in favor of the name change and those opposed by and large rejected this idea. A typical comment from a member strongly in favor was "if you are going to change the name, go all the way; 'Physical' should not be used even internally." Another said "Keeping 'Physical' for internal use may sastify nostalgia but will necessitate duplication and a constant need for explanation. I vote for clean change to American Physics Society." A member who was strongly opposed said "I'm particularly opposed to the concept of having two identities, which is bound to lead to significant confusion."

Many of those who responded in favor had personal experiences to recount regarding confusion over the word "physical." Said one, "I now work in a non-academic field (venture capital). Trust me on this...95% of the people I know and work with have no idea what 'physical society' means. Sounds like an aerobics organization. And these people are not idiots, they are engineers, businesspeople etc. CHANGE THE NAME!"

Another person commented, "Many years ago during an APS March Meeting, a colleague met me in a bar for a drink. The illustration on the cover of that year's program was a Buckyball. My colleague, while heading to the bar, overheard a couple of people on a street corner, where one said 'What is this American Physical Society?' The other said, 'They must be Physical Education instructors, because they have a soccer ball on the book they all carry'."

Many of those in opposition noted that the name American Physics Society was less inclusive. Said one opposed member, "There is more than just physics to the American Physical Society. The word physical is more inclusive. APS represents materials scientists, polymer scientists, etc. who do not consider themselves exclusively physicists." Added another, "The change from physical to physics suggests an exclusion of physical scientists who are not physicists, e.g., physical chemists, physical biologists. As a physical chemist working in the area of biophysics and biological physics, I find the name change ill-advised."

"Many of these comments make valid points," Cohen said, "I was especially struck by the opposition to having two names, and by the contention that 'physical' is a more inclusive term than 'physics'. The Board will consider action on both issues when it meets in September."

Letters

Collaboration with Iran could be risky

Ernie Tretkoff's reporting on the status of Iranian physics and Hessamaddin Arfaei's efforts to improve Iranian scientific collaboration with the international community is not just important reportage but also provokes many questions that we should ask ourselves as well as our prospective collaborators.

I do not know Professor Arfaei, and on simple principles of human rights and freedoms, I concur with his desire to improve the access that Iranian scientists wish to have to their peers in order to participate in and stimulate the very best in intellectual pursuits of truth and knowledge. The APS has been in the forefront of promoting human rights by way of supporting efforts of internationally recognized physicists to resist totalitarian suppression of freedom of speech and freedom from oppression. Perhaps Anatoly (Natan) Sharansky is one of the best known poster children of the physicists' determination to fight totalitarianism.

At the same time, I would wish to examine the broader implications of promoting freer access to the scientific community for Iranian scientists. Does, for example Professor Arfaei's desire for more international collaboration extend to any non-Muslim scientists that may still, if unlikely, remain in Iran? Does his humanitarian position include all Jews and Christians in the Iranian scientific community?

Perhaps just as important, if not more so, what are the implications for giving Iran access to more scientific exchange? Given that the Iranian government has moved in the recent rigged elections to a more restrictive fundamentalist regime, which is intent on furthering its development of offensive nuclear weapons (and I cannot take seriously anyone who disagrees with this premise), what is the wisdom of collaboration in areas of science that further enables the goals of a totalitarian regime, despite the yearnings of individuals who would wish to think and work unfettered? Were we not concerned during World War II that the Germans would reach the nuclear advantage before us, thus the secrecy and breakneck effort of the Manhattan Project? What is Iran's Manhattan Project, and do we wish to find out eventually that we helped to support it, if unwittingly?

I support the long-term objectives of freedom of access. An open society is apt to be a more democratic society, given that an economic depression does not destabilize the political institutions, as happened in Germany.

However, I believe that we should also ask ourselves what we are exposing ourselves to in terms of global risk. I cannot fully answer that question on my own, and believe that we should have a healthy discussion on the implications of our position and efforts.

This is and always has been the key dilemma of science in a free and democratic society: What is the proper balance between free and open expression of intellectual activity and the need to act responsibly to guard the security of the culture that enables such freedom?

Jeff Schoenwald
Irvine, CA.

Council slights one ex-President

The June 2005 issue of *APS News* featured four tributes to former APS presidents who had died within the previous year. The first three begin "The Council of the American Physical Society notes with great sadness...". The fourth, however, omits the adjective "great".

I don't know if this inconsistency is in the original resolutions, or if it was introduced in the reproductions that appeared in *APS News.* In either case, I assume it was purely accidental, and reflected no differing degree of emotion.

Nevertheless, it caught my eye. Perhaps more care might be taken in the future to standardize this language.

Richard Helms
Ithaca, NY

Metric system: political football?

Ernie Tretkoff's April article,"US Could Soon Be Playing Second Fiddle In Areas of Science and Technology," should be printed up as a pamphlet and sent to our colleges and universities, to be distributed to our students, faculties, and administrators alike. On the other hand, in one important area of science and technology, the US has not even been playing second fiddle–it is not in the orchestra at all! Were it not for one, or perhaps two, very small countries, the US would be the only country in the world that is not on the metric system. It is therefore not just a question of the federal government increasing funding to American colleges and universities to support research and education, it is a question of whether the federal government is going to appropriate whatever is necessary to convert the US to the metric system as soon as possible.

It is an enormous and expensive task, but it has to be done. It is unquestionably more important to the country than making plans to go back to the Moon and on to Mars lugging, as it were, the British system of units along with us.

Meanwhile, while waiting for Congress and the Administration to act, our colleges and universities could help to alert and to educate the public by carrying out such a conversion on a small, relatively inexpensive, but pedagogically valuable scale–they could do this by converting their football fields from 100 yards to 100 meters. The 100 meter football field, as I pointed out in 1996 in the *American Scientist*, can be used to make the learning of physics easier for our students.

Such a football field conversion by our colleges and universities might help to arouse the public to remind Congress of its Constitutional responsibility in this area, and to take the necessary action. The future of the US very much depends upon it.

Frank R. Tangherlini
San Diego, CA

Viewpoint...

A More Effective Approach to US Security

By Frederick Lamb

Nuclear weapons are the only weapons that could kill millions of people almost instantly and destroy the infrastructure and social fabric of the United States. Even a simple fission weapon can release a million times more destructive energy per kilogram than conventional explosives such as TNT. For these reasons, nuclear weapons were for decades considered the only weapons of mass destruction. However, in recent years there has been a tendency to include radiological weapons ("dirty bombs"), chemical weapons, and biological agents in this same category. Broadening the definition in this way obscures the profound differences in the lethality and destructiveness of these weapons, the timescales on which their effects are felt, and the possibility of protecting against them. It also distracts us from focusing on the most dangerous threat, the threat posed by nuclear weapons.

A device that spreads radioactive material is a weapon of mass disruption, not mass destruction. Release of radioactive material in a city would not physically damage structures or immediately injure anyone, but probably would contaminate a few city blocks with intensely radioactive material and a larger area with more weakly radioactive material. (If explosives were used to disperse the material, the explosion could cause a small amount of damage and some injuries.) Depending on their exposure to radiation and how they were treated, hundreds or perhaps even thousands of people could become sick. A larger number could have a somewhat higher probability of developing cancer and other diseases decades later. However, the main effect of a radiological weapon would be to create fear and disrupt normal activities.

Release of a toxic chemical in a city would create fear, disrupt normal activities, and possibly cause a large number of casualties, but would not cause mass destruction. The most deadly chemicals, such as nerve gases, are complicated to synthesize, extremely dangerous to handle, and difficult to use effectively. A complex long-term effort would be needed to develop and effectively deliver such an agent. If dispersed effectively, a chemical agent could contaminate a substantial area and, if toxic enough, might cause hundreds or perhaps even thousands of casualties, but it would not destroy buildings or vital infrastructure. Precautions before such a release and rapid medical treatment and decontamination afterward could reduce substantially the number of casualties, especially for less deadly agents.

Release of a biological agent would likewise create fear and disrupt normal activities, but would not cause mass destruction. In order to cause mass casualties, substantial amounts of agents such as anthrax, smallpox, and plague would have to be converted into tiny particles and then dispersed in an aerosol. Because these agents are so deadly, the required forms and the equipment needed to disperse them are difficult to come by. A pathogen such as anthrax that does not produce contagious disease could be used to attack a particular building or city, but a pathogen such as smallpox that produces a deadly contagious disease would be a "doomsday" weapon, because it could kill millions of people around the globe, including the group or nation that released it. In countries with an effective public health service, prompt quarantine, vaccination, and other measures could reduce the number of casualties, the area affected, and the time required to get the disease under control. In less developed countries, a contagious deadly disease could be devastating.

In contrast to a chemical or biological agent, a "small" (10 kiloton) nuclear weapon detonated in a major city would kill more than 100,000 people and reduce tens of square kilometers to rubble almost instantly. Even a crude nuclear device that fizzled would destroy many square kilometers of a city and kill tens of thousands of people. A large (1 megaton) nuclear weapon could kill millions of people and destroy hundreds of square kilometers within a few seconds. Those who survived a nuclear explosion would have to deal with severe physical trauma, burns, and radiation sickness. Vital infrastructure would be destroyed or damaged, and radioactivity would linger for years near and downwind of the explosion. Unlike the effects of a chemical or biological weapon, the devastating effects of a nuclear weapon on a city cannot be reduced significantly by actions taken before or after the attack.

How might a nuclear weapon be delivered to a US city? The current administration has tended to focus on the possibility that an emerging missile state such as North Korea or Iran could use long-range ballistic missiles capable of striking the United States. However, the US intelligence community considers long-range ballistic missiles the least likely method an enemy might use to attack the United States, and no emerging missile states currently have missiles that

Viewpoint continued on page 5

Congress Destroying US Economy

Senator Bingaman gave a thoughtful but incomplete analysis of the perils of the continued reduction in the funding of research and development in the U.S. ("Maintaining America's Competitive Edge." Back Page, June 2005). Unfortunately, he concentrated on the symptoms rather than on the disease. He lamented the decline in interest in science, engineering and technology on the part of American students today, but he did not inquire as to why this is happening.

The day after I read the Senator's article, I read the story in the *New York Times*, "Cutting Here, but Hiring Over There," (June 24, 2005) which tells how one of our largest and best-known American technological firms is laying off "up to 13,000 workers in Europe and the United States" and that it "plans to increase its payroll in India this year by more than 14,000 workers." Students can read these stories and can see that the evidence points to a future in which they invest time and money to become skilled in science and technology. They then take technological jobs and about the time they are approaching mid-career, the present pattern suggests that they will be replaced by technologists from low-cost countries. They may be fired, without pensions or health care.

Both parties in the Congress eagerly embraced the expansion of trade that has brought these things about. Free trade was, and is, politically correct. This has allowed the major national retail discount stores to lower the prices they are willing to pay to suppliers. When American suppliers can't meet the demanded lower costs, the production contracts go to companies in foreign countries where wages and benefits are low. So American factories have been forced to close, devastating the economies of towns and cities where it is difficult for fired workers to find new employment. The U.S. trade deficit has soared because our low-cost suppliers do not return the favors and purchase goods made in America as was promised. So the two-way trade so strongly favored by the Congress is now working as follows: the low-cost producers export manufactured goods to us and in return, they import our dollars, which gives them the money needed to buy America's companies and resources. This strengthens their economies and their military establishments while weakening ours.

It is a classic case of sub-optimization. Our entire national well-being is being sacrificed in order to minimize the cost of goods in the big national supermarts. The Congress has put in place a system that is destroying major sections of our manufacturing and technological infrastructure. We shouldn't wonder why so few American students are choosing to study in the fields of science and technology. They can see the handwriting on the wall, but Congress can't, or won't.

It is difficult to understand the logic of the present situation in which the U.S. is exporting jobs and is importing people. We are exporting high-end jobs in science and technology, middle level jobs in manufacturing, and low end jobs in agriculture. At the same time we are importing people to compete with Americans.

This methodical destruction of our economy won't be fixed by sincere analyses of the symptoms. Both parties in the Congress have to step back and look at the long-term consequences of the policies they have so eagerly embraced and then address the illness, not the symptoms.

Albert A. Bartlett
Boulder, CO

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MORE LETTERS FROM PAGE 4

Article misrepresents CLAS role

I was particularly troubled by your headline article by the CLAS Collaboration and I wish that APS had researched the situation. If one looks at *Phys.Rev.Lett.*92:032001, 2004, Erratum-ibid.92:049902, 2004, then one can see that the CLAS collaboration claimed a 7.8 sigma effect FOR a pentaquark. This is by far the most significant evidence for a pentaquark.

The headline article gives the impression that CLAS played a major role in casting doubt on the 1540 state. A more honest article would have been to try to explain how they found such a significant result in a previous report.

The main evidence against the pentaquark states does not come from CLAS, but rather from large collaborations that have a history of careful reports, systematic studies, and detailed analyses. Generally, collaborations do not report a negative result in a journal article, but rather these results percolate out to the field in conferences and seminars.

This article truly misrepresents the CLAS experiment's role in the search for pentaquarks. I am happy that they now agree with most other experiments.

John Cumalat
Boulder, CO

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CLAS spokesperson responds

While the headline of the *APS News* article was accurate, the article was unclear on one point. The latest CLAS measurement repeated a previous experiment by the SAPHIR collaboration and found a null result. It did NOT repeat the CLAS measurement on the proton which showed a 7.8 sigma pentaquark peak (that measurement was at higher beam energy and studied a different reaction channel). We plan to repeat that experiment with much higher statistics in about a year.

The article emphasizes the results from the CLAS collaboration, but does not ignore previous null results. In fact, the article states "But other studies soon produced null results, casting doubt on the original positive sightings."

One reason the new CLAS results are significant is because it was not clear that the previous null results had the sensitivity to see a pentaquark signal. For example, please see preprint nucl-th/0408001 which shows, in a theoretical model, that pentaquark production infragmentation-dominated reactions are highly suppressed.

When the existence of a signal is controversial, the scientific method is to repeat an experiment where the signal has been seen. The CLAS experiment presented at the Tampa meeting (which found no Theta+ signal in the same experimental conditions as the SAPHIR measurement) was the first to do this with high statistics. Previous null results (such as those at Fermilab) did not repeat a positive-evidence experiment.

John Cumalat has legitimate concerns about the lack of publicity for previous null results. However, we would urge the "large collaborations" to publish their negative results so we can judge all the evidence.

In any case, the important issue is whether the Theta+(1540) pentaquark exists. Currently, there are as many positive reports (many from "large collaborations that have a history of careful reports ...") as negative results. The last talk at the Tampa APS meeting on pentaquarks in fact was a positive result regarding another pentaquark state, the Theta++. Given that there are many different initial states and production mechanisms, one negative result can not be definitive. This issue will not be closed until other high-significance results are also repeated, such as the 7.8-sigma result seen earlier by CLAS.

Larry Weinstein
Norfolk, VA

US SECURITY CONTINUED FROM PAGE 4

could reach the US homeland.

Russia currently has about 6,000 nuclear-tipped intercontinental-range missiles capable of striking the US homeland and China has about 20, but neither North Korea nor Iran currently has missiles capable of reaching the United States. The longest-range missile North Korea has tested (once, in 1998) is its Taepodong I. With two stages, this missile is thought capable of lofting a nuclear warhead about 2,000 km, half the distance required to reach Alaska from North Korea and about a third the distance needed to reach Hawaii. In the 1998 test, a small third stage was added and blew up in flight. If the Taepodong I had a third stage that worked, it could probably loft about 500 kg, less than the mass of an unsophisticated nuclear warhead, a distance of 3,000–4,000 km, less than the distance to Alaska or Hawaii. North Korea has for a decade been reported to be working on a more advanced missile, the Taepodong II, which might be able to loft a nuclear warhead far enough to reach Alaska or Hawaii but probably not other parts of the United States. Iran has tested a ballistic missile that has a range of 1,300 km and is reportedly developing a more advanced missile that is expected to have a range of 2,000–3,000 km, far less than that needed to strike the United States.

Developing a system that can deliver a nuclear weapon using a long-range ballistic missile requires mastering many challenging technologies. The nuclear warhead must be light enough to be carried by the missile and must be capable of surviving the harsh conditions of launch and re-entry at hypersonic speeds. If the attacker has only a few nuclear weapons, the missile must be reliable and accurate enough to risk using it to deliver a weapon.

Partly for these reasons, the US intelligence community has long judged that the United States is more likely to be attacked using shorter-range ballistic or cruise missiles. For example, several countries are considered technically capable of developing the technology to launch short- or medium-range ballistic missiles or land-attack cruise missiles against the United States from ships or other platforms positioned off our coasts. A commercial surface vessel could be covertly equipped to launch cruise missiles, providing a large and potentially inconspicuous launch platform and at least some deniability. Proliferation of nuclear weapon technology and materials increases the risk of such attacks.

The national intelligence community considers delivery of a nuclear weapon by non-missile means, such as a truck, shipping container, boat, or barge more likely than delivery by a missile, because these methods are easier and less costly to acquire than a missile, are more reliable and accurate than the missiles of emerging missile states, could be prepared covertly, and—importantly—could be used without immediate attribution. In contrast, the launch of a ballistic missile against the United States could be detected and identified within seconds by our missile warning and tracking systems. A nuclear attack by terrorists using non-missile means is considered more likely than an attack by a nation-state, in part because terrorists are less likely to be deterred by the threat of retaliation.

According to the March 31, 2005, report of the US Government Accountability Office, $85 billion has been spent on ballistic missile defense programs since fiscal year 1985, mostly on programs to defend against long-range missiles. An additional $66.5 billion is expected to be requested between now and fiscal year 2011 to continue these programs. So far this effort has not produced a system that would be effective against a realistic ballistic-missile attack. But even if a system that would be effective against such an attack were available and could be deployed now, it would be virtually irrelevant for defending against the kinds of nuclear attacks that are considered most likely. Focusing our attention and scarce resources on a system that, even if successful, would address only the least likely threat to the United States is unwise, especially when the dangers posed by other threats are growing.

In recent years, nuclear weapon materials and designs have been traded and sold by governments unfriendly to the United States and by unofficial networks, such as the A.Q. Khan network based in Pakistan. The nonproliferation regime based on the Nonproliferation Treaty is currently facing important new challenges. In this situation our nation's top priority should be to maintain and strengthen the nonproliferation regime, reduce existing nuclear arsenals, halt the spread of nuclear weapons and technologies, and prevent their theft, diversion, or sale to terrorist groups.

If we do not make a more strenuous effort to halt and reverse nuclear proliferation and prevent nuclear terrorism, it is inevitable that a nuclear bomb will eventually explode in a US city. This catastrophe can be prevented by taking appropriate actions. We should take the actions now that we will demand after a bomb explodes. Failure to do so would be inexcusable.

Frederick K. Lamb is Professor of Physics and Astronomy, and Director of the Center for Theoretical Astrophysics, at the University of Illinois, Urbana-Champaign. He was the co-Chair of the APS study group on boost-phase intercept systems for national missile defense.

Viewpoint...

Scientific Literacy and Education Reform

By Warren Huelsnitz

Our nation's economic growth, national pride, and national security, as well as continued improvements in quality of life, all require a strong investment in basic scientific research. In addition to cash, one very essential resource for the scientific community is the talented people that do the research. However, the scientific literacy of the general public is at an unacceptably low level and many people believe that physics is irrelevant, boring, and too difficult. We need to instigate a paradigm shift throughout our society in order to assure a continued stream of quality researchers and research funding into the future. The focus needs to be at the beginning, with a dramatic change in how we educate our citizens. The usual efforts to educate the public and get them excited about science, such as public outreach programs and television shows, will not solve our problems any time soon, if ever.

Many surveys and studies, including various National Science Foundation reports, indicate that the scientific literacy of the American public is disappointingly low and not improving. I don't need everyone to understand QCD, or string theory, or how extra dimensions can solve the hierarchy problem. But it would be nice if the general public understood the scientific process and was able to use logic and reasoning. People should understand that there is a difference between having a scientific basis for something and not having one. They should be able to use logic and reasoning to debate issues and make public policy decisions that affect our lives, rather than just going with who can win a popularity contest or what their own personal beliefs and misconceptions are.

Cable TV programs on string theory, time travel, or the origin of the universe, are great. I love watching them. But these programs are just 'preaching to the choir'. The only people watching them are those who are already interested in physics. The bulk of the public does not watch them and does not even care that they are on. Additionally, there are a significant number of great, hands-on outreach programs around the country. But these programs contact too small a subset of the population and for too brief a period of time. The end result is that we are just treading water and not making any significant breakthroughs in our nation's scientific literacy. We need to get at the root cause of our nation's lack of scientific literacy. To do this, we need a captive and receptive audience, one that is still impressionable, and where we have an opportunity to reach all of society. We can find this in our nation's elementary and secondary education system.

We need to change the mentality of how math and physics are taught in elementary and secondary schools. We need to make science interesting, not just the memorization of lists or cataloging of facts. Students need to realize that there are still areas where they can make significant breakthroughs and significant contributions. We need to promote our heroes and the significance of their amazing theoretical or experimental accomplishments. But we also need to promote the "average" physicist who is having fun and doing great things so people don't get intimidated by believing that you have to be Einstein in order to be good at physics. We need to show real people doing real science and making real breakthroughs.

To dramatically improve the scientific literacy of our nation, young students need to learn at an early age that math and science are fun and can lead to a great future. They also need to learn that being smart, working hard, and being successful are cool. To accomplish this, we are going to have to overcome a significant amount of inertia that is the status quo in our country's public education system. Actors, musicians, and athletes are important parts of our culture, but so are scientists and engineers.

Warren Huelsnitz is Director of the Navy Nuclear Power School in Charleston, South Carolina.

Native American Physicist Pursues Career at Caltech

By Ernie Tretkoff

Former APS Corporate Minority Scholar J. Sequoyah Aldridge, a member of the Cherokee Tribe, recently received his PhD and is now a physicist at Caltech, making him one of a small number of Native American physicists. Aldridge, a 1/8 degree Cherokee, is the great grandson of Sequoyah Trottingwolf, after whom he is named.

Aldridge grew up in Escondido, California, a suburb of San Diego. As a child he demonstrated an aptitude for math and science. "At a young age, to keep myself occupied, I took math classes at a community college," he said. He says he became interested in physics at about the same time. At age 11, he started taking classes at Palomar College. At age 13 he took calculus, and obtained the highest grade in the class. Aldridge attended San Pasqual High School, but after two years he had taken all the science and math classes the school offered, and was looking for more advanced coursework. So he decided to enter college early, and in 1991, at age 15, he enrolled at Caltech.

He applied for and received the APS Corporate Minority Scholarship, which he says was valuable to him. "Everything helps," says Aldridge.

The young Aldridge found Caltech very challenging academically. He remembers no particular role model or mentor, and never knew any other Native American physicists, but says that did not deter him from pursuing a career in physics. He did not find any particular challenge in being a minority in physics, he says.

Aldridge spent three years at Caltech as a physics major, and then transferred to the University of California, San Diego, where he completed his BS in 1997. He obtained his PhD in December 2004 from the University of California, Santa Barbara, working on micro-electromechanical systems (MEMS) and nano-electromechanical systems (NEMS), with advisor Andrew Cleland.

Recently, Aldridge accepted a position as a research engineer in condensed matter physics at Caltech. "It's weird to be back at Caltech" as a scientist rather than as a student, he says. His work involves applying NEMS devices for use as mass sensors.

He is also now happily married, and has a 1-year old daughter, who will also become a member of the Cherokee tribe.

Aldridge says he never doubted his choice of physics as a career, and he advises other young minority students to pursue science if they are interested in it, and not give up. "They should go ahead and go for it if they are really interested," he says.

MINORITY SCHOLARS CONTINUED FROM PAGE 1

League universities and historically black colleges and universities. They have expressed interest in many areas of physics, including astrophysics, biophysics, and nuclear physics. One plans to become a doctor, another dreams of becoming an astrophysicist with NASA. But they are alike in their passion for physics, their curiosity about how the world works, and their love of solving problems.

A member of the Chippewa tribe, new minority scholar Anton Gereau, says he wants to go into nuclear physics, in part because he is concerned about pollution and the need to reduce our reliance on fossil fuels. He also just likes solving physics problems. "I like that it gives me a real-world scenario to use math," he says. Gereau says he first became interested in physics, somewhat by chance, in eighth grade. "I had to do a report on someone, and I just happened to choose Einstein," he says. Gereau also enjoys scuba diving, rock climbing, and reading. He's spending the summer in California before heading off to Rensselaer Polytechnic Institute in the fall.

Lara Autrey-Rodriguez, of Houston, Texas, is a determined young woman who will be attending Yale University in the fall. In 11th grade, physics was not a required class, but she decided to try it, and found she loved the subject. Physics appeals to her because it shows "how everything fits together," she says. She admits she has some fears about studying physics in college. "Physics is a real challenge. I'm scared of doing physics, but I want to challenge myself." Autrey-Rodriguez believes she can break the stereotype of physics being for nerdy white males. "Usually you don't see a lot of women. That actually motivates me. I could break the stereotype. I have to have faith in myself. I'm good at it and I'm a woman." Among other activities, this summer Autrey-Rodriguez is teaching English at a summer program for students who come from disadvantaged backgrounds. In addition to her other interests, she says, "I have a strong passion for Latin American culture." She has even considered a career combining that passion with a physics background, possibly working in a Latin American country where she could use her physics training to improve the infrastructure.

Minority scholar Rodrigo Farnham, originally from Brazil and now living in Slidell, Louisiana, thinks he might eventually go into theoretical physics. He likes "being able to predict what's going to happen," as physics enables him to do. As a project in 12th grade, he and a partner designed and built a trebuchet, a medieval siege weapon used to throw large rocks, or sometimes rotting animal carcasses, at the enemy. Instead of dead cows, Farnham's 15-foot-tall device threw cantaloupes across a football field. In a perfect demonstration of projectile motion, the cantaloupes flew about a hundred yards, Farnham says. Strangely, he notes, the machine did not do so well with pumpkins, which actually flew backwards. In addition to hurling fruit, Farnham also likes chess and playing the violin. "I couldn't have done it without my parents' support," he says of his many accomplishments. He will attend Louisiana State University in the fall. Farnham says he is already in touch with physicists at LSU who are helping and encouraging him in his study of physics.

The endless possibilities of space attracted Sarajane Williams, of Prairie View, Texas, to the study of physics. She has been fascinated by stargazing and by reading books about space. Last summer, she took an astronomy class at Harvard, and was especially intrigued by black holes. Williams says she's not at all discouraged by the low numbers of women and minorities in physics. "I was never really fazed by that," she says. She says she has been influenced and encouraged by the successful women in her life, including her mother. Williams enjoys acting, singing, dancing and writing. Recently she was a lead attorney in "Waller County Teen Court," which basically functions like a real court of law, except that teenagers run it. Offenders can be sentenced to community service. Because she has participated in

Minority Scholars continued on page 7

New Scholarships:

Lara Autrey-Rodriguez
Luis Bryce
Marissa Cevallos
Okenna Egwu
Rodrigo Farnham
Anton Gereau
Collin Joseph
Hassan Korre
Marc Martinez
Eric Paniagua
Aaron Pollack
Matthew Rickert
Eduardo Ruiz-Rivera
Casey Stevens
Luis Vargas
Sarajane Williams

Renewals:

Samuel Alemayehu
Peter Blair
Micaela Casas
Brian Chavarria
Bree Guerra
Christopher Hain
Gilbert Lee IV
Michael Maindi
Jeremy Morales
James Silva
Sharon Torres

INTERNATIONAL News

...from the APS Office of International Affairs

International Security & Arms Control Committee Celebrates 25th Anniversary During World Year of Physics

By Raymond Jeanloz

Chair, Committee on International Security and Arms Control; Professor of Earth and Planetary Science and Astronomy, University of California, Berkeley

Anne Harrington

Director, Committee on International Security and Arms Control; Professor of the History of Science, Harvard University

The Committee on International Security and Arms Control (CISAC), an organization within the National Academy of Sciences (NAS), is celebrating its 25th anniversary during 2005, the World Year of Physics. For 25 years the committee has applied science and technology to problems of international security and arms control. Now its focus on the major nuclear arsenals that defined the Cold War is expanding to address contemporary security challenges of terrorism, nuclear proliferation and the threats posed by modern biology.

Changing Environments and New Approaches

In a post-9/11 environment, new questions must be asked. Will the spread of nuclear power, driven by global energy needs, induce the spread of nuclear weapons technology? Are there nuclear technologies that are less prone to proliferation than others? What nuclear safeguards are available, and how can they be enhanced? More generally, what is the researcher's personal role in developing and applying scientific knowledge responsibly, and preventing the proliferation of threats presented by modern technology? How can our connections with other scientists around the world promote debate and develop options for addressing these issues?

Science and scientists can play a vital role in answering these questions. Scientists' ability to interact with and contribute to security policy is at the core of CISAC's mission. Scientist-to-scientist ties have played a central role in the committee's activities, which include technical and policy studies and bilateral dialogues. In its most recent report, *Monitoring Nuclear Weapons and Nuclear-Explosive Materials: An Assessment of Methods and Capabilities*, the committee applied what it had learned from dialogues with Russia, China and India. (See accompanying box for a list of CISAC reports.)

CISAC is responding to the post-9/11 challenges by pursuing several broad areas of activity that address the world's security issues. These include:

- *Maintaining and Enriching Dialogues with security specialists from the scientific, military and policy communities in Russia, China and India*
- *Developing Regional Networks in Europe, Japan and elsewhere*
- *Broadening the Scope of activity to other countries, including South Asia/Pakistan, Iran, North Korea, Cuba and Iraq*
- *Reducing the Threat of Nuclear and Biological Proliferation*
- *Counter-terrorism*

In order to carry out this agenda, CISAC is complemented by a Nonproliferation Panel and a Biological Threats Panel, and it is coordinating closely with all other parts of the National Academies in addressing the complex and urgent problems of international security.

Science and Security–an Evolving Partnership

In its early years, CISAC helped to keep discussions on nuclear arms control alive with its Soviet counterpart in the Soviet Academy of Sciences, during a period of high tension between the two countries. The CISAC dialogue and reports were not a substitute for government-to-government interactions, but by focusing on the scientific dimensions CISAC helped keep communication channels open to discuss critical issues of arms control.

Many of the challenges that CISAC faced 25 years ago persist in different forms in the 21st century. For example, the committee's 1991 study, "The Future of the U.S.-Soviet Nuclear Relationship," considered how the United States and the Soviet Union could significantly reduce their nuclear arsenals below the levels prescribed by the Strategic Arms Reduction Treat (START). Fifteen years later, strategic arms reductions and safeguards for nuclear warheads remain on CISAC's agenda. Today, however, the threat of

International News continued on page 8

Commitee on International Security and Arms Control (CISAC)

Reports

Monitoring Nuclear Weapons and Nuclear-Explosive Materials: An Assessment of Methods and Capabilities, 2005

Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty, 2002

The Spent-Fuel Standard for Disposition of Excess Weapon Plutonium: Application to Current DOE Options, 2000

The Future of U.S. Nuclear Weapons Policy, 1997

Controlling Dangerous Pathogens: A Blueprint for U.S.-Russian Cooperation, A Report to the Cooperative Threat Reduction Program of the U.S. Department of Defense, 1997

U.S.-German Cooperation in Elimination of Excess Weapons Plutonium, 1995

Management and Disposition of Excess Weapons Plutonium--Reactor-Related Options, 1995

Management and Disposition of Excess Weapons Plutonium, 1994

The Future of the U.S.-Soviet Nuclear Relationship, 1991

Challenges for the 1990s for Arms Control and International Security, 1989

Reykjavik and Beyond: Deep Reductions in Strategic Nuclear Arsenals and the Future Direction of Arms Control, 1988

Crisis Management in the Nuclear Age, 1987

Nuclear Arms Control: Background and Issues, 1985

Announcements

APS Seeks Two New Operating Officers– Treasurer and Editor-in-Chief

The American Physical Society (APS) is headed by a Senior Management Team that consists of three co-equal operating officers: the Editor-in-Chief (responsible for all scientific publications and for related activities, excluding marketing); the Treasurer (responsible for fiscal management and for publications marketing activities); and the Executive Officer (responsible for all member-related and outreach-related activities of the Society). These three work together as a team to manage all aspects of the Society's business. They report to the elected Presidential line and to the Council and its Executive Board of which they are statutory members.

In late 2006, two members of the current APS Senior Management Team will retire. The APS is searching for candidates to fill these two positions, specifically, Treasurer and Editor-in-Chief.

If you have suggestions of good candidates who should be recruited for either of these positions, please send them to the Search Committee chair, Helen Quinn quinn@slac.stanford.edu.

Descriptions of the positions are as follows:

Treasurer—This officer is responsible for all aspects of APS fiscal management and publications marketing, and is a member of the three-person Senior Management Team (see above). Specific responsibilities include:

•Management of general APS finances: Formulating annual budgets for the Society, working in concert with the Executive Officer and the Editor-in-Chief to ensure that program goals can be met within the budget plan; managing the financial reserves of the Society in accordance with policy set by Council; overseeing fiscal record keeping, adherence to budget, auditing, and compliance to all relevant laws.

•Management of all legal and insurance issues for the Society.

•Management of publications marketing and of production contracts: overseeing the marketing of APS publications and the journals' contractual relationships with production vendors (working in concert with the Editor-in-Chief).

•Setting staffing and compensation policies (in consultation with the Executive Officer and Editor-in-Chief).

•Reporting regularly to the Council and its Executive Board on fiscal and personnel issues.

•Overseeing the activities of the Director of Finance, Director of Human Resources, and the Associate Publisher/Director of Marketing.

This position is based at APS Headquarters in College Park MD. It requires an understanding of physics and the physics community and the ability to work collegially with the other members of the Senior Management Team to solve business problems. An advanced degree in physics or a closely related discipline is highly desirable. It is a full time position and requires significant travel. Appointment is for a five-year term, renewable by mutual agreement.

Editor-in-Chief—This officer is responsible for all aspects of the production of APS scientific journals and for the role of APS in the future evolution of scientific communication and dissemination of physics. The person holding this position is one of the three-person Senior Management Team (see above). Specific responsibilities include:

•Planning and implementing plans to ensure that APS is an international leader in physics communication.

•Maintaining and improving the quality and usefulness of APS publications.

•Overseeing editorial functions and ethical issues for APS publications.

•Managing the APS Editorial Office of the *Physical Reviews, Physical Review Letters*, and *Reviews of Modern Physics*, with over 150 in-house staff members and many remote editors.

•Communicating APS concerns and policies on publications issues to diverse audiences.

•Working together with the Treasurer to set fiscal policies for publications consistent with the overall fiscal planning of the Society.

•Reporting regularly to the Council and its Executive Board on both current and future publications issues.

•Overseeing the activities of the Editorial Director, Director of Journal Information Systems, the Director of Journal Operations and the Director of Facilities Management.

This job is located at the APS Editorial Office in Ridge, New York (Eastern Long Island). It requires a PhD in physics or a closely related discipline and the ability to work collegially with the other members of the Senior Management Team to solve business problems. It is a full-time position, and requires significant travel. Appointment is for a five-year term, renewable by mutual agreement.

Both of these positions require strong leadership/management skills, the ability and desire to work in a team environment, excellent written and verbal communications skills, professional demeanor, and the ability to deal effectively with both scientific and business professionals. Competitive salaries and outstanding benefits package offered. Visit our website at www.aps.org. Interviewing will begin in late fall, 2005. To apply, send cover letter including salary requirement, resume, and contact information for professional references to Helen Quinn at quinn@slac.stanford.edu.

Now Appearing in RMP Recently Posted Reviews and Colloquia

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

Quantum information with continuous variables
-Samuel L. Braunstein and Peter van Loock

Quantum information theory often focuses on discrete states like those in qubits, but states with continuous variables such as the coherent electromagnetic field of lasers can also be employed. This review discusses the theory of quantum information and entanglement for continuous variables, with application to quantum optical systems. Recent experimental developments include secure communication, teleportation of quantum states, and the demonstration of a quantum memory.

Job Fair at DPP Meeting

APS Division of Plasma Physics Meeting
October 24-26, 2005; Adam's Mark Hotel; Denver, CO

Whether you are looking for a job or recruiting, (DPP) meeting is the place to be! The DPP Job Fair will provide job seekers and hiring managers with unsurpassed recruitment and networking opportunities. Last year, more than 30 companies, laboratories and universities met with 180 job seekers.

Job Seekers utilize the services to:

Network with technical staff and human resource recruiters; Post your resume and search open positions; Interview for positions.

POST EARLY! Employers have access to the online resume database two weeks before the Job Fair.

Employers utilize the services to:

Showcase your company with a Recruitment Booth; Advertise open positions; Interview qualified job seekers; Search resumes specific to the meeting.

The Job Fair is free of charge to all job seekers. There is a nominal fee for employers. **The pre-registration deadline for both employers and job seekers is October 3, 2005.**

For more information, please visit www.aip.org/careersvc or contact Alix Brice at abrice@aip.org or 301-209-3187.

PROPOSED APS BYLAWS REVISION

Regarding Unit Proposals for Outside Funding

FIRST VOTE APPROVED BY COUNCIL, APRIL 15, 2005

It is common for some APS units to provide student travel awards to attend conferences, and undertake other outreach projects. Often funding proposals to outside resources are submitted to support these activities. Current wording in the APS Bylaws implies that all proposals for unit funding require Council approval. Below is suggested wording to limit Executive Board approval of unit proposals to those greater than $10,000 at the discretion of the Executive Officer and remove any requirement for Council approval of unit funding proposals. Proposals equal to or less than $10,000 will no longer require approval. This amendment is intended to more accurately reflect current practice in these situations.

ARTICLE V–FINANCES

4. Grants-in-Aid.–A Division, Topical Group, Forum, Section, or Committee seeking grants-in-aid or contracts for the support of specific proposals of more than $10,000 shall submit such proposals to the Executive Officer for approval. ~~The Executive Board shall review such proposals and may authorize submission to prospective sources of funds prior to final approval by Council.~~ The Executive Officer may, at his or her discretion, submit the proposal to the Executive Board for its approval.

EDITOR, *PHYSICAL REVIEW A*

http://pra.aps.org/

The American Physical Society is conducting an international search for a successor to the current Editor of PRA, who is retiring in the fall of 2005. The Editor is responsible for editorial standards, policies, and direction of the journal, and leadership of a board of remote Associate Editors. The Editor reports to the Editor-in-Chief and is supported by an in-house staff of full time editors and editorial assistants. It is expected that the Editor will maintain his/her present appointment and location and devote approximately 20% of his/her time to the position.

A candidate should possess the following qualifications:

–recognized stature as a researcher in atomic, molecular or optical physics;

–strong interpersonal skills and leadership ability;

–broad knowledge and interest in physics and its frontiers;

–experience with the editing/refereeing process in physics publication.

The initial appointment is for three years with renewal possible after review. Salary is negotiable. The APS is an equal opportunity employer. Inquiries, nominations, and applications (including CV, publications, and letter of intent) are requested by 30 September 2005 and may be directed to: Ron Walsworth, Chair, PRA Search Committee, c/o American Physical Society, 1 Research Road, Box 9000, Ridge, NY 11961-9000; or electronically to edsearch@aps.org.

New Membership Directory Feature

APS Members may now search the Online Member Directory by institution. Please visit http://www.aps.org/memb/enter-directory.cfm to login to the Member Directory. From there you will see the original single member search and the new "Search by Affiliation" option.

An email request was sent to all members during the last year to verify the accuracy of all affiliation linking that we have on record. Please note that not all members have provided affiliation information and may not be listed in the institutional directory. If you did not receive an email, have a correction to a listing or don't see an affiliation, please contact a membership representative at membership@aps.org for assistance.

Thank You

The APS Membership Department

MINORITY SCHOLARS CONTINUED FROM PAGE 6

many summer classes and activities in the past few years, Williams plans to spend most of this summer at home, relaxing. "It seems like I've always been going, going, going," she says. In the fall she will be going to Yale University. Williams wants to share her outlook on life: "I want to encourage people to not doubt themselves. People are too afraid to try new things." Her motto, she says, is: "If in doubt, do it anyway." Many of the new minority scholars seem to have followed that advice as well.

Any African-American, Hispanic American, or Native American US citizen or permanent resident who is majoring or planning to major in physics, and who is a high school senior, college freshman, or sophomore is eligible to apply for the scholarship. The selection committee especially encourages applications from students enrolled in institutions with historically African American, Hispanic or Native American enrollment.

Information about the scholarship can be found at http://www.aps.org/educ/com/scholars/index.cfm.

The Back Page

Looking Back and Looking Forward for APS

By Helen Quinn

Any organization, no matter how healthy, needs a periodic review, looking back to see what it has done well and what not so well, and looking forward (as well as it can) to see what it needs to change to continue to be of value in a changing world. During my tenure as President I wanted APS to do that. Fortunately, other members of the Executive Board agreed, to the extent that many did significant work outside of meetings, gathering input from many others so they could report to the board a "state of the society" in some area of our activity. Their efforts turned my idea into a useful exercise.

An organization like the APS is more like an oil-tanker than a ketch. We cannot, and should not try to, change directions quickly. All the more reason that we need to look ahead and make the small course corrections now that will avoid our becoming stranded in the future. I think that looking ahead is happening today at APS. The discussions of the Board and Council in the past year have helped prompt a more active stance about this. Of course a single review is not enough; future Boards and Councils need to continue to try to look ahead and to make the needed course corrections.

In our June 2004 Executive Board retreat we spent most of our time on a "long range planning" activity. My brother, Richard Arnold, who does such work professionally, had volunteered his time to facilitate this discussion (after I had bugged him long enough with questions about how to make this work). His effort and effectiveness were appreciated by all who attended that meeting. Actually we did not plan anything, but we did do something that I think was much more useful. (I am skeptical of grand plans to be perfect.) Each board member had reviewed one aspect of the Society's activity. After hearing all their reports, we talked for a day and came to agreement on what are the major issues that need attention as we move forward. Nothing particularly surprising came up, but the discussions did identify some real challenges. I can already see numerous ways in which those discussions have led to changes, new actions by staff, new efforts of advisory committees, and generally a more forward-looking approach to decisions about what matters for the society.

Let me briefly comment on some of the issues. These comments are my own opinions, not necessarily positions that are shared by anyone else. I will address three major activities, journals, meetings, and our Washington office. This is not to devalue other areas; those who know me know how important I think education and outreach work are, and how much of my APS activity and time in the past year was related to improving the visa situation for our international students and colleagues, but space does not allow me to cover everything.

A critical issue for the future of the Society is the future of our journals. For the fiscal health of APS we rely on the journals to break even, or even do a little better than that (since the membership dues do not support all the functions that members say in surveys they would like to see the society doing.) We have built up a funding reserve. That is essential, since it protects the Society from devastation by fluctuations in income in the rapidly changing economics of journal publishing. (During my tenure in the presidential line outside actions, over which we had no control, and which we could not possibly have forseen, caused fluctuations in journal income of over half a million dollars in both directions!) We use this reserve also as if it were an endowment. Some of the income from investment of the reserve provides a source of funds for program activity, and the rest is reinvested to maintain the real value of the reserve. The Board now has a conscious policy on this, and sets an upper limit on budgeted withdrawals from reserves.

The first goal of the journals, however, must be to support the dissemination of scientific information as effectively and efficiently as possible. Our journals are highly regarded, not only for the strength of the science that is published there, but because we have moved, under our current Editor-in-Chief, Marty Blume, to a model which is fully electronic (with paper available for a price that reflects the extra cost that it adds to the process). In the current year the internal journal processing is rapidly moving to a paperless system. Both in internal processing and in the composition process we have realized very significant cost savings, and these are reflected in the small changes in prices of the past two years, even as submissions continue to rise significantly every year. Marty Blume has also been a leader of international discussions to encourage all journals to take on their share of the responsibility for dealing with ethical issues such a plagiarism and scientific fraud, a role he is justifiably proud of playing, and one which does credit to the attention that APS has focused on these issues through its ethics task force and follow-on activities engendered by that report.

So today, our journals are strong and healthy, but that is only one side of the coin. The flip side is that the nature of scientific communication is still changing rapidly. "Open access" is one pressure, but so far the term means many different models, none of them as yet of proven financial viability. APS publishing cannot sit still and rest on the accomplishments of the past. We must continue to modify the way we do business to stay abreast of changes and, if possible, to lead the way to better serving the needs of science. Whatever changes we make must be made while maintaining the flow of articles through the system, and paying attention both to costs and to long-term accessibility of the information. I do not know what the answers are or will be, but I do know that our journals in ten years will work as differently from today, as today's do compared to ten years ago. We need to lead the changes, not be left behind by them.

Photo Credit: Dan Quinn

Helen Quinn

I see another challenge, a challenge to the members of APS as much as it is to the journal publishing system. Our journals are only as good as our refereeing makes them. Refereeing is a community responsibility. It is not rewarded in any significant way. Good refereeing takes time and intellectual effort. It is my impression that, at least in some subfields, physicists have decided effectively that refereeing does not work well enough to be worth much bother. If they do it at all, it is often late and often slipshod work. The general belief is that the only reward for doing it well and fast is more such work to do. This scientific "tragedy of the commons" must be reversed or the peer review system of evaluating papers will fail. (Some say it already has.) Either we need to support the system we have, or we need to invent a better one, rather than pretending that all is well but failing to do this part of our work responsibly.

Meetings are another form of scientific communication, historically a very important one. But do our APS meetings serve us well today? APS meetings fall into two classes: unit meetings and general meetings. Unit meetings seem in general to be healthy, they serve their constituents well. Of the two big general meetings the first, the March meeting, also looks healthy. It is valued by the community that it serves, and regarded by many as the place to be to hear the latest. Its attendance keeps growing. It was well over 6, 000 this year. In contrast the April meeting seems to me to struggle for a reason to exist. Its attendance hovers around 1,000 and that is after lots of work by staff to encourage divisions to participate more fully. For most of the subfields of physics that it serves it is not the most important meeting of their year. For example, it is quite unlikely that a high energy physics experiment would release any new result at the April meeting. Those who do attend enjoy some excellent plenary talks that cover a breadth of physics, and find that the opportunity to hear about fields other than their own is exciting and interesting, but few can afford to attend for those reasons. Some excellent invited sessions are arranged, but too often the speakers appear only for their talks and leave again the same day. Some tell me the meeting is a good opportunity for their students to give a talk, but they don't attend to see their students talking to almost empty rooms. Can we afford to continue to run a meeting of this type? (At my urging, this year's President, Marvin Cohen, will set up a task force to address this question. Because I am so opinionated already, I declined the invitation to serve on it.)

In recent years the physics community has been fortunate to have a strong lobby in the APS Washington office. These are very difficult budget times, but I am quite certain that, without the groundwork that had been carefully laid over a period of several years, making the case for physical science, the budgets we are now seeing would be significantly worse. Effective physics lobbying is critical and will not happen without coordination. While we are an international society, we are also the American Physical Society. It is important that we recognize that if we do not speak for physics budgets in this country, no one else can fill that void. Only relatively recently in the history of APS did the Society reach this recognition. We are steadily building effectiveness and credibility in Washington, but we need to continue to develop and expand this effort. Whether it is the letter-writing efforts at our major meetings, or the one-on-one visits to congressional or senatorial offices by members, we need more of it. In lobbying we need partners, both from other sciences and from industry. Our Washington office has been key to forging the necessary partnerships. When I went to lobby for physical sciences accompanied by the Chair of FASEB (the Federation of Societies for Experimental Biology), the President of the ACS (American Chemical Society) and AMS (American Mathematics Society), our voices together made more impression than had each of us lobbied separately for our own area of science. We need to continue to learn how to be more effective in arguing for science funding, and we need strong staff support in Washington to help us do that. By law this particular effort can only be supported by membership dues. We must increase our membership by recruiting our colleagues to better support this effort. Of course the membership numbers also help validate the Society's voice in Washington. So I urge each US member to recruit at least one new APS member this year, to strengthen our society first and its voice in Washington second.

As Past President I have one more task for APS, and that is to lead the search committee that must find replacements for our Editor-in-Chief, Marty Blume, and our Treasurer, Tom McIlrath, both of whom wish to retire at the end of 2006. These are key positions, two of the team of three lead APS staff. Both Marty and Tom have served APS immeasurably, and to replace them we need the best possible people. We are beginning to advertise these positions with detailed job descriptions (see page 7 of this issue), but please, if you have good ideas about who could do these jobs well, or would be interested in either of them yourself, drop me a note (quinn@slac.stanford.edu). The search committee will appreciate your input.

Helen Quinn is Professor of Physics at SLAC. She served as APS President in 2004. This article is adapted from her retiring Presidential address delivered at the 2005 APS April meeting in Tampa.

INTERNATIONAL NEWS CONTINUED FROM PAGE 6

nuclear warheads or nuclear explosive materials getting into the hands of terrorists or countries aspiring to join the nuclear club occupies at least an equal place on the priority list, as reflected in CISAC's recent study, "Monitoring Nuclear Weapons and Nuclear Explosive Materials: An Assessment of Methods and Capabilities."

One of the main challenges in confrontational environments is how to build channels of communications, transparency and confidence that can be the foundations of constructive, non-adversarial post-confrontation relations. CISAC was established specifically to address this kind of challenge, engaging influential scientific, policy and military communities through dialogues, studies, symposia, workshops, and other activities aimed at developing common solutions to security and arms control problems. CISAC's experience with the Soviet Union was unique to that environment, but the lessons learned from that and other experiences with counterparts around the world are being applied to the contemporary security environment.

For more information on CISAC, see: www.nas.edu/cisac.