APS Report Spurs Congressional Action on Critical Elements

By Michael Lucibella

Rare and exotic elements have sparked a flurry of activity on Capitol Hill. A bevy of bills have been brought forward by members of both the House and Senate to secure continued supplies of rare elements important to cutting-edge technology and research. This comes in part as the result of a recent joint APS and Materials Research Society (MRS) report looking at the future of uncommon elements critical to the nation’s future energy technologies.

The report, “Energy Critical Elements: Securing Materials for Emerging Technologies” high-lighted the need to secure supplies of exotic elements ranging from cerium to yttrium. Dubbed “Emerging Technologies” high-temperature energy technologies, these elements represent a significant portion of the nation’s future energy needs.

The report states, “The report, “Energy Critical Elements: Securing Materials for Emerging Technologies” highlights the need to secure supplies of exotic elements ranging from cerium to yttrium. Dubbed “Emerging Technologies” high-temperature energy technologies, these elements represent a significant portion of the nation’s future energy needs.

As a result of the report, the recent joint APS and Materials Research Society (MRS) report, “Energy Critical Elements: Securing Materials for Emerging Technologies,” highlights the need to secure supplies of exotic elements ranging from cerium to yttrium. Dubbed “Emerging Technologies” high-temperature energy technologies, these elements represent a significant portion of the nation’s future energy needs.

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2006 Blewett Recipient Now on Tenure Track

By Gabriel Popkin

Seven years ago, APS established a fellowship with a bequest from M. Hildegard Blewett, an accelerator physicist who died in 2004. The fellowship was created for women physicists returning to research after having taken a break from their careers, for family or other reasons. To date, nine women have been awarded the fellowship, and one of them now has a tenure-track position.

Elizabeth Freeland, who became the second recipient of the Blewett Fellowship in 2006, will start teaching this fall at Benedictine University in Lisle, Illinois, a suburb of Chicago. Freeland, a high-energy physicist, says the position is exactly what she was looking for. “I’m very excited to have this position. I’ve known for a long time that I wanted to teach at a primarily undergraduate institution.” And just as important for Freeland, who has been a postdoc at both Washington University in Saint Louis and the University of Illinois at Urbana-Champaign, “My entire life will now be in one geographical location.”

Receiving a tenure-track position represents the culmination of a journey back to physics research following the birth of Freeland’s second child. She left research after receiving a PhD in physics from The Johns Hopkins University in 1995, when her husband took a position at Brookhaven National Lab on Long Island, and in modern electronics. Often-times these elements are rare and critical for the nation’s future energy technologies.

School Physics Elite to Represent US at Bangkok Olympic Competition

By Mary Catherine Adams

In a quiet laboratory down a short corridor in the University of Maryland’s physics building, about a dozen students are tucking into weights and ropes, scribbling notes on formula-filled books and APS “Future Physicist” posters. The students are in Rochester, Minnesota who will receive a $300 gift certificate to Educational Innovations. Third place went to Jannae Monnet’s class at Friedell Middle School in Rochester, Minnesota who will receive a $100 gift certificate. All the winning classes will also receive physics toys from Educational Innovations, a classroom set of autographed Spectra comic books and APS “Future Physicist” buttons.

APHYSICS NEWS

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Science In Iran Faces Hurdles

See Page 3

Fifteen From High School Physics Elite to Represent US at Bangkok Olympic Competition

The twenty members of the Olympiad team enjoy a rare moment of relaxation. Labs and lectures all week, they still have the weekend to go before the traveling team is chosen. Breakfasted at 7 a.m. and out the door by 7:30, the students’ rigorous schedule has them cramming in fluids and thermo, waves and relativity, all before lunchtime. Afternoons are filled with more lectures, labs and exams, and study time follows a late dinner.

ESAME Progresses Despite Mideast Turmoil

Despite political upheaval in the Middle East and earlier financial concerns, efforts to bring a particle accelerator to the region are continuing forward as planned. The report from the May 30-June 1 council meeting of the Synchrotron-light for Experimental Science and Applications in the Middle East, better known as SESAME, is that the project is on schedule and close to being fully funded.

“I think the main thing was we really feel pretty secure about funding now,” said Sir Chris Llewellyn-Smith, president of the SESAME council. “We’re in a position to really go full steam ahead.”

SESAME is the multinational project to build a 2.5 GeV synchrotron light source in Jordan. Currently there are about 60 synchrotrons around the world, however, none is located in the Middle East. The multinational SESAME collaboration, organized by UNESCO and modeled after CERN, aims in part to revitalize science in the region. At the same time, SESAME is seen as a major diplomatic effort, bringing nine nations together on the project, including historical rivals such as Israel, Iran, Pakistan and the Palestinian Authority.

Much of the construction of the facilities is already completed, and workers are preparing to install the accelerators themselves soon. The tunnels and radiation shielding walls have all SESAME continued on page 3

Started by APS during the World Year of Physics in 2005, PhysicsQuest has brought interactive physics experiments to hundreds of thousands of middle school students every year. The free kits include the materials for four physics experiments centered on a field of physics. This year’s version ties the experiments together with a comic book narrative “Spectra’s Force,” starring APS’s original laser super hero Spectra. The kit focuses on force and motion, and features the titu lar hero squaring off against the brilliant but misguided General Relativity.

CO-OP continued on page 6

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problem faced by many scientists including the infamous two-body problem on this and related issues, have successfully returned from the deep freeze to scientists who have taken calculated risks that I thought this really needs to be formalized linear career paths, Freeman plans to continue doing so. "I had to do so much work when I was first trying to get a grant that I thought this really needs to be written down," she says. The website features grants available to scientists who have taken career breaks, stories of women who have successfully returned such breaks, and articles and reports on this and related issues, including the infamous two-body problem and the importance of institutional affiliation aren't ex- cluded, she says. "More flexibility in terms of career paths would, I suspect, help diversify science in the United States. In many cases it's just a phrase" in the applica- tion needs that is needed to change. Freeman plans to continue do- ing research at the University of Chicago and she began her high-energy physics research program where she still has many collaborators, and she will now be able to do extra summer research opportunities to her stu- dents. She is also looking forward to teaching and designing new courses. She says, "I have a lot of experience teaching non-scientists and creating new courses; and I have a lot of new ideas I’m excited to try."

"Neutrinos, they are very small! They have charge and have no mass! And do not interact at all!" -- Archie Balfour in a 1960 poem, "Cosmic Gall." Neutrinos were a fairly recent discovery that, within two years physicists would discover that they were only just beginning to understand this mysterious, almost lost particle. For instance, there was more than one kind of neutrino, and it would take physicists another 40 years to find them all.

Pauli first proposed the existence of neutrinos in 1930 while investigating the conundrum of radioactive beta decay, in which some of the original energy appeared to be missing after an electron was emitted from an atomic nucleus. He hypothesized that in order to abide by the laws of energy conservation, another, yet-undetected neutral particle might also be emitted, accounting for the missing energy. Pauli was reluctant to publish a pa- per on this unusual hypothesis, and he even penned a letter to a group of prominent nuclear physicists gathering for a conference in Tuebingen, Germany, in December asking for input regard- ing means of detecting such a particle experimentally. "I have done some thing very bad today by proposing a particle where there is nothing. It is something no theorist should ever do," he wrote, describing his idea as a "dreadful remedy."

Among the physicists who took Pauli’s idea seriously was Enrico Fermi, who developed the theory of beta decay further in 1934, coining the name “neutrino” (“little neutral one”) in the process. It became clear that if such a particle existed, it must be very light and very small. Neutrinos were a fairly recent discovery then, as is something no theorist should ever do, wrote Pauli, telegraphed back. "Everytime it comes to him who knows how to wait."

Fermilab plans to continue doing so. Freeman plans to continue doing so. "I had to do so much work when I was first trying to get a grant that I thought this really needs to be written down," she says. The website features grants available to scientists who have taken career breaks, stories of women who have successfully returned such breaks, and articles and reports on this and related issues, including the infamous two-body problem and the importance of institutional affiliation aren’t ex- cluded, she says. "More flexibility in terms of career paths would, I suspect, help diversify science in the United States. In many cases it’s just a phrase" in the applica- tion needs that is needed to change. Freeman plans to continue do- ing research at the University of Chicago and she began her high-energy physics research program where she still has many collaborators, and she will now be able to do extra summer research opportunities to her stu- dents. She is also looking forward to teaching and designing new courses. She says, "I have a lot of experience teaching non-scientists and creating new courses; and I have a lot of new ideas I’m excited to try."

The plan itself will change, but you have, before you take a break. And then you can start brainstorming options and prioritizing them. You have a lot of new ideas that you can bring to the table. You can brainstorm all of the options and figure out which ones are the most important and doable."

The experiment also validated a number of assumptions made by the previous experiments. They concluded that the neutrino detection, most notably the emulsion cloud chamber, which significantly increased the number of observed neutrino interactions.

Leon Lederman, who had shared the 1989 Nobel Prize in Physics with Jack Steinberger and Richard Schwartz for the discovery of the muon neutrino, called the achieve- ment “an important and low-award. The question was answered with a resounding yes in 2010. Scientists with the OPERA experiment at Gran Sasso National Laboratory in Italy reported that they had found four instances of the telltale sig- natures of neutrinos at a distance of billions of km away. The experiment used CERN’s Large Hadron Collider to make one more neutrino to change into a tau neutrino via oscillation? That question was answered with a resounding yes in 2010. Scientists with the OPERA experiment at Gran Sasso National Laboratory in Italy reported that they had found four instances of the telltale sig- natures of neutrinos at a distance of billions of km away.
SOUTHERN AFRICA continued on page 7
Noting the use of the label, "African American President", in the otherwise timely and infor- mative May Inside the Beltway column, is a disappointment. The last two columns of the essay fail to do a literature search. It’s as if the authors never bothered to try to reach out to young women to get our take on the matter.

I have no special desire to become "more African," as suggested by Dr. Tilmighman. I do, however, have the desire to earn a decent paycheck and have a modicum of job security. Given that a physics PhD's chances of landing a tenure-track professorship is nearly nonexistent, and that a woman needs to be twice as productive as her male colleague just to be equally competent, many of us women make the pragmatic decision to leave academia to seek gainful employ- ment elsewhere rather than lose a decade or more of our lives pur- suing the one-in-a-million shot of becoming a tenured professor. It’s not that we don’t want to be pro- fessors—it’s dear to the heart of all of us grad students, myself includ- ing. But I am smart enough to know that the odds aren’t in our favor.

In addition, many of us are not drawn to other PhDs who re- fuse to leave academia. Perhaps because of the male tendency towards overconfidence in their abilities, these tenured faculty seem to think they’re better than the competition. (I am the Lake Wobegon Effect) and that will be the only lucky soul who will win the big Tenure Track Professor Lottery. Know- ing that the odds of finding TWO PhDs with two differing geo- graphical area is pretty much im- possible, many of us women make the rational decision to leave aca- demia so that there can be at least one steady income in the family.

In their Back Page in the June APS News, Shanahan and Haz- ari point out that there has been a large increase in the number of girls going into the biological sciences but not a comparable increase going into the physical sciences. They suggest that the physical science interest of women can be increased by having high school physics teachers discuss the discrepancy. I suggest that they are looking at the matter in the girl's educational careers at too late a stage. Peer pressure is very import- ant to high school girls, and peer pressure is very weak when the girls don’t excel in mathematics.

Lack of confidence in their math- ematical ability will easily explain the preference for the biological sciences.

Ethics Authors Don’t Follow Guidelines

The ethics of physics described in the Back Page of "Women in Physics" is based on an APS survey of junior physicists. The authors of the sur- vey did not follow the APS’s rules of conducting such a survey. They would then have found my own 1999 article "The author- ship list in physics--postdocs' per- ceptions of the status of women in Science and Engineering Ethics" has little or no relevance.

In any case ethics training at least in medical publication ethics seems to lead to worse behavior. Young researchers find out just how they are expected to behave, which turns out to be...unethically.

Eugen Tarnow
Fair Lawn, NJ

Follow Guidelines

The APS tried to stop my surveys in Science and Engineering Ethics (on postdoc experiences, on ethics) in 2002. And I put the manuscripts on the internet at that point so that the survey would be of interest to the larger community. Anyone can then find them on the internet under copyright

I guess authors of ethics do not have to follow ethical guide- lines. In a sense I did not either...
Texas Hosts Lively Teacher Preparation Conference

By Gabriel Popkin

During two warm, workshop-packed spring days in Austin, Texas, 120 physicists and educators came together to discuss topics as disparate as undergraduate course reforms, student teacher mentorship, and open access to physics education research. The occasion was the seventh annual Physics Teacher Education Coalition (PhysTEC) Conference, which took place on the campus of the University of Texas at Austin. The PhysTEC Conference, organized by APS and the American Society of Physics Teacher Educators and formerly known as the PTEC Conference, is the nation’s largest event focusing on physics teacher preparation, and brings together experts in this field from around the country. This year’s conference was back-to-back with the annual meeting of the University of Texas Institute, a project based at the University of Texas, Austin that prepares science and math teachers at all educational levels.

The theme of this year’s conference was sustainability, and with good reason. It’s a problem that affects a number of contexts. Panels explored ways to sustain various components of teacher education programs, including the physics-specific pedagogy courses, the hiring of master teachers to work in physics departments, and teaching resources in introductory physics courses.

In a popular session entitled “It takes a University for Physics Teacher Education,” she said. “We need to have all students understanding what people like,” Serene said about allowing open access to physics journals. “It leaves science caught in the vise of a reduced domestic discretionary budget and having to compete with all of the other popular programs it contains, many of which hold much higher priority for Republicans, based upon my anecdotal experience. And a Pew Foundation poll carried out two years ago said that only six percent of scientists identified themselves as Republicans, whereas the Pew poll, which asked the same question, people called themselves Democrats. Nine percent said they were conservative, while sixty-six percent said they were liberal or very liberal. Nineteen percent said they were independent, and during cocktails I found myself in a posh suburb of New York City, I met the leader of the International Ladies Garment Workers Union, and I remember the words, “The only good Republicans are acceptable guests.”

PhysTEC is in a unique position to attract high schools. The schools that have signed onto the PhysTEC program should be considered open access or hybrid access models. Perhaps understandably, some schools are targeting high schools because the publicans, reducing taxes, cutting spending and downsizing government. APS NEWS

Caught in a Vise

by Michael S. Lubell, APS Director of Public Affairs

When I read Gus Tyler’s obituary in The New York Times on June 12, it reminded me how easily political passions can poison the well of sensible dialogue. Gus, a social democrat who had dedicated much of his 99 years to labor issues and was as uncompromising in his commitment to the cause as he was pugnacious. I met him more than four decades ago, when he was vice president of the International Ladies Garment Workers Union, and I was in my fifth year of graduate work at Yale. We were at an elite dinner party in Kings Point, a posh suburb of New York City, and during cocktails I found myself standing next to Gus and his wife, Marie.

We got on famously until I casually mentioned that I had done fieldwork for New York Republican Governor Nelson Rockefeller in 1966. Gus then approached the Society and requested if they could have access to its journals free of cost, the society understood. "It leaves science caught in the vise of a reduced domestic discretionary budget and having to compete with all of the other popular programs it contains, many of which hold much higher priority for Republicans, based upon my anecdotal experience. And a Pew Foundation poll carried out two years ago said that only six percent of scientists identified themselves as Republicans, whereas the Pew poll, which asked the same question, people called themselves Democrats. Nine percent said they were conservative, while sixty-six percent said they were liberal or very liberal. Nineteen percent said they were independent, and during cocktails I found myself in a posh suburb of New York City, I met the leader of the International Ladies Garment Workers Union, and I remember the words, “The only good Republicans are acceptable guests.”

Public and High-School Libraries Provide Access to APS Journals

A year after the announcement by APS that public libraries can access its journals free of cost, the number of libraries participating and the number of journals downloaded have both been growing incrementally but steadily.

The policy allows any library with an open access subscription to access any article from the APS journals, as far back as their founding in 1893, from any library enrolled in the program. Public libraries can access nearly 200,000 articles from library computers with approved IP addresses, whether they are members of APS or not. Any high-school or public library can participate for free.

APS has been keeping track of the number of downloads since the public library program since January. While the number of papers downloaded is still relatively small, the program has been gaining in popularity. By the end of May, 1,611 papers had been downloaded from public libraries, the most popular journal being Reviews of Modern Physics.

The total number of libraries participating has been steadily increasing as well. At press time, 573 public libraries and 161 high school libraries from across the country had signed up.

“I think it’s great that we were able to find a way to make our journals accessible and do it in a way that doesn’t hurt our business model,” said APS treasurer and publisher Joseph Serene.

The inclusion of high-school libraries occurred shortly after the beginning of the public library program. Several high schools approached the Society and requested if they could have access to the journals as well. Shortly afterwards, APS announced the start of a new program specifically targeted at high schools.

The schools that have signed up for the program are a mix of public and private schools. Many are private academies and magnet science and engineering schools. However, several regular public high schools are participating as well.

“We’re trying things and seeing what people like,” Serene said about allowing open access to journals in libraries, “It’s a great thermometer for gauging the public’s interest in the physics literature.”

In recent years, APS has been working to increase its open access portfolio. Physical Review X is APS’s newest journal, an online-only open access journal that publishes research in all disciplines of physics. The online-only journals Physical Review Special Topics: Accelerators and Beams and Physical Review Special Topics: Electrical Engineering Education Research were the first open access journals published by APS.

Though many publishers are understandably cautious, as an industry science publishing has been trending towards the introduction of more open access journals. The biomedical community has been in the lead in pushing for open access. The National Institutes of Health, under its former director Harold Varmus, mandated in 2003 that federal grant-ee by requiring that published NIH-sponsored research has to be freely available after a year. Other organizations and publishers have started experimenting with new open access or hybrid access models. Perhaps understandably, physics journals have not been as high demand from the public as the medical and life science journals.

“There is no question that there is going to be more open access publishing. How much more and in what form nobody knows,” Serene said.
“This was PhysicQuest’s sixth year. It’s a program that comes with everything you need to do four physics experiments,” said Rebecca Thompson, APS’s head of public outreach, “It’s done with things they can find in their kitchen. It’s done to teach them that physics is everywhere, just not in a lab.”

Next year’s kit will return to heat and thermodynamics as Spec- tra faces off against the mean new kids in town. The students are out of about 13,000 competing teams, the coaches review the answers and are completed, all the teams’ subject matter, however, is kept secret. The students are the latest ad- vanced mathematical problems and a day of rest devoted to theoretical problems, of course, are included. The students face exams on a range of physics subjects. They will spend the weeks leading up to the competition preparing and will have an idea of what topics might appear on the exams. The exact subject matter, however, is kept secret until the exams are passed. After all the labs and exams are completed, all the teams’ coaches review the answers and calculate the winners.

The American Association of Physics Teachers (AAPT) and the University of Maryland have organized and trained each US team from its inception. APS and the American Institute of Phys- ics (AIP), along with more than a dozen other organizations, also sponsor the team. The selection process for the team starts in January when high schools register for their students to take the “F=ma exam.” The top 400 or so scorers move on to take the semi-final exam. From there, 20 students are selected to be on the team. The team trained in Colorado, New Mexico, and then the University of Maryland in late May. At the end of the training course, five team members were chosen as travel team and represent the US at the international competition.

Since first competing in 1986, US teams have won 41 gold medals, 28 silver medals, 29 bronze medals and 11 honorable mentions. Students find ways to develop new materials, puri- fication of materials, the study of biological structures such as pro- teins, the study of drugs and new medicines, and fundamental neu- tron physics, to name a few.

In 1999, the United States joined the competition in 1986 into a worldwide competition. The school students, started in Eastern Europe, have an idea of what topics might appear on the exams. The exact subject matter, however, is kept secret until the exams are passed. After all the laboratories and exams are completed, all the teams’ coaches review the answers and calculate the winners.

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All eight members of the home schooling cooperative get together to do the "Watch it Fly" activity from the 2011 PhysicQuest kit.

Ekdahl. “But the scientists I've met are very con- cerned about the environment…

Parker and Ekdahl say the new plan has stirred up controversy in the physics community and gathered attention from other fac- ulty members. Parker even puts forth the prediction that, “this is how big science facilities will be designed in the future.”

But much of ESS’s energy plan is made possible by its location. As the institute notes, “the United States utilize a district heating system like Lund, not to mention that in the United States, large sci- ence facilities tend to be located far away from large cities. Not all locations are ideal for renewable sources like wind or solar. Even ESS will have to take into account the inconsistency of some renewable sources, like wind farm energy, but it is something that can be overcome with the kind of vender system used in Europe, or quite as large an impact as is made in renewable sources. Ken Jones, Director of Oak Ridge’s Accelerator Research Division, says it is limitations like these, not a lack of desire, that has limited United States facilities in energy-saving approaches similar to Lund.

If any accelerator facility in the United States could find the right balance between its geo- logical location and its ability to draw on renewable, predictable sources of energy," said Jones. "I think the management teams would jump at the opportunity to reduce their energy costs."

Most of the ESS’s energy plans concern policy and management decisions, but improvements to the existing site infrastructure and facilities is something accelerator physicists have been working on for decades. One of the potential candidates of the techniques ESS used to reduce its annual energy bill was adopting superconductivity in some areas. The institute’s heat source that uses the heat of lost through resistance in traditional magnets for the much lower cost of cooling the liquid helium needed to keep supercon- ducting magnets at 2 Kelvin.
**Correction**

In the June issue of APS News about using Cherenkov radiation, the energy of the electron beam was stated to be 100 GeV, as in Actinum 235. It should have been Actinium 225. APS News regrets the error and apologizes to the extra neutrons that were inadvertently implied.

**Correction**

We inadvertently failed to acknowledge the source of the Back Page in the June APS News. We should have noted that a version of the article by Marie-Claire Shanahan and Zahra Hazari first appeared as a guest blog by the former author on the website of ScientificAmerican.com.

**Correction**

The difficulty in setting up a lab has had two effects on the physics community in Iran; a disparity in the numbers of physicists and technologists because it is cheaper to host them, and a general brain drain from the country.

Hosts of the traveling abroad presents its own difficulties. In 2010, when Arslan tried to come to the APS March Meeting, visa complications prevented him from entering the country. Other physicists have also said that long visa delays have prevented them from traveling to the United States.

As soon as someone is tagged as a physicist from Iran, they immediately identify them as part of the enemy of the people, Arslan said. "I’m one of the usual suspects."

Any of the United States’ future supply issues on its own. Elements such as actinium, americium, and curium aren’t found in any minable quantities in the United States, while other countries like China can produce them cheaply. It’s a much more complex issue. Mining is an important component to a wise mineral policy, but it is only a component," Jaffe said. "We have a diverse network of international suppliers, and it would be foolish to limit ourselves to U.S. sources."

Francis Slakey, APS associate director of public affairs, says that likely none of the bills proposed thus far will be signed into law in their current form. "The only way for a bill to get to the President is if there is some merging," Slakey said. He said that right now the various representatives and senators are negotiating to work out a more expansive bill that will cover the gamut of issues. Though no final bill has yet emerged, critical materials have been quickly gaining a lot of interest in Congress. "We’re really on the fast track," Slakey said, adding that typically it can take between three and five years for an issue emerges and Congress passes final legislation. The APS-MRS study however was released in February of this year, as reported in the March APS News.

The event drew men and women from a wide range of physics disciplines who have various stages of their careers. Attendees included undergraduates, graduate students, faculty, society members and industrial physicists.

The conference brought together nearly 300 participants from over 70 countries from across the world, including attendees from Japan, Russia and Nigeria. Egypt also sent a delegation despite the recent political upheaval in the country.

IUPAP picked South Africa for its fourth conference on women in physics because of various international reasons. A major factor was to try to get more people from developing nations in Africa to participate. Hosting the conference in South Africa cut travel costs for those on the continent, dramatically increasing the participation of people from African nations. Past conferences were held in Paris, Brazil and South Korea.

In addition, South Africa has been aggressively pushing its scientific programs and building its academic credentials. It already is home to the Southern African Large Telescope (SALT), the largest optical telescope in the Southern Hemisphere, and is vying to put the South African Astronomical Observatory in the upcoming Southern Cross.

Many of the talks were video-recorded and can be accessed online. Emma Ideal, a graduate student from the University of Illinois, cut together the video archive from the meeting. She said that they hoped that attendees would be able to make more presentations.

"Others who weren’t able to make it for whatever reason… this broadcast would allow them to have a greater participation role by means of the post-conference dissemination," Ideal said.

The videos can be accessed at http://www.scientificamerican.com/video/interna

Colloquium: Physics of optical lattice clocks

Andrei Derevianko and Hiroshi Katori

The accurate measurement of time is fundamental in many different areas in physics and engineering. In this colloquium, a way to measure time using optical lattices is presented. Optical lattices are made out of cold atoms trapped in optical lattices. Within this method a clock "would neither lose or gain a fraction of a second over an estimated age of 5,000 years," according to the speakers.

http://rmp.aps.org
Research Facility is poised to provide excellent facilities for have made impressive advances in sensitivity, pursuing mul-
formation, and evolution, and provides convincing evidence material directly influences large-scale cosmology, galactic
eration of scientists and engineers.

These programs have been extraordinarily vetted by the High Energy Physics (HEP) and Nuclear Physics (NP) communities and are essential elements to advance these disciplines. The US and the DOE established national underground science for their leadership in selecting solutions in the midst of such uncertain funding times. For the last three years, three significant events occurred: 1) DOE established a committee to assess options for underground physics experiments efforts that were underway; the Long Baseline Neutrino program (LBNE), searches for Dark Matter (DM), and for Neutrinoless Double Beta Decay (0ββ); 2) The DUSEL Preliminary Design was completed; and 3) the National Research Council’s report assessing DU-
SELS science opportunities is anticipated shortly [4].

Fortunately there is a path forward that preserves US lead-
ship roles, leverages the existing efforts designing the facil-
ity, capitalizes on South Dakota’s inspirational investments, and maintains the existing momentum. In February, William Brinkman, Director of DOE’s Office of Science, announced the formation of the Independent Re-
view of Options for Underground Science Committee to assess the costs, as well as siting and staging alternatives to achieve cost-effective options for implementing a world-class program of underground science [5].

The Compelling Science has been Identified and Pri-
oritized

In 2008 the Particle Physics Project Prioritization Panel Roadmap of the HEP Advisory Panel (HEPAP) and in 2007 the National Academy of Science’s Dark Matter Long Baseline Neutrino Experiment (DM-LBNE) assessed these high priority research topics as the DOE and NSF jointly pursued concepts for an underground facility. The full suite of scientific experiments has been critically assessed by the scientific communities. We believe that the costs are mature, well documented. Many sections of the report are well
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documented. The costs are mature, well support-
level expected for a CD-2 review in the DOE system.

The Facility Design was critically reviewed by a 23-mem-
ber committee, who report: The costs are mature, well support-
ed and well documented. Significant infrastructure and safety enhancements have been installed. The Davis Laboratory, which housed Davis’ Nobel Prize-winning solar neutrino experiment, has been expanded and a new hall excavated. Both are being outfitted to support physics experiments.

Geotechnical investigations affirm that the 100 ktonne cav-
dence design poses few recent. Analyses indicate that these costs exceed fare well within existing excavation and ground support technologies.

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