Once certain unanticipated torques spacetime—to within around 1%, the geodetic effect—how much that general relativity correctly predicted the frame-dragging effect. The goal of the meeting, according to conference co-chair Nora Berrah of Western Michigan University, was to find ways to double the number of women in physics over the next 15 years. The gender equity conference was organized by APS with support from NSF and DOE.

Women now make up about 13% of physics faculty, but only 7.9% at top 50 research-oriented universities. Berrah pointed out that chemistry and astronomy have twice the percentage of women that physics has. “The gender gap is a serious concern. We should be talking about the pool of talent,” she said.

In the opening session, work on Public Affairs, was at NSF when the criterion was first put in place in the mid-1990s. He said that the criterion is meant to serve two purposes: first, it forces scientists to think more carefully about the ways in which their work impacts society, and second, it helps provide the public with more information about what scientists are doing.

Fred Cooper, a current NSF program director for theoretical physics, said his personal opinion is that this is a good thing for NSF to do. “I’m very happy to encourage people to think about these things,” he said. He says it is in scientists’ self-interest to do so.

However, some scientists object to the “Broader Impacts” Criterion Gets Mixed Reviews Panel of 50 major research institutions, which was to find ways to double the number of women in physics. Berrah pointed out that chemistry and astronomy have twice the percentage of women that physics has. “The gender gap is a serious concern. We should be talking about the pool of talent,” she said.

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In 1876 Edward Alexander Bouchet made history by becoming the first African American PhD physicist, and the sixth person of any race to receive a PhD from an American university. Bouchet went on to educate and inspire others as a science teacher at a school for black students.

Bouchet was born in September 1852, in New Haven, Connecticut. His father, a freed slave, worked as an unemployed laborer, like many black men in the town. His mother was a housewife, and he had three younger siblings. Bouchet family was active with their local church and the local abolitionist movement, and encouraged all the children to get an education.

The local public schools were segregated, so in elementary school Edward Bouchet attended the Artisan Tinted Colored School, which had 30 students of all grade levels, and one teacher. In 1868 he gained admission to Hopkins Grammar School, a prestigious private preparatory school at the time, and graduated to Yale College. At Hopkins Grammar School he received an education in science, studying Latin and Greek as well as geometry, algebra and history. Bouchet graduated first in his class in 1870. He entered Yale in the fall of that year. Bouchet was not the first black student to enter Yale, but he was the first to graduate. He lived at home during his time at Yale, and was dearly devoted to his students. In June 1876, Bouchet graduated with a class of 124 students. He was the first black person to be nominated to Phi Beta Kappa.

As a talented young black man interested in science, Bouchet had come to the attention of Alfred Cope, a philanthropist in Philadelphia who was on the board of managers for the Institute for Colored Youth. The VIC was one of the few places in the city where black students could get an academic high school education. Cope wanted to build up the science program there, and hoped to bring Bouchet onto the staff. But before recruiting him as a teacher, Cope encouraged Bouchet to continue his studies, and paid for his graduate education at Yale. Edward Bouchet spent two more years there, completing further studies in chemistry, mineralogy, and physics. His primary professor was Arthur Wright, who in 1861 had become the first person to earn a doctorate in physics from an American university. Bouchet’s original research focused on geometrical optics, and he wrote a dissertation entitled “On Measuring Reflective In-Depths.” Just two years after completing undergraduate studies, Bouchet became the first black person to earn a PhD in physics.

A white person with Bouchet’s credentials would have been able to obtain a university position, but even with his impressive accomplishments, not many career options were open to him as an African American. So in the fall of 1876 Bouchet went to teach at the Institute for Colored Youth, as Cope had wanted.

At IGY, Bouchet headed the school’s new science program. In addition to physics and chemistry, Bouchet taught classes in geology, geography, and physiology. An advocate for improving science education, Bouchet repeatedly asked the school’s board of managers to provide laboratory space for students to perform individual experiments. In addition to his regular teaching, Bouchet gave lectures on various scientific topics for students and staff, and even reached out to the wider community by giving public lectures on science.

Bouchet taught at the IGY for 26 years. However, by around 1900, many black young people were being pushed into vocational and technical training, rather than academic education. For black leaders, including Booker T. Washington, advocated for this approach, arguing that this type of education was what suited black people best. Bouchet’s accomplishments clearly showed that black people were capable of academic and scientific pursuits, but in 1902 the IGY managers decided that the school would give up academic subjects and shift its focus to industrial education. Bouchet lost his job.

Bouchet spent the next several years in several different teaching positions around the country. In 1916, Bouchet returned home to New Haven in poor health, and died in 1918 at age 66. He was survived by his mother, who died two years later at age 102.

As a black man in a segregated society, Bouchet faced many challenges, but he didn’t leave behind any letters or notebooks, so we know little today about his thoughts on his career or his daily life. A friend of his wrote in an obituary that Bouchet was “a man of keen interest and unusual refinement. He was a prolific reader and was greatly interested in the history of his own people and of his native town.

Bouchet never married or had children. He was a member of the Franklin Institute and the American Academy of Political and Social Science and was active in the NAACP.

Over his career in teaching, Bouchet had educated many black youth in science, but black people were still excluded from most scientific education and careers for many years. It was not until 1918, the year Bouchet died, and 42 years after he received his PhD, that Elmer Imes became the second African American to receive a PhD in physics.

**Washington Dispatch**

A bimonthly update from the APS Office of Public Affairs

**ISSUE: Science Research Budgets**

Congress has begun consideration of the President's Budget Request for Fiscal Year 2008, which begins October 1. While no appropriations bills have been marked up as of press time, the House and Senate have sent positive signals for science research funding through their respective Budget Resolutions.

The Budget Resolution, which sets non-binding spending goals for the President's requested increases for DOE Science, NSF, and the NIST Labs. Senators Bingaman (D-NM) and Alexander (R-TN) offered an amendment to provide an additional $1 billion for the requested increases, and other science and math education and research measures. The amendment passed overwhelmingly by a 97-1 vote. Conferences are reconciling the differences between the House and Senate resolutions.

The House began marking up its appropriations bills in May; the Senate will do so in June. See http://www.aaas.org/aps/pdf/0706.htm to track the progress.

**ISSUE: Nuclear Forensics Study**

The APS Panel on Public Affairs and the AAAS have established a study group on nuclear forensics technology and techniques. The panel's chair is Michael May, Emeritus Director of Lawrence Livermore National Lab and Professor Emeritus at Stanford University. Other members of the group include Al Carnesale, Phil Coyle, Jay Davis, Don Kerr, Francis Slakey, & Benn Tannenbaum. The first panel meeting will be held this summer, with the report scheduled to be completed early next year.

**ISSUE: Nuclear Workforce Study**

The APS Panel on Public Affairs has established a study group to examine the status of the United States Nuclear Workforce. Sekazi Mitwega, from MIT, will chair the study. Other members of the group include: Henry Waxman (D-CA), Member of Congress; Andrew Klein, Lynne Fairclough, Allen Sasses, Marc Ross, and Carol Berger. The first panel meeting is scheduled to be held this summer, with site visits planned for August and September. A report is slated to be completed early next year.

**ISSUE: Science Education and School Boards**

Congressional and Executive Branch Science Fellows will have the opportunity to attend a workshop on how to get involved with school boards, July 16th at the AAAS. The workshop will provide materials on how school boards function, how members are elected or selected, and how scientists can become effective participants. Those interested in attending the workshop should contact Francis Slakey at slakey@aps.org.

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

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**APs and Yale Honor J. Willard Gibbs**

Photo by Michael Marsland/Yale University Office of Public Affairs

J. Willard Gibbs served as Professor of Mathematical Physics at Yale from 1871 until his death in 1903, during which time he made fundamental contributions to thermodynamics and statistical mechanics. To honor Gibbs, Yale was among the original set of physics historic sites chosen by the APS Historic Sites Committee in 2005. For scheduling reasons, however, the plaque presentation ceremony was not held until this year. On April 20, members of the Yale Physics department and guests gathered in Stoane Physics Laboratory to celebrate the occasion. Standing, left to right, are Yale Physics Chair R. Shankar, APS Editor-in-Chief Gene Sipress, and Yale Provost Andrew D. Hamilton, who is explaining the impact that Gibbs had on Yale and on science. Listening intently are the Chair of the APS Historic Sites Committee, John Rigden (seated at left) and J. Willard Gibbs himself (perched on the easel). After the ceremony, the audience was treated to a lecture on Gibbs by Yale historian of science emeritus Martin J. Klein, the first recipient of the APS Pais Prize for history of physics.

**Efficiency is Key to Resolution of Energy Crisis**

While many energy discussions focus on finding new sources of energy, a lot can be done to use the energy we have more efficiently, said speakers in an April Meeting session. In many cases, more efficient technology is already available and cost-effective.

Amory Lovins, an energy expert and founder of the Rocky Mountain Institute, described several existing efficient technologies. We could save billions of dollars per year by investing in these technologies, he said. In fact, it would cost less to use efficient technology to save than to produce new energy, he said. In addition to building new structures, said Lovins, you could have an ultra-light hybrid SUV that gets 67 miles per gallon. The car would be as big, comfortable and safe as today's cars, he said. Vehicles use 70% of US oil, said Lovins. New advanced ultralight materials such as carbon fiber thermoplastic, said Lovins, could be used because the automobile would not need as much power. "The car would be as big, comfortable, and safe as today's SUVs. A car such as this would cost much more to produce, and would pay for itself in saved oil in less than two years," he said. "This is of finding a Saudi Arabia under Detroit," said Lovins in a press conference at the April Meeting. A new interest in彗星 going on in electricity generation, he said. Clean, small, "micropower" plants were already generating a sixth of the world's electricity in 2005, and are set to provide an even greater proportion of our electricity supply. "The revolution already happened, sorry if you missed it," said Lovins. These small, low-cost, decentralized generating plants involve less financial risk than large central thermal power stations, he said. They are funded mainly by private investment.

Another speaker in the session, Leon Glicksman of MIT, said that more efficient buildings could save significant amounts of energy. Buildings use almost 40% of the country's energy and about two-thirds of the electricity. In fact, given how much energy is used indoors, buildings probably have more of an impact than transportation systems.

Many discussions about energy issues focus on the supply side, but we need to have a more balanced approach, to save energy and using it efficiently, he said. Glicksman has worked on ways to design buildings that are more efficient. Buildings usually last a long time and are difficult to retrofit, so it's important to build them efficiently. But builders don't have money to save the energy bills, and consumers don't know enough about energy efficiency.

Glicksman said that architects have to be trained in more efficient structures. To help them, he and colleagues have developed a computer program that simulates the heating, lighting, and cooling requirements for a given building design. In addition to building new structures that are more energy efficient, something that can save a lot of energy in existing buildings, said Glicksman. For instance, they found that at MIT about half of the heat flows in the chemistry building were being left open at night, which wasted a lot of energy. Energy efficient buildings and other ways of saving energy are available, Glicksman said. "It's really a question of getting people to use these things."

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**JLab Experiment Pins Down \(\pi^0\) Lifetime**

A new measurement of the lifetime of the neutral pion is twice as precise as previous measurements, researchers from the PrimEx collaboration reported at the April APS Meeting. The result agrees with previous experiments, is \((8.4 \pm 0.6) \times 10^{-8}\) s, and confirms our researchers from the PrimEx collaboration spokesman Ashot Gasparian of North Carolina A&T State University, that the pion lifetime to date. The experi-

The new result is the most precise measurement of the neutral pion lifetime to date. The experiment was carried out at the Thomas Jefferson National Accelerator Facility by the PrimEx collaboration, a group of over 70 researchers from 21 institutions.

The new, mean lifetime value, about 82 attoseconds, is more than twice as precise as previous measurements, Gasparian said. For comparison, the lightest quark-anti-quark meson, is made up of a superposition of an up, anti-up pair and a down, anti-down pair. The lifetime of the chargeless pion is one of the few quantities that can be calculated directly from QCD, said PrimEx collaboration member Liping Gan of the University of North Carolina, Wilmington.

Lawrence Cardman, Jefferson Lab’s Associate Director for Experimental Nuclear Physics comments that the neutral pion is a simple system that provides a good test of fundamental theory. He called the system the “positioning of QCD.”

The JLab experiment produces pions using the Primakoff effect. In this effect, a beam of photons is aimed at a target nucleus. The nucleus generates a cloud of virtual photons, one of which interacts with a photon from the beam to produce a neutral pion. The pion then quickly decays back into two photons. Using a sensitive calorimeter, the researchers detected the energy and position of both of these decay photons. They used these measurements to calculate the pion’s lifetime.

The PrimEx collaboration came up with a mean value of \((8.2 \pm 0.24) \times 10^{-8}\). The Particle Data Group’s Particle Physics Booklet’s value, based on the average of several previous experiments, is \((8.4 \pm 0.6) \times 10^{-8}\). The PrimEx group was able to obtain a more precise measurement than previous Primakoff experiments because the photon beam is tagged so the number and energy of photons aimed at the target nucleus can be tracked, and the decay photons are measured by an advanced hybrid calorimeter.

More data from the PrimEx experiment remains to be analyzed, and the collaboration expects to announce an even more precise value for the neutral pion lifetime after completing that analysis.
I want to comment on the letter “Simulations Teach Real Physics” in the April 07 APS News by Henderson Cole, and the Viewpoint by Alan Chalmers on page 29 of the April 07 APS News. The former states that “events in a real laboratory happen too fast to observe the physics,” so it is better to learn by using a physics simulation software package, and watch it in slow motion. He should try the proposed method of measuring the gravitational acceleration constant g.

About 55 years ago, my high school physics teacher devised an experiment to measure g using a ball bearing slowly rolling down an improvised inclined plane (a 16-foot section of half-round rain gutter dusted with flour to show the oscillating trajectory). Measurements gave a value of g that was about 30% too low. More precise measurements confirmed this low value. My teacher and I did not know after about a week of intense study, learned enough math to understand and calculate the rotational inertia of the ball bearing, and get the accepted value of g. The enjoyment was in the quest for the answer, not learning it in a simulation, but rather doing it on electricity without recalling the aroma of ozone from sparks. Doing physics lab experiments using canned software simulations is about as exciting as picking up a crossword puzzle, only to find that the answers have already been penciled in. The virtue of using virtual experiments as a teaching tool in high schools should be limited to comparing the measured results to the expected results, not as a substitute for real physics. Teaching the fundamental laws of physics in high schools requires observation and measurement, not simulations.[2]

Sloppy, I admit, not thinking through my argument carefully before writing it. When a current-carrying wire move in a magnetic field is more instructive than just plugging the current and field values into a simulation of the Lorentz Force Law. Can a force really be perpendicular to both the current and the magnetic field? Seeing it is better than reading about it. Doing it is even better. I recently gave small battery-powered DC electric motor kits to every student in the AP physics class at my former high school. I can understand why students who learn (memorize) physics using virtual physics experiments might perform better on AP physics tests. And I understand the inherent danger in exposing some students to electricity in the lab (These are often the same ones who never learn AAA (Always Add Acid) in the chemistry lab). But the original basis for physics was to explain real world phenomena using tools and experimental evidence. Viewing virtual experiments on a computer is no substitute for doing the real thing, even if the equipment has to be improvised.

Robert Shafer
Los Alamos, NM

Correction

The institutional affiliation of Geraldo A. Barbosa, the author of the International News column in the April APS News, was incorrectly stated and maintained is not known, opened their homes to me, inviting me to participate in various family activities, including various birthdays, New Year’s Day, and Christmas—which is celebrated not on December 25th, as in the west, but on January 7th, in keeping with the Eastern Orthodox calendar. The cultural center of Akademgorodok is “The House of Scientists”, where I was able to attend symphony orchestra performances and engage in discussions on aspects of the social life of the town. In particular, I was quite popular with the “English Club” that met at the House of Scientists, whose members were anxious to practice their English with me and to learn as much as they could about life in the US. Furthermore, I distinctly remember the selfless work of the members of some of the local churches, where I also assisted in the efforts to teach English language courses and to provide humanitarian aid to hospitals, schools, and prisons throughout the region. The results of the research that I performed in Russia have been superseded in the intervening years, and the focus of my scientific career has changed significantly. However, my experiences in Akademgorodok have stayed with me ever since I returned in February of 1999. I have not forgotten the quite beautiful days I have walked through knee-deep snow in 40-degree weather (where the Fahrenheit and Celsius scales coincide) to reach the offices of the Institute. I remember the occasional signs of economic hardship in the region, such as the local grocery store ran out of the vast majority of products and was unable to restock. Even more than I remember how patient and adaptable the community was in the face of such hardship. I recall with fondness the opportunities afforded to me to learn about the local culture and economic life in the US. Furthermore, I distinctly remember the opportunities afforded to me to learn important new skills, to gain exposure to some of the diverse members of the international scientific community, and to learn about the goals, ideals, and lives of fellow scientists. My products and was unable to restock. Even more so I remember how patient and adaptable the community was in the face of such hardship. I recall with fondness the opportunities afforded to me to learn about the local culture and economic life in the US. Furthermore, I distinctly remember the opportunities afforded to me to learn important new skills, to gain exposure to some of the diverse members of the international scientific community, and to learn about the goals, ideals, and lives of fellow scientists.
MiniBooNE Results Inconsistent with Existence of “Sterile” Neutrino

One neutrino anomaly has been resolved while another has sprung up, according to the results from the MiniBooNE experiment at Fermilab. The results were officially announced the week before the APS April Meeting in Jacksonville, Florida, and there were several papers on the topic presented at the conference.

MiniBooNE is short for Mini Booster Neutrino Experiment, an international collaboration involving 77 physicists from 17 different institutions in the US and the United Kingdom. Its much-anticipated findings indicate that only three low-mass neutrino species exist: electron, muon and tau neutrinos. This in turn seems to rule out two-neutrino oscillations involving a hypothetical fourth neutrino species.

Several experiments had previously shown that neutrinos regularly change form from one species to another. Oscillating neutrinos are comprised of three different waves that combine in different ways as they travel through space. Small physical differences in mass lead to telltale interference effects. If, indeed, neutrinos oscillate—as seems to be the case per experimental results from Japan’s Super-Kamiokande collaboration announced in 1998—their mix is the possibility of a fourth “sterile” neutrino that would only interact through gravity.

Like any good physicist, Frank excelled in observation, data collection, decision-making, and problem-solving. And so it was in observing a colleague’s frustrated attempts to lead. Frank decided that a managerial career was right for him. “I went into management, partly because I didn’t want this guy to control my destiny; I wanted to do that myself,” he says.

Frank was interrupted with colleagues trying. “The environment I saw was fascinating; with plenty of bite-size pieces. And you have to recognize what you have done already,” Frank says. “You need to look at the tough parts of a project first, to see if it can be done. Physics is outstanding for that. It is systems thinking.”

As CTO, Frank was accountable for the “technical health” of the company. He was responsible for research, development, and engineering at the corporate laboratories and at the business units, which oversaw product lines. His job was to ensure that the technological strategy and the technology of the company’s products and processes were all running smoothly.

Furthermore, the job was a blast. “Physicists deal with a broad range of technologies, including bio-technology, nanotechnology, metalurgy, etc., so physics is the perfect platform for designing and leading a company’s technological strategy,” says Frank.

Frank had to play the role of the honeybee pollinating ideas,” Frank recalls. “I gave a lot of direct control over people, and I think I was respected for the company first, with a structure that is more global for a global company.”

Although he retired, Frank Lederman still stays involved in technology management as a member of the Board of Directors of Cray Inc. (a global supercomputer leader), and as an emeritus member of the Industrial Research Institute, which conducts the present TOs. He also volunteers his time on several university advisory boards. For students and colleagues interested in a career in technology management, the physicist suggests “getting exposure to a lot of different things, and thinking a vision using your unique abilities to follow your passion.” And the quintessentially academic subject upon which to build a triumphant technology management career? There’s no question, Frank says. “Physics is the right science. I wouldn’t pick another.”

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About 10 years ago, the Liquid Scintillator Neutrino Detector (LSND) experiment at Los Alamos National Laboratory threw an unexpected wrinkle into the mix: the possibility of a fourth “sterile” neutrino that would only interact through gravity. The level of observed oscillations suggested the existence of a different type of neutrino masses than those inferred from prior studies of solar neutrinos and atmospheric neutrinos.

MiniBooNE was conceived to test the results of the LSND experiment. For the experiment, protons from Fermilab’s booster accelerator smashed into a fixed target, creating a swarm of mesons, which very quickly decayed into secondary particles, including many muon neutrinos. The MiniBooNE detector was placed 500 meters away. Although muon neutrinos might oscillate into electron neutrinos, over the short run from the fixed target to the detector, the scientists expected very few oscillations to occur.

The LSND and Fermilab detector both looked for electron neutrinos. Fermilab tried to approximate the same ratio of source-detector distance to neutrino energy, thereby setting the amount of likely oscillation. LSND used 30 MeV neutrinos observed after a 30-meter distance, while the earlier Fermilab experiment used 500 MeV neutrinos detected after a distance of 500 meters. The trick is to discriminate between the few rare events in which one electron neutrino strikes a neutron in a huge bath of mineral oil, thereby creating a telltale signature—an electron plus a slow-moving proton and much the more common event in which a muon neutrino strikes a proton to make a muon and a neutron. LSND saw a small but statistically significant (the team argued) number of electron neutrino events.

Heather Ray of Los Alamos, when analyzing MiniBooNE’s data, they took a “biting” look at what the experiment had seen as they were collecting the neutrino data, they didn’t even look at any of the data in the region of interest: the region where they would expect to see the same signature of oscillations as LSND. They didn’t “blunt” the data and open the box until three weeks before the official announcement.

Upon doing so, they found no telltale oscillation signature, contradicting the LSND findings from 1995. So MiniBooNE’s results rule out a fourth sterile neutrino, thereby verifying the current Standard Model with its three low-mass neutrino species.

However, a new anomaly appeared. They were tuning in on the third electron neutrino event detected at low neutrino energies, and this tiny subset of data remains a mystery. More experiments are planned to explore this anomaly, this time using a beam of anti-electron neutrinos.

Project spokesperson Janet Conrad (Cornell University) said the MiniBooNE experiment was “very robust and that, while some new physical effect cannot be ruled out, the low energy data do not undo the new assertion that the earlier LSND results cannot be explained by the existence of a fourth neutrino type.”

As a member of Alcoa’s executive team, Frank participated in the board that decisions of the company. Again, his physics came in handy, as it taught him what questions to ask in order to identify the underlying problem confronting a particular situation.

His greatest moment of satisfaction as CTO came when he convinced the CEO and key business managers that they had to play a bigger role in deciding which technologies get pursued and how they are managed. The technologies ranged from the design of alloys for an airplane wing to “enabling technologies” such as the physical chemistry behind production processes.

“We formed a virtual technology organization,” Frank recalls, “I gave up a lot of direct control over people, and I think I was respected for the company first, with a structure that is more global for a global company.”

Although he retired, Frank Lederman still stays involved in technology management as a member of the Board of Directors of Cray Inc. (a global supercomputer leader), and as an emeritus member of the Industrial Research Institute, which conducts the present TOs. He also volunteers his time on several university advisory boards. For students and colleagues interested in a career in technology management, the physicist suggests “getting exposure to a lot of different things, and thinking a vision using your unique abilities to follow your passion.” And the quintessentially academic subject upon which to build a triumphant technology management career? There’s no question, Frank says. “Physics is the right science. I wouldn’t pick another.”

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My Heart Belongs to Gravity

Experiments at Fermilab have placed new constraints on the mass of the Higgs particle that suggest that it might be too heavy to be detected by the Tevatron. The scientists have also detected rare processes and tightened constraints on some exotic particles. These are among the many results from the Tevatron presented at the April Meeting.

The Tevatron smashes together protons and antiprotons with combined energies near 1.96 TeV. Kevin Lannon of Ohio State University said in a press conference that the Tevatron, which is 70% through its highest rate ever, is the key to success in data analysis, he says.

Among the recent results Lannon described is a new measurement of the top quark mass. The Tevatron scientists report a top quark mass of 179.0 ± 1.0 GeV, which is a slight improvement from previous measurements. This measurement indicates indirect information on the mass of the Higgs particle, but doesn't provide any direct measurement.

Lannon also discussed evidence for the extremely rare production of single top quarks via a weak-force process. Top quarks are usually produced in top-antitop pairs by a strong force process. The DZero collaboration at Fermilab identified about 60 single top events out of billions of collisions.

The rate of single top production places constraints on the parameter $V_{tb}$, which is related to the probability of a top quark decaying into a bottom quark. The Tevatron single top data limits $V_{tb}$ to lie between about .68 and 1. This provides strong evidence that the only known source of mass for the top quark is the Higgs. The new limit on $V_{tb}$ is 0.84 (stat) ± 0.03 (syst) ± 0.04 (trg).

NSF continued from page 1

feet to research funding being coupled to education or outreach efforts. Mildred Dresselhaus of MIT, who chairs a panel that awards grants, noted that many scientists who are unhappy with the broader impacts requirements, and who feel they should be able to focus on their research, not outreach. Many physicists feel they don't have the expertise to do outreach activities. While the NSF requires education and outreach be encouraged, they're not required to be applied for research funding.

Some scientists, especially those applying for their first grants, find the broader impacts requirement especially daunting. One scientist said that beginning these professionals are overtime trying to stretch. They feel they have to do everything they can, and they think that they must devote significant time and energy to addressing the broader impacts criteria.

Dresselhaus describes this situation as “punitive.”

Broader impacts don't have to be burdensome, said Orel. There are a variety of things one can do, and NSF does not expect individual researchers to move mountains. One thing that would be a good faith effort to do outreach activities that individual scientists could join. This way, scientists would not have to develop their own outreach project, which might or might not be effective. For example, Cooper has started a program called TheoryNet, which brings theoretical physicists to talk with high school classes. Scientists could apply for grants to do programs that do broad outreach projects. Scientists have to do things that would help students understand what the science is. Plisch has conducted surveys that show that the Center's education programs are supportive of the center are supportive of the center are supportive of the center are supportive of the center. These programs include work grants, finding the broader impacts activities, getting professional from science classes for undergraduates and mentoring and career advice programs for graduate students.

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The requirements are deliberately non-specific in order to encourage creativity, explained Eisenstein.

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Large research centers have the resources to set up these kinds of programs, but individual scientists with smaller research grants may not be skilled at planning and carrying out an educational activity. Often, said Orel, scientists think that educational activities are left to large organizations that have the resources to do educational projects.

Individual scientists should be able to focus on pure research, and NSF is the only funding agency dedicated to funding pure research, said Orel. Others, including Eisenstein, argue that broader impacts activities are something most scientists would appreciate. NSF will still be able to provide the resources to do educational projects.

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EQUITY continued from page 1

Workshop attendees participated in an interactive theater performance by the University of Michigan Center for Research on Learning and Teaching (CRLT) players. The sketch, “faculty meeting” showed some of the subtle biases and often unnoticed behaviors that make it difficult for women to succeed.

After listening to presentations and participating in breakout groups, workshop participants came up with recommendations for increasing the participation of women in physics. Department chairs were asked to take at least two recommendations back to their department and implement them. A website will be set up for them to report their progress.

Throughout the meeting, speakers and participants addressed the causes for the low numbers of women in physics and made recommendations for improving the situation. Many of the recommendations were aimed at creating a more welcoming climate for all physics students and faculty members, including women.

Virginia Valian of Hunter College and the Conference on the Status of Women in Physics noted that “we need to have a plan to for handling family.”

Barbara Whitten of the University of Texas A&M University commented that the undergraduate level is where the biggest leak in the pipe line comes in, and the undergraduate level is usually the last chance to recruit new students to physics. Barbara Whitten suggested that to recruit more majors, including female students, departments should focus on introductory courses and create an attractive curriculum that includes introductory topics. Departments can also befriend undergraduates by creating student lounges, encouraging cooperative work group, hosting local events and making departmental seminars accessible to undergraduates.

Several workshop participants expressed the concern that the difficulty of applying for funding is deterring young people from science careers, and many professors aimed at creating a more welcoming atmosphere in their department to for handling family.

Several workshop participants noted that the funding agencies can play an important role. She pointed out that there have been successful programs such as NSF’s ADVANCE, which was designed to increase the participation of women in science and engineering careers.

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The Strange Tale of the Hafnium Bomb: A Personal Narrative

By Peter D. Zimmerman

In 2001, with a new president and secretary of defense, less interest in taking scientific advice if it conflicted to the military, DARPA steps in with two large programs, SIER, or Stimulated Isomer Energy Release, and HIPP, the Hafnium Isomer Production Panel. Heading the rest of the government that the ‘‘above ground test’’ was a ‘‘sound weapon’’ and only Sharon Weinberger would get to sort out what she thought was the truth, writing only what she chose. Hence she failed.

Hafnium became the subject of a cover article of a Washington Post Sunday Magazine few months later, complete with a cover photo of Collins and a screen shot of the line ‘‘we have a winner’’. That got the House and Senate appropriators in the game, and within months the law forbade DOD to spend its money on isomers. I thought I had killed the hafnium bomb, and it was good guys? Well, not exactly. DOE supported the work with Stickley apparently getting funds that way. A Ferguson shows triggering and our suggestions were followed, we would agree that triggering was real; my contribution was to suggest that what the Russians showed was ‘‘interest’’ in isomers, and, most serious of all, they were shown triggering and our suggestions were followed, we would agree that triggering was real; my contribution was to suggest that what the Russians showed was ‘‘interest’’ in isomers, and, most serious of all, they were

The Pentagon had seemed to have five pound hand grenade powered by a hafnium explosive could deliver a two kiloton kick. Neither Fred Ambruce, nor his colleague, Dr. Eliot Lehman, could explain just how the laws of physics were to be violated quite so grossly.

Other things they didn’t explain included how a soldier was supposed to hold a hafnium grenade, given that it would be fiercely radioactive, at least thousands of curies, or how anybody was supposed to be able to throw a five pound grenade far enough to survive a two kiloton blast. Later others were to scale that back to two tons, but I still don’t know how the grenade was going to come out alive, even if his throwing arm wasn’t shredded.

A long after a meeting at ACDA it was folded into the State Department. Ambassador A. T. Bohlen however requested that I attend a meeting at which I came and became her science adviser. I also had the job of running the research budget for the three State Department bureaus which housed most of the people from ACDA. ***

Stanford Hoover may be the most important two-star admiral you’ve never heard of. He is the father of electronics in the US Navy, and was a key player in the creation of the two topographic maps and in the late 1930s headed the U.S. Navy’s Technical bureaus which housed most of the people from ACDA.

I was in my last few weeks of waiting for White House security clearance to start a new job as chief scientist of the Arms Control and Disarmament Agency (ACDA) when I received an offer to be briefed by an official of the Defense Intelligence Agency (DIA) on hafnium research. Because I had not yet started my new job, protocol required that the briefing be on DIA’s turf, and not ACDA’s, and so I crossed the Potomac.

What I heard was extraordinary: DARPA had gone to work on isomers in a big way, despite the fact that there was a six or seven order of magnitude gap between real nuclear theory and the rest of the government that the “above ground test” was a “sound weapon” and only Sharon Weinberger would get to sort out what she thought was the truth, writing only what she chose. Hence she failed.

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