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LA Hosts 2005 APS March Meeting

Attendees who shivered through last year's March meeting in Montréal will head instead for the land of palm trees and perpetual sunshine in 2005. The APS March Meeting will take place in Los Angeles, March 21-25.

Photo Credit: Courtesy of the Los Angeles Convention Center

This is typically the largest physics meeting of the year with approximately 6000 participants, and will include more than 90 invited sessions and 550 contributed sessions, covering the latest research in areas represented by the APS divisions of condensed matter physics, materials physics, polymer physics, chemical physics, biological physics, fluid dynamics, laser science, computational physics, and atomic, molecular and optical physics.

Also taking part will be the APS topical groups on Instrument and Measurement Science, Magnetism and Its Applications, Shock Compression of Condensed Matter, Statistical and Nonlinear Physics, as well as the forums on Industrial and Applied Physics, Physics and Society, History of Physics, International Physics, Education, and Graduate Student Affairs.

In honor of the World Year of Physics 2005 and the centennial of Einstein's "miracle year," special sessions will be devoted to

See LA 2005 *on page 4*

Heckman, Hodas Capture 2004 APS Apker Award

Nathan Oken Hodas

Photo Credit: Shelly Johnston

Jonathan Heckman

Two undergraduates, one from Princeton and the other from Williams College, have been chosen as the recipients of the 2004 LeRoy Apker Award of the APS.

The Award is given annually for outstanding research accomplishments to two students, one from a PhD-granting institution, and one from an institution that does not offer the PhD. The nominees are narrowed to six finalists (See the November 2004 issue) and the recipients are determined after a day of interviews of the finalists by the selection committee.

Jonathan Heckman of

See APKER AWARD *on page 6*

World Year of Physics Flies High At Young Scientist Challenge

By Ernie Tretkoff

Forty middle school students gathered at Cole Field House at the University of Maryland on October 25th and 26th to compete for prizes and scholarships in a series of challenges inspired by Einstein's physics.

These students, some of the best young scientists in the country, had excelled in their local science fairs to become finalists in the 6th Annual Discovery Channel Young Scientist Challenge.

In the "Extreme Einstein challenges," the students watched skateboarders and analyzed the g-forces, did a relativity experiment, and guided a laser beam through an obstacle course.

"This is awesome!", said Dustin Shea, 13, of Jacksonville, IL. The other students had similar reactions.

This year, in honor of the World Year of Physics 2005, several of the challenges related to physics. In one popular challenge, skaters—some riding "world year of physics" skateboards—skated on a half pipe, while the students captured acceleration data. The students made predictions about the g-forces on the skaters and then asked the skaters to perform tricks

See WYP *on page 3*

Photo Credit: James Riordon

Skateboarder Dennis Guenthner shows Young Scientist Challenge participants that even extreme athletes obey the laws of physics.

Three American Physicists Share 2004 Nobel Physics Prize for QCD

Three American physicists have been awarded the 2004 Nobel Prize in Physics. David J. Gross (University of California, Santa Barbara), David Politzer (Caltech) and Frank Wilczek (MIT) were honored "for the discovery of asymptotic freedom in the theory of the strong interaction." Published in 1973, their discoveries led to the development of the theory of quantum chromodynamics (QCD), a companion to quantum electrodynamics (QED), the crown jewel of modern physics, which describes the interactions of the electromagnetic force with matter.

QCD describes the strong force, also known as the color interaction, which holds together the quarks that make up the various constituents of the atom (protons and neutrons). The existence of quarks had been known since the 1960s, but scientists discovered a couple of strange features. First, quarks have electric charges that are a fraction of the proton's—-1/3 or +2/3—something scientists have yet to explain.

Second, in addition to its electrical charge, each quark also has a special quantized property called the color charge; quarks can carry the color charges red, blue or green.

And finally, it is not possible to produce free quarks; they are fundamentally confined. They can, however, sometimes appear to be free particles, or grains inside a proton—an effect witnessed in several scattering experiments between electrons and protons.

What Gross, Politzer and

See NOBEL PRIZE *on page 3*

Is He the Oldest Fellow of Them All?

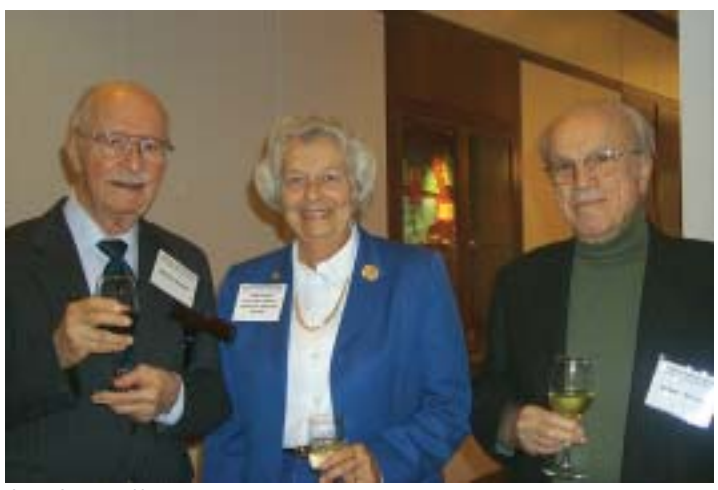

Photo Credit: Laura Walsh

Taken at the recent Fellows' reception in College Park, MD (see story on page 6) this photo shows APS Executive Officer Judy Franz (center) flanked by two unrelated Shapiros, Anatole on the right and Maurice on the left. Maurice Shapiro was elected to APS Fellowship in 1946, making him the longest-serving Fellow of whom we are aware. Does he indeed hold the record? APS News *would like to hear from others whose Fellowship is of a similar, or perhaps even older, vintage. Anyone who was elected an APS Fellow prior to 1950 is invited to contact Shelly Johnston at 301-209-3268 or johnston@aps.org for a special commemorative gift.*

New Optical Devices, Techniques Highlight Laser Science Meeting

3-D reality, a new technique for internal fingerprints, and a fiber-optic probe for detecting precancerous cells were among the highlights at the 2004 Frontiers in Optics/Laser Science XX meeting, the annual meeting of the Optical Society of America, held October 10-14 in Rochester, NY. The Laser Science XX meeting serves as the annual meeting of the APS Division of Laser Science and provides an important forum for the latest work on laser applications and development, spanning a broad range of topics in physics, biology and chemistry.

The conference plenary session featured three visionary speakers and a keynote presentation from Senator Hillary Rodham Clinton (D-NY). Kerry Vahala of Caltech provided a tour of tiny devices for confining and controlling light. Watt Webb of Cornell University discussed recent advances in imaging and studying tiny biomolecular structures using the whole range of the electromagnetic spectrum.

The University of Rochester's Emil Wolf traced optics history from the 1860s to the 21st century to present a new development in which he played a major part: a

See LASER SCIENCE *on page 3*

Highlights

Members in the Media

"It's very unfortunate that missile defense has become a sort of political litmus test. Ballistic missiles are by far the least likely way that the United States would be attacked with a nuclear weapon. It's this politicization of missile defense that has led to what I think is a vast, dramatic misallocation of resources."
—Wolfgang Panofsky, Stanford University, Orlando Sentinel, October 17, 2004

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"String theory leads in a remarkably simple way… to a reasonable rough draft of particle physics that requires gravity. But there are uncomfortably many ways to get the rough draft, and it's frustratingly difficult to get the second draft."
—Ed Witten, Institute for Advanced Study, Dallas Morning News, October 25, 2004

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"We will never be able to use fundamental theory to calculate the radius of the Earth's orbit, and we may never be able to use fundamental theory to calculate the vacuum energy."
—Steven Weinberg, University of Texas at Austin, Dallas Morning News, October 25, 2004

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"The best thing you could hope for is black holes,"
—Harold Ogren, Indiana University, on what the LHC might produce, Dallas Morning News, October 25, 2004

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"It combines rational and irrational numbers to get zero. It's bizarre."
—Robert Crease, SUNY Stony Brook, on Euler's equation, The New York Times, October 24, 2004

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"I think the general physics community, they're a little bored with the equation. It's risen to the level of icon that people no longer pay attention to."
— Neil deGrasse Tyson, Hayden Planetarium, on $E=mc^2$, The New York Times, October 24, 2004

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"Just like primitives, people fetishize. They see this stuff worn by tough, powerful people, and think they can take on those powers. Think Uma Thurman in her yellow leather riding suit and helmet in '*Kill Bill 2*.' "
—Charles Falco, University of Arizona, on the latest fashions in motorcycle clothing, The New York Times, October 27

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"The movie is saying that somehow we can all get together and, with our collective thought processes, we can influence the outcome. But that's two leaps beyond what scientists believe to be true."
—Bruce Schumm, University of California, Santa Cruz, on the movie, "What the bleep do we know?" The Christian Science Monitor, October 14, 2004

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"It's just raw, in-your-face paradise,"
—David Gross, UCSB, on the environment of Santa Barbara, Associated Press, October 14, 2004

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"Much of the important science of the 21st century is going to be done in very large facilities like the light source."
—Robert Birgeneau, University of California, Berkeley, on a new synchrotron facility in Saskatoon, Toronto Star, October 21, 2004

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"If you were asked to exercise in a room where the level of radioactivity was hundreds of times higher than the allowable doses set by the National Radiation Protection board, I'm sure students would be demanding the facility be shut down. Yet this same situation exists in group exercise settings, the only difference is in the aerobics class the radiation is acoustic energy and the affected organ is very specific, your ear."
—Eugenie V. Mielczarek, George Mason University, on unhealthy sound levels in exercise classes, WAMU radio, October 15, 2004

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"There's no seating chart. People will self-organize their tables."
—Julio Ottino, Northwestern University, on plans for a "Complexity Dinner", Chicago Tribune, October 31, 2004.

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"Say you had some in a box, and you pulled one out and weighed it and it weighed m_1. Then you pulled out an identical one, and it weighed m_2. It isn't a situation where a neutrino is m_1 or m_2— it's a situation where the neutrino is 50% one mass and 50% another. This seems surprising, but it's perfectly natural in quantum mechanics."
—Stuart Freedman, UC Berkeley, San Francisco Chronicle, November 1, 2004

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"I think there is not enough awareness of science as there should be. People are very aware of the latest comings and goings of celebrities, while sometimes the greatest science discoveries go unnoticed."
—Paul Halpern, University of the Sciences, Philadelphia Inquirer, October 17, 2004

This Month in Physics History

December 1898: The Curies discover Radium

Women physicists were a rarity in the 19th century, but even rarer were husband-and-wife collaborative teams. Pierre and Marie Curie made history not only in that respect, but also because their scientific teamwork led to the discovery of radioactivity and two new elements in the periodic table, for which they shared the Nobel Prize in Physics.

A native of Poland, Marie Curie was born Maria Sklodowska. Her father was a schoolteacher who had lost his prestigious position because of his pro-Polish sentiments at a time when Poland was divided up among Austria, Prussia and czarist Russia.

The family was poor, but her father exposed Marie and all her siblings to the classics of literature, as well as science.

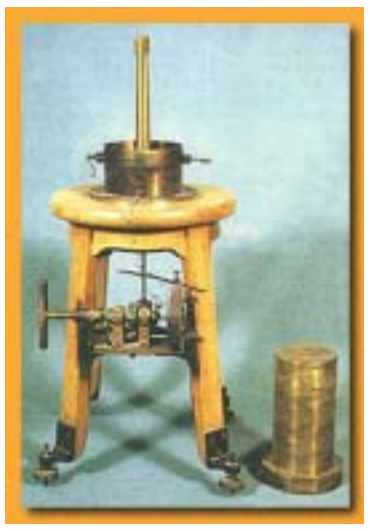
Marie could not enroll at the University of Warsaw; women were not admitted. Instead, she, her sister Bronya, and several other friends attended a "floating university": an illegal night school whose classes met in changing locations to evade the czarist authorities. She worked as a governess for several years, helping pay for Bronya's tuition at medical school in Paris.

Finally, it was her turn. Marie set out for Paris, in the fall of 1891 to pursue studies at the University of Paris' prestigious Sorbonne. Although her math and science background was woefully inadequate, Marie worked hard to catch up with her peers, and eventually finished first in her master's degree physics course, also earning a second in mathematics the following year.

In the spring of 1894, Marie's search for laboratory space led to a fateful introduction to Pierre Curie, a scientist some 10 years her senior who had done pioneering work on magnetism.

The son of a respected physician, Pierre had the benefit of private tutoring as a child, soon demonstrating a passion and gift for mathematics. He earned a master's degree by age 18, and

Pierre and Marie Curie Shortly after their wedding.



Pierre and Jacques Curie's electrometer.

three years later discovered the piezoelectric effect with his older brother, Jacques.

They found that when pressure is applied to certain crystals, they generate electrical voltage, and when placed in an electric field, those same crystals became compressed. They used this effect to build a piezoelectric quartz electrometer to measure faint electric currents, which Marie would use in her research.

Pierre later discovered a fundamental relationship between magnetic properties and temperature. Today, the temperature at which permanent magnetism disappears is known as the "Curie point."

It was Marie who encouraged Pierre to write up this latter work as a doctoral thesis. He received his PhD in March 1895, along with a promotion to a professorship at the Municipal School, and the couple married three months later.

For her own doctorate, Marie chose to focus on the mysterious uranium rays discovered in early 1896 by Henri Becquerel, a few months after Wilhelm Roentgen's discovery of x-rays.

Marie conducted numerous experiments confirming Becquerel's observations that the electrical effects of uranium rays are constant, regardless of whether solid or pulverized, pure or in a compound, wet or dry, or whether exposed to light or heat. She also validated his conclusion that those minerals with a higher proportion of uranium emitted the most intense rays.

And she took those findings one step further, forming the hypothesis that the emission of rays by uranium compounds was an atomic property of the element uranium—something built into the very structure of its atoms. She coined the term "radioactivity" to describe this unique effect, which she also found in thorium compounds.

Intrigued by his wife's findings, Pierre joined forces with her. She had found that two uranium ores, pitchblende and chalcolite, were much more radioactive than pure uranium, and concluded their highly radioactive nature was due to as yet undiscovered elements. As a team, the Curies worked to separate the substances in these ores and then used the electrometer to make radiation measurements to "trace" the minute amount of unknown radioactive element among the fractions that resulted.

They discovered that one fraction was strongly radioactive, so even though it chemically behaved like bismuth, it had to be something new. They named this new element "polonium."

In December 1898, they discovered a second new element in a barium fraction, which they named "radium." To prove to a skeptical scientific community that these were indeed new elements, the Curies had to isolate them. It took Marie over three years to isolate one-tenth of a gram of pure radium chloride, and she never succeeded in isolating polonium because of its very short half-life: 138 days. Even as she was performing her

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Editor ..... Alan Chodos
Associate Editor ..... Jennifer Ouellette
Special Publications Manager ..... Patti Mascone
Design and Production ..... Stephanie Jankowski
Forefronts Editor ..... Craig Davis
Proofreader ..... Edward Lee

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Washington Dispatch

A bi-monthly update from the APS Office of Public Affairs

ISSUE: RESEARCH FUNDING

Before Congress recessed for the election, it had sent four FY 05 appropriation bills to the President for signature: Defense, Military Construction, Foreign Operations and Legislative Branch. In a post-election session, Congress will wrap most of the remaining nine bills into a single appropriation or extend a Continuing Resolution until February. Prior to the recess, the Senate Appropriations Committee approved a 3% increase over FY04 for NSF, countering the House cut of 2%. The Senate Committee was also much kinder to NASA than the House, funding it at $135 million more than the request and $1.2 billion more than the House. The Senate Appropriations Committee joined the House in approving a restoration of funding for the NIST core programs that suffered major cuts in last year's omnibus bill.

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ISSUE: ENERGY

At its October 23 meeting, the APS Panel on Public Affairs (POPA) unanimously supported a study on nuclear power and proliferation resistance. Roger Hagengruber will chair the study; other POPA participants currently include: John Ahearne, Ernest Moniz, Burt Richter, Wayne Shotts, Francis Slakey, and Frank von Hippel. The study is scheduled to be completed by April 1.

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ISSUE: SCIENTIFIC ADVICE TO CONGRESS

At its October 23 meeting, POPA established a subcommittee, chaired by Peter Eisenberger, to review various proposals for supplementing the means by which Congress receives scientific and technical advice, among them bills introduced by Senator Bingaman (D-NM) and Representative Holt (D-NJ) that can be downloaded from the Office of Public Affairs website. The Eisenberger subcommittee will discuss its findings and recommendations at the POPA January meeting.

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ISSUE: VISAS

The State Department reported significant improvement in visa processing beginning in September, including a decrease in visa mantis clearance delays, that have impinged on the ability of foreign students and scholars to enter the US in recent years. APS continues to monitor the visa processing system and advocate implementation of six recommendations made in a joint statement issued this spring along with more than 30 other science and university organizations.

ISSUE: MOON-MARS

At its October 23rd meeting, POPA approved a policy report on the Administration's Moon-Mars initiative and sent the report to the Executive Board for final action.

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

NOBEL PRIZE *from page 1*

Wilczek discovered initially appeared to be contradictory: for some reason, the closer quarks come to each other, the weaker the color charge between them. When quarks are very close to each other, the force is so weak that they behave much like free particles.

This behavior is called asymptotic freedom. When quarks move apart, the force remains essentially constant as the distance between them increases, thereby preventing quarks from escaping as free particles.

This happens because the force carrying particles (gluons) interact not only with quarks, but also with each other. Asymptotic freedom made it possible to calculate the small distance interaction for quarks and gluons, and to compare it with experimental data obtained by colliding the particles at very high energies.

The three physicists devised an elegant mathematical framework to express this discovery, leading to the development of QCD, an integral aspect of the Standard Model of particle physics, which describes all physics connected with the electromagnetic force, the weak force, and the strong force. The theory has since been rigorously tested experimentally, most recently at CERN in Switzerland. Thanks to QCD, physicists are able to explain why quarks only behave as free particles at extremely high energies. In the proton and neutron, they always occur in triplets.

Perhaps the most significant implication of QCD asymptotic freedom is that it opens up the possibility of a Grand Unified Theory describing all of the forces of Nature.

The model must also incorporate the recent discovery that neutrinos have non-zero mass, which may in turn lead to better understanding of the nature of the dark matter that seems to dominate in our universe.

WYP *from page 1*

to test their predictions. James Riordon, APS Head of Media Relations, hosted the skateboard event.

APS Member John Gastineau, of Vernier Software and Technology, worked on the data capture equipment for the skateboard challenge. When he was first asked to work on the project, "I was a little apprehensive, because acceleration is something college freshmen have trouble with," he said. But these middle school students were able to handle the challenge. The video and analysis equipment allowed the students to see what's really going on, said Gastineau.

Photo Credit: Ernie Tretkoff

APS Outreach Coordinator Jessica Clark explains to one of the Young Scientist Challenge teams that patting an Einstein doll on the head makes it easier to understand the theory of relativity.

Another challenge required students to use radar guns to measure the relative velocity of two carts—one carrying an Einstein doll—as the carts zipped past each other across the stadium. Each group approached the problem differently, said APS outreach coordinator Jessica Clark, who hosted the event. "It's like a different challenge every time," she said.

In the laser obstacle course challenge, the teams had to arrange mirrors so the beam navigated the obstacles and hit a target. Other challenges included an event in which students tried to identify skulls and skeletons, another in which they used microscopes to identify various microorganisms, and one in which they tried to record their own version of Beethoven's fifth symphony on several weird instruments.

The forty finalists had worked hard to get to this event, but they clearly were enjoying the experience.

Blake Zwerling, 15, of Portland, OR, said she and her partner worked for over a year and a half on her science fair project, which tested the effect of psoralens—a class of photosensitive chemicals—on yeast. "I was reluctant to enter at first, but it's paid off," she said. After two days of science challenges, the students attended an awards ceremony, at which Olympic gold medalist Michael Phelps made an appearance.

First place, a $15,000 scholarship, and the title "America's Top Young Scientist of the Year," went to Shannon McClintock, of San Diego, CA, whose science fair project was "The Little Engine That Could: Enhancing Traction Through Friction." Blake Thompson, of Gainesville, FL won second place, and David Westrich, of Cape Girardeau, MO, took third place.

LASER SCIENCE *from page 1*

recently developed unified theory of coherence and polarization, two key properties of light waves. Senator Clinton also spoke, touching on the impact of optics in the state of New York.

Finding a Vein. Finding a vein, necessary for administering intravenous solutions, can often be difficult. A new device, called a Vein Contrast Enhancer (VCE), uses sensitive infrared sensing to find the vein beneath the skin and then also projects the rather spooky vein image back onto the patient's wrist. This makes it appear as if the veins were lying right on top, making it easy for a nurse to make an injection.

An array of light-emitting diodes shines infrared light at the subject. Since red blood cells absorb the light, whereas surrounding tissues scatter it, the veins appear dark. The scattered light passes through some filters and then is captured by a sensitive TV camera, processed by computer, and rendered as a sort of movie at a rate of 30 frames per second. These images can be projected onto the subject through a careful aligning process to register the surface projection with subcutaneous anatomy.

No Cell Left Behind. How can a surgeon be sure that no cancer cells are left behind during surgery? Or what if some cancer patients could skip exploratory surgery and have suspicious areas examined with an endoscope? Irving Bigio of Boston University, and clinical collaborators in London, may have an answer. His team has constructed a fiber-optic probe inserted through an endoscope that will measure via spectroscopy the structural properties of cells in tissue. For example, cancerous cells can be identified by changes in size or density of subcellular components like the nuclei. Bigio's research takes the spectroscopic measurements in vivo and collects real-time measurements. Then a surgical biopsy is done. To make it clinically practical, diagnostic algorithms would need to be created to process the information in real time, and larger-scale studies would need to be done to prove efficacy.

An Internal Fingerprint. In the movie *Minority Report*, the main character has his eyeballs swapped out in order to fool a biometric retina scanner. Robert Rowe of Lumidigm, Inc. has introduced a system for fingerprint identification that is almost as hard to fool. The new sensor uses multiple colors of light to measure the subsurface structure of the finger, sending visible light and very near infrared light into the finger. This new development builds on work that shows that tiny capillaries under the fingerprint also have distinctive patterns, and the blood that the capillaries carry can be easily detected by the light sensor. They've even tested it against fake fingers to ensure that the system can't be spoofed. The system could easily integrate into some of today's fingerprint scanners. The spoof-detection technology should be available in mid-2005.

Detecting Early Signs of Cancer. Patients with chronic diseases that may lead to cancer need a means for monitoring tissue health, without invasive and non-definitive biopsies. Adam Wax of Duke University has developed a way to detect pre-cancerous cells in intact tissues in just one second with a technique called angle-resolved low-coherence interferometry (a/LCI).

To find pre-cancerous cells, the a/LCI device looks beneath the tissue surface and measures cell features with a sensitivity smaller than the wavelength of light.

One of the earliest changes in pre-cancerous cells is that the cell's nucleus enlarges, which changes its light-scattering properties, and this can be seen by a/LCI. The interferometer records the angular distribution of light scattered by a small region of tissue, even beneath the tissue surface where cancer begins. It measures the frequency variations of the light returned and in one fell swoop acquires the entire light-scattering pattern over a wide range of angles, instead of acquiring measurements one by one, which used to take five minutes per measurement. Wax anticipates that the first clinical trials in human subjects with esophageal cancer will begin in about two years.

3-D Reality Without the Real. Conventional 3-D displays force our eyes to do two conflicting things at the same time, for instance, pointing our eyes to look at something that appears to be far away, but having to focus the lenses of our eyes up close. But this unnatural eye pose is tiring and gives people headaches. It's easier and natural for our eyes to focus at the same place that we're pointing them. Brian Schowengerdt at the University of Washington's Human Interface Technology Laboratory has a new 3-D display, called True 3-D, that matches what's most easy on the eyes.

With the True 3-D scanned-light display, light from different objects seems to come from different distances in space. This is made possible by a tiny stretchable mir-

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LETTERS

Security at Los Alamos: What's Really Involved

I read with interest the "Back Page" in the October 2004 *APS News* by Rhon Keinigs; he contrasted the perceptions of LANL employees with those of some members of our government.

Information security is widespread with many corporations; much of their information is "Company Proprietary"; disclosure could permit competitors an advantage. A government also has its secrets. A security plan has two components, institutional and personal. Institutional security means that the locks work; the fences are secure; the guards are alert and well trained; unauthorized people are not allowed in, etc.. Personal security is the responsibility of the individual and is based on trust; if he chooses to violate that trust then he is subject to sanctions.

No one enjoys security, but he agreed to it when he hired on as a part of the job; if one really does not like it, he can quit. DOE security has two layers; if one "goofs", *e.g.* leaves his safe file open, it is an "infraction" and the matter is listed in his employee file and he gets a talking to. If one willfully breaches security, or gets too many infractions, it is a security "violation", which can lead to disciplinary action including termination, and in serious cases, criminal action. The overwhelming majority of DOE employees and contractors obey security. There are a few scofflaws, very, very few; Wen Ho Lee made a comment to the media that everyone at LANL cheated on security. We do not.

A measure of the seriousness of a security incident is whether sensitive information got out. A safe file left open in a secure area is probably harmless because it is unlikely that that information would get into the wrong hands. Klaus Fuchs, a German and naturalized British subject, worked at the Manhattan Project at Los Alamos; he gave the Soviets the plans of the Fat Man device, which was used at Trinity, Nagasaki, and the 1946 Crossroads tests. The Soviets replicated Fat Man and test fired it in August 1949; the Soviet Union became a nuclear power sooner than it otherwise would have.

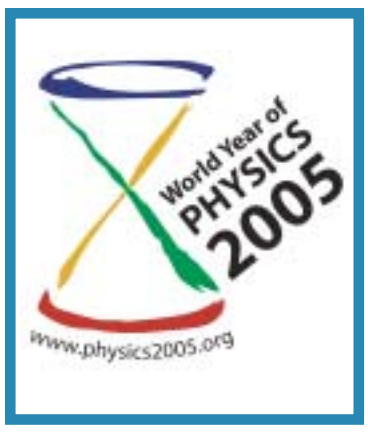
During the 1990's the LANL employee Wen Ho Lee, a naturalized US citizen from Taiwan, downloaded classified material from a classified computer to an "open" one where it was in jeopardy of being accessed by unauthorized persons; there is no evidence that the material was ever accessed. There was a great deal of publicity that Lee spied for the People's Republic of China; no evidence was found that the mishandled data ever got there. In a plea bargain, Lee was convicted of the one indictment count of mishandling classified information and sentenced to the nine months of his incarceration since his arrest. The fanciful 58 counts regarding espionage were dismissed. At no time did his defense claim that he had not been properly indoctrinated on security procedures.

Leaks of classified information to the media can be best described as a hemorrhage, particularly in the Washington, DC area. During my time at the DOE Office of Energy Intelligence (1996-1997), roughly once a week, the staff would gather to compose an unclassified media release to damage-limit the latest leak. The "roughly once a week" only had to do with DOE matters; other departments had their own problems.

Who leaks all the classified information? The major offenders seem to be congressional staffers; they are often hired off the street and may not have adequate background investigations and indoctrinations. The usual scenario: a briefing team, from say, DOE, would be summoned to Capitol Hill to discuss matters; very seldom was the congressional Member present, just his staffers. It was all in the next day's paper, whether the material was classified or not. Considering the limited attendance of the get-together, it should be easy to determine who the leaker was, but there is almost never any enforcement. The owner of military national security information could "pull" the security clearance of an offender, but the Member would likely retaliate. Further, an attempt to enforce the laws might lead to a classified trial, which is extremely awkward and expensive. The Bush administration is currently under investigation regarding a classified information leak to a prominent journalist.

Los Alamos has been criticized regarding security because the lab enforces security, which brings the matter to light. Usually, the case is a personal, not institutional, matter; Wen Ho Lee worked alone. A recent quote from a member of Congress is; there is "probably better security at the public library over CD's and videos that are on the Blockbuster top 10 list". There is almost no security enforcement inside the Washington Beltway; without enforcement, there is no publicity of security lapses. In 2004 there was a minor (no evidence that information got out) security incident at LANL. Director Nanos, with no comprehension of the difference between institutional and personal security, nor of the difference between an infraction and a violation, responded by shutting down the whole lab idling 12,000 people when only 19 appeared to have been remiss. Ultimately, he terminated five people for the incident. The shutdown continued for a number of weeks; classified work was down for ten weeks.

John L. Richter
Albuquerque, NM



Atmosphere at Los Alamos Called Stifling

Rhon Keinigs' description of Los Alamos labs does not square with my impression. While Los Alamos used to be one of the most exciting places to work for a scientist, back in the 1940s, it is not so anymore. It is a place in which little interesting physics is done and in which office politics kills creativity.

Most of the reason may be the difference in context: Back in the 1940s, all the scientists had other places they could call home and their time at Los Alamos was a choice to be made. Nowadays Los Alamos employees have nowhere but the lab to call home. The real estate is expensive and there is only one employer in town making for a high stakes individual financial situation. Back in the 1940s, the Nazis and the Japanese were devils to be fought with all imaginable fire power—not too long ago the mission of the lab used to be something like "making safer nuclear weapons", a semi-oxymoron that lacks as a motivator.

I worked in three different groups. In one of them, about 30 people turned out 2-3 peer reviewed articles per year. At another, the leader was a coauthor on thirty-some papers per year and it was known that he required coauthorship from anybody who would visit the group in the summer. The deputy group leader of the same group was very political and was going to head a big initiative on semiconductors, having no previous experience in the field. In the third group I had a friend who told me that he was so good at the politics that he no longer knew who he was.

While there are smart people in Los Alamos (it may have the highest concentration of PhDs anywhere) the place is very debilitating. This also shows on the kids. Once I went to a celebration of the Phi Beta Kappa society for the best high school students in town. One would have expected half of them to go to Ivy League schools. Only one out of about 20 did.

I believe the statement "the departure of [senior scientists and engineers] means a loss of important mentoring for new staff members" is wrong—one prerequisite to break up the current stifling atmosphere is to give packages to the senior people currently running the place. The implied statement that work is always done "safely and securely" contradicts stories about employee abuse I used to read in the New Mexican. One was about a lawsuit from a staff member who had suggested that there was dangerous waste. His managers allegedly moved his desk to just outside the bathroom and had the bathroom visitors heckle him.

Eugen Tarnow
Fair Lawn, NJ

No Lack of Security at Los Alamos

As a 30-year employee at the Los Alamos National Lab, now retired, I applaud the piece by Rhon Keinigs in the October 2004 issue of the *APS News*.

My experience at LANL and the security that goes with working there is the same as he described. During my career at LANL I worked on classified and unclassified programs and security was NOT lax. We were very conscientious about safeguarding classified material in all forms. The responses by the Congressional investigating committee members described by Rhon shows a complete lack of understanding of workers at the Lab and what goes on at a world class research institution.

Kudos to Rhon Keinigs for speaking out.

Richard D. Dick
Albuquerque, NM

Science: Just the Facts, Please

When I read the "Letters" column in the August/September 2004 issue of *APS News*, I could not believe that they were referring to the same commentary that I had read in the June issue, which I remembered as a reasoned discourse on the proper place of scientific endeavor in a democratic society.

I have now gone back to reread his words and find that the letters all deal with only a few paragraphs out of more than 20 in the article.

The complainers seem to forget that religion is a matter of "belief" only. Our Constitution guarantees us the right to practice our religious beliefs freely but not to impose them on anyone else.

Science, on the other hand, as Dr. Varmus so ably makes clear, must deal with the "facts" of nature. A scientist cannot choose to believe that gravitational force is repulsive because all experience and experiment shows it to be attractive. Any theory based on the assumption that gravitation is repulsive is bound to fail.

Stephen Rosenblum
San Jose, CA

HISTORY *from page 2*

experiments the polonium in her raw material was rapidly decaying.

Their combined work led almost immediately to the use of radioactive materials in medicine, since isotopes are more effective and safer than surgery or chemicals for attacking cancers and other diseases.

Even today, radioactive isotopes are used as "tracers" to track chemical changes and biological processes.

Pierre also quickly realized the potential for radioactive decay for dating materials; the age of the earth was determined to be several billion years, thanks to a study of uranium decay.

In 1903 the French Academy of Sciences nominated Becquerel and Pierre—but not Marie—as candidates for the Nobel Prize in physics. A Swedish mathematician named Magnus Goesta Mittag-Leffler, a member of the nominating committee and an advocate of women scientists,—intervened, and Marie was included in the nomination. The three scientists were honored with the Nobel Prize in December 1903.

***Source**: Adapted from an online exhibit by the American Institute of Physics: http://www.aip.org/history/curie/contents.htm*

LA 2005 *from page 1*

Einstein, including a Wednesday evening session on "Einstein and Condensed Matter Physics," and other sessions and events to be announced.

In addition to the regular program, the Division of Polymers will run a two-day short course on charged polymers, which will be held on Saturday and Sunday before the meeting. Also on Sunday, half-day tutorials will be held on a variety of specialized topics, including Acoustics and the Perception and Reproduction of Music, Biophysics of Sensing and Learning, Spintronics, Computational Nanoscience, Jamming in Soft Condensed Matter, Opportunities in Biological Physics: Sensing and Neurobiology, Molecular Magnets, and Understanding Electronic Transport in Carbon Nanotube Devices.

Other special events during the meeting include a job fair, exhibit hall, students lunch with the experts, a meet-the-editors session, and the ceremonial presentation of APS Prizes and Awards.

In honor of the World Year of Physics 2005 and the centennial of Einstein's "miracle year," special sessions will be devoted to Einstein, including a Wednesday evening session on "Einstein and Condensed Matter Physics," two sessions sponsored by the Forum on the History of Physics and the Statistical and Non-linear Topical Group on "Einstein and Friends," and a Forum on Physics and Society session on "Albert Einstein and Social Responsibility."

Also on Sunday, there will be a free half-day workshop on two new approaches to the calculus-based introductory physics course that emphasize contemporary physics, a workshop for new physics faculty, a workshop for Professional Skills Development for Women Physics Faculty, and the first day of the international Conference on Computational Physics.

Other special events during the meeting include a special Monday evening plenary session on Paradigm shifts: Breakthroughs and advances that shaped our field, a job fair, exhibit hall, student's lunch with the experts, a meet-the-editors session, and the ceremonial presentation of *APS Prizes and Awards*.

World Year of Physics Gets Early Kickoff At Sigma Pi Sigma Quadrennial Congress

By Ernie Tretkoff

Sigma Pi Sigma, the physics honor society, kicked off the World Year of Physics 2005 at its 2004 Quadrennial Congress October 15-16, in Albuquerque, New Mexico. The meeting was held in conjunction with the APS Four Corners Section meeting, regional groups of the Society of Physics Students (SPS), and the American Association of Physics Teachers (AAPT).

"Having all those groups at once, it was unique in the fact that we had lots of students and lots of retired people at the same meeting. Lots of physics people who were not in academics came to this meeting. I think that made for the discussions being very robust because you've got a lot of perspectives," said Gary White, director of Sigma Pi Sigma.

At a World Year of Physics session, Vinaya Sathyasheelappa, APS World Year of Physics project coordinator, presented APS plans for the World Year of Physics. A number of SPS chapters presented posters with their plans for the 2005 celebration.

Science historian and author John Rigden gave a talk about Einstein's legacy and how his 1905 contributions are still impacting physics. Dwight Neuenschwander talked about ethics and Einstein.

Several workshops focused on ethics and science. Speakers and discussion leaders included Mildred Dresselhaus, Ken Ford, Lydia Sohn, James Stith, Bo Hammer, and Diandra Leslie-Pelecky. John Marburger, science advisor to the President, offered a government perspective on science and ethics. In addition, Nobel Laureate Carl Wieman gave a talk about Bose-Einstein condensates, and Jocelyn Bell Burnell spoke about pulsars. Sigma Pi Sigma members and students displayed posters about their research, careers, or education and outreach activities.

"Having 80 or 90 students in the room for every talk gave it a vibrancy that you might not find at a lot of meetings," said White.

The day before the congress, about 200 conference attendees went on a special tour of the Trinity Site in the New Mexico desert, where the first atomic bomb was detonated in July 1945.

Physics Enlightens the World, and Battles Light Pollution Too

By Ernie Tretkoff

One of the main international events celebrating the World Year of Physics (WYP) will have the additional benefit of raising awareness about the dangers of light pollution, which is a problem of particular concern to astronomers and astrophysicists.

The event, dubbed "Physics enlightens the world," will consist of a relay of light beams around the globe in one night, starting in Princeton, NJ on April 18, 2005, the 50th anniversary of Einstein's death.

Max Lippitsch of the University of Graz in Austria is in charge of organizing the event, which was first proposed at the WYP planning meeting in Graz in 2003, and was endorsed by the International Steering Committee of the WYP in Montréal last March.

One of the main goals of the light relay is to bring publicity to physics and the WYP, through media coverage and possibly even an entry in the *Guinness Book of World Records*. Money raised during the event would go to a fund administered by UNESCO dedicated to aiding physics education in developing countries.

The organizers hope to have from ten to twenty thousand participants, each of whom will turn on a light for less than one minute. Event guidelines say that participants can use almost any source of light, including flashlights, and car headlights.

Earlier this year, members of various groups in the astronomical community pointed out that, even though the actual amount of light released into the atmosphere would be negligible, this event ignored the seriousness of light pollution as a danger to the environment.

Virginia Trimble, who is chair of the IUPAP commission on astrophysics, expressed concern on behalf of that group. She said, "My first thought was, 'Oh, what a cute idea.' Some colleagues have reacted that way and not gone beyond that. I think physicists haven't grasped how valuable the night sky is to astronomers, and maybe all of us haven't realized how devastating light pollution is, not just for astronomy, but for all kinds of wildlife." Other groups registering their unhappiness included the American Astronomical Society, the International Dark Sky Association, Citizens for Responsible Lighting, and the International Astronomical Union.

In response to this criticism, Lippitsch changed the wording of the project description, and has altered the event to be more sensitive to the concerns of astronomers. For instance, the ring of light will now be preceded by a "flash of darkness"—participants agree to turn off lights in their area for a few moments before receiving and transmitting the light signal. "This would be a very nice way to show people that we should be aware of the problems of light pollution," said Lippitsch.

Also, participants would pledge to permanently remove or baffle one light on their property, thereby reducing light pollution.

"Physics Enlightens the World" is not specifically a US event, and the APS is not involved in organizing it. But the US WYP web site, www.physics2005.org, links to the international events, including "Physics Enlightens the World." Since the event is planned to begin and end in Princeton, participation by individual Americans is essential if the project is to succeed.

As a way to foster the increased awareness of light pollution in connection with this project, the APS Executive Board passed a resolution at its meeting in October, which reads in part: "*The American Physical Society urges individuals and organizations to reduce light pollution, which is endangering our ability to explore the outer reaches of the Universe with telescopes that observe faint light from distant objects.*" The full resolution is posted on the APS website at http://www.aps.org/exec/Reducing-Light-Pollution.cfm, together with links to other sites that address the issue of light pollution.

Elsewhere in the world, light pollution issues have assumed varying degrees of importance in the physics community.

In the UK, the Institute of Physics has decided not to support "Physics Enlightens the World." Because of "respect to the astronomy community and concerns about the light pollution," according to IoP International Director Peter Melville.

In an example unrelated to the WYP and apparently oblivious to concerns over light pollution, the celebration of the 50th anniversary of CERN on September 29 was accompanied by a dazzling visual display. According to the CERN press release issued the week before, "At 20:00 sharp on 29 September, Micheline Spoerri, Head of Geneva's Department of Justice, Police and Security, will throw the switch for 24 powerful 'skytracer' floodlights to light up the night sky of the Geneva-Pays de Gex region."

Meanwhile, Lippitsch notes that interest in "Physics Enlightens the World" is high worldwide. "We have many people who are enthusiastic about this idea," he said. "Several countries already we know will take part, and there will be many people participating in this event."

Light relay event website: http://www.wyp2005.at/glob1-light.htm.

George E. Valley, Jr. Prize Goes to Ivo Souza

Ivo Souza

Ivo Souza of the University of California, Berkeley, has been awarded the 2005 George E. Valley Prize for his research on the electronic properties of solids.

The Valley Prize recognizes an individual in the early stages of his or her career for an outstanding scientific contribution to physics that is deemed to have significant potential for a dramatic impact on the field. To be eligible, a candidate must have received the PhD no earlier than five years before April 1 of the year in which the selection takes place. The $20,000 prize is the largest given by the APS, and is awarded every other year.

"It was a completely unexpected but very pleasant surprise. I was really flattered that they chose me," said Souza, "It's also a good recognition for our field."

Souza was cited "for fundamental advances in the theory of polarization, localization, and electric fields in crystalline insulators." His research contributed to the development of methods for performing first principles calculations of the response of crystalline solids to applied electric fields.

Souza, a citizen of Portugal, earned his undergraduate degree in Engineering Physics in 1995 from Universidade Técnica de Lisboa. He received his PhD in 2000 from the University of Illinois at Urbana-Champaign, where he worked with Richard Martin.

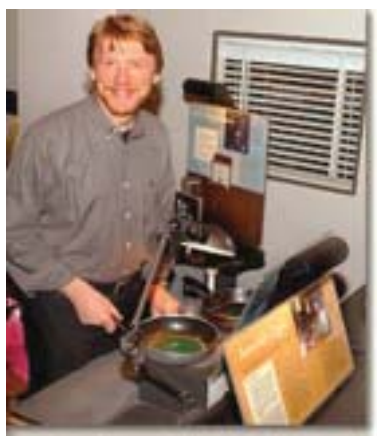
He then did post-doctoral research at Rutgers University in the research group of David Vanderbilt, and in January 2004 he joined the physics faculty at Berkeley.

He is continuing to work on expanding the range of properties that can be studied from first principles. His current research involves modeling the vibrational spectroscopy of nanoclusters and nanoparticles. These calculations can help identify the structure of these particles, he said.

The Valley prize will be presented to Souza at the 2005 March meeting. It is funded by a bequest from the estate of the late George E. Valley, Jr. and was first awarded in 2002.

More information about the Valley Prize is available on the web at http://www.aps.org/praw/valley/index.cfm.

Semper Finds Ways to Entertain While Teaching Science



Rob Semper cooks up an experiment exhibit.

The Exploratorium, a science museum in San Francisco, is known for being a fun place to learn about science, filled with fascinating exhibits and scientific toys for all ages. It's also an interesting place to work, says physicist Rob Semper, who is now the Executive Associate Director.

In his position at the Exploratorium, Semper gets to interact with scientists and educators, learn new things about science, travel to amazing lab sites around the world, and oversee the production of live webcasts on topics from the science of music to the transit of Venus.

Semper has worked at the Exploratorium since 1977, and now manages many of its projects in his current role. In the past ten years Semper has been working on extending the museum beyond its walls, through webcasting and other media. These projects often take Semper all around the world, something he really loves about the job, since he gets to learn about science and nature as well as experience new cultures.

One such project he and a team recently completed was called *Origins*, which takes visitors to the Exploratorium's website on a "virtual field trip" to six laboratory locations, from the world of high energy particle physics at CERN in Geneva, Switzerland, to the biodiversity in the jungles of Belize, to the extreme environments of Antarctica.

The site includes live webcasts and interviews with scientists, as well as explanations of the ideas behind the science and pictures of the lab environment and the equipment. "The idea was to give people through the web a sense of what it's like to be doing science in the real world," says Semper.

Semper traces his interest in science back to his visits to science museums when he was young. He grew up in New York, visiting the American Museum of Natural History and the Hayden Planetarium, and was also intrigued by television science shows like Mr. Wizard.

Semper says he had good science teachers in elementary school, and his father pursued hobbies like radio and electronics. Electricity and magnetism especially captivated Semper. "That was really what pulled me into the world of physics," he says.

Semper also enjoyed building experimental apparatus. He went to graduate school at Johns Hopkins, where he studied solid state physics, then went on to use his skills in building detectors

See SEMPER *on page 6*

APS Fellows Enjoy College Park Event

Photos Credit: Laura Walsh

APS Fellows in the Washington, DC area turned out in force for a reception at the American Center for Physics in College Park, MD on October 26.

In addition to having ample time to chat with their fellow Fellows and to sample refreshments, they heard about APS activities from APS President Helen Quinn, Executive Officer Judy Franz, Director of Education Ted Hodapp, and Director of Public Affairs Michael Lubell.

In the photo at upper left, **Luis Orozco** and **Steven Rolston** chat with **Ted Hodapp** (right).

The photo at upper right shows **Sammye** and **P. K. Williams** together with **Walter Faust** and **William Wallenmeyer**.

The photo in the bottom left features **Zachary Levine**, **Peter Mohr**, and **Anne Davies**. And in the middle right photo, **Anthony Johnson** and **Gerald Epstein** enjoy a moment with APS Director of International Affairs **Amy Flatten**.

Sounds of the Subway

New York City is famous for the broad diversity of its cultural venues, particularly world class performance halls like Carnegie Hall and Lincoln Center. But the city's most popular performance space can be found in its vast underground network of subway stations.

"Ask any New Yorker and you'll get an earful of recommendations on the best stations, the best players, and how much to tip," says Alex Case, director of Fermata Audio + Acoustics, Portsmouth, NH, and a professor at Berklee College of Music in Boston.

Case himself is something of a connoisseur when it comes to subway acoustics. He's done extensive studies of local musicians who regularly play in subway stations, using portable digital recorders to capture these on-the-fly performances.

Not all subway stations are created equal. Subway buskers choose their locations carefully, avoiding stations with a steady stream of announcements, or major hubs with more than one line running through them. Delays might be irritating for commuters, but for the performers they are godsends, giving them an extended performance period in between trains. And Case has found that the buskers instinctively seek out locations near hard walls and under low ceilings, so their music is amplified above the din of the station.

Case doesn't find this at all surprising. Subway walls are typically made of rigid heavy materials like tile, stone, steel, and concrete. These materials are better at reflecting sound waves, allowing sound levels to build up naturally, with no need for microphones or loudspeakers.

As a result, subway listeners are immersed in a bath of echoed sound known as reverberation.The same sound, heard up close, has much less reverberation. Reverberation is the critical element in the design of all performance spaces, whether mainstream opera houses or alternative spaces like the subway. It's the same reason why so many people enjoy singing in the shower. "It just so happens that the sort of space that is durable, easy to clean, and graffiti resistant also happens to be sound reflective," says Case. "The musicians wallow in it. The passengers variously savor, ignore or avoid it."

So if subway stations are such terrific acoustical environments, how come it's so hard to understand the announcements over the public address system? Case says that's because amplifying speech requires far less reverberation than music. The same phenomenon that sustains musical notes by building up sound reflections causes speech to become mushy and unintelligible. The reflections all mix together, so that individual words can't be deciphered. Add in the electronic amplification, and the reverberation is so strong that the announcer might as well be speaking with a mouthful of marbles.

That's why acousticians like Case tailor their designs to the specific needs of performance spaces. Large opera houses like Boston Symphony Hall or Carnegie Hall have different acoustical needs than, say, Broadway theaters. For the latter, says Case, he designs spaces with more sound absorption, lowering the amount of sustaining reverberation the space adds to a speaking voice. "This makes it easier for listeners to follow the spoken word, syllable by syllable," he says.

Concert hall design isn't just about the strategic conservation of sound energy inside the performance space. A great deal of effort is also spent on suppressing the noise and vibration of the surrounding city, not to mention noise from modern amenities—the heating and air conditioning equipment, elevators and plumbing—all of which can seriously detract from the pleasure of a performance. No one wants to hear a subway rumbling or a toilet flushing in the middle of Wagner's "Ring" cycle.

For Case, the most appealing feature of alternative performance spaces like the subway is their broad accessibility, compared with conventional opera houses, which tend to be somewhat elitist. He estimates that some 7 million passengers ride the New York subway system every day. Even if only 1 in 10 passengers pay attention to the music, it still adds up to about 700,000 listeners per day, from every conceivable social demographic. Carnegie Hall and Lincoln Center would have to sell out 54 shows every day, on all six main stages, just to compete. The subway is the opera house of the people.

— Inside Science News Service

Note: *Audio sample files can be heard at www.aip.org/isns/reports/2004/014.html*

zero gravity
The Lighter Side of Science

The 2004 Ig Nobel Prizes

The 2004 Ig Nobel Prizes were awarded at Harvard University's historic Sanders Theatre before 1200 spectators.

The evening featured the 24/7-Lectures—in which famous thinkers explained their field of research, first in twenty-four (24) seconds, and then in seven (7) words.

The night also featured the premiere of a new mini-opera called "The Atkins Diet Opera," which starred professional opera singers Wayne Hobbs, Margot Button, and Jane Tankersley, who were joined in the rousing conclusion by all of the scientists on stage. For more info see http://www.improbable.com/ig/2004/2004-details.html

MEDICINE

Steven Stack of Wayne State University [Detroit, Michigan, USA] and James Gundlach of Auburn University [Auburn, Alabama, USA] for their published report "The Effect of Country Music on Suicide."

PHYSICS

Ramesh Balasubramaniam of the University of Ottowa, and Michael Turvey of the University of Connecticut and Yale University, for exploring and explaining the dynamics of hula-hooping.

PUBLIC HEALTH

Jillian Clarke of the Chicago High School for Agricultural Sciences (and then Howard University, Washington, DC), for investigating the scientific validity of the Five-Second Rule about whether it's safe to eat food that's been dropped on the floor.

CHEMISTRY

The Coca-Cola Company of Great Britain, for using advanced technology to convert liquid from the River Thames into Dasani, a transparent form of water, which for precautionary reasons has been made unavailable to consumers.

ENGINEERING

Donald J. Smith and his father, the late Frank J. Smith, of Orlando Florida, USA, for patenting the combover (US Patent #4,022,227).

LITERATURE

The American Nudist Research Library of Kissimmee, Florida, USA, for preserving nudist history so that everyone can see it.

PSYCHOLOGY

Daniel Simons of the University of Illinois at Urbana-Champaign and Christopher Chabris of Harvard University, for demonstrating that when people pay close attention to something, it's all too easy to overlook anything else—even a man in a gorilla suit.

ECONOMICS

The Vatican, for outsourcing prayers to India.

PEACE

Daisuke Inoue of Hyogo, Japan, for inventing karaoke, thereby providing an entirely new way for people to learn to tolerate each other.

BIOLOGY

Ben Wilson of the University of British Columbia, Lawrence Dill of Simon Fraser University [Canada], Robert Batty of the Scottish Association for Marine Science, Magnus Whalberg of the University of Aarhus [Denmark], and Hakan Westerberg of Sweden's National Board of Fisheries, for showing that herrings apparently communicate by farting.

APKER AWARD *from page 1*

Princeton receives the Award for research at a PhD granting institution. His senior thesis, in an active area of string theory, was done under the supervision of Steven Gubser, and is entitled "Large R-charged Sectors of the Ads/CFT Correspondence."

At Princeton, Heckman received the physics department's Kusaka Memorial Award for undergraduate research and was inducted into Phi Beta Kappa and Sigma Xi. He is currently pursuing a PhD in theoretical high-energy physics at Harvard University.

The Award for research at a non-PhD institution goes to Nathan Oken Hodas of Williams College. He graduated with Highest Honors in Physics, and was awarded the Howard P. Stabler Prize in Physics.

At Williams, he engaged in several research projects in theoretical biophysics with his advisor, Daniel Aalberts. His work included developing a polymer physics model of single-stranded stacking in nucleic acids, creating a fast RNA binding algorithm, and explaining asymmetries in the tertiary structure of RNA pseudoknots.

He also conducted summer research with Prof. Anand Jagota, now at Lehigh University, creating an interactive, real-time, multi-lane highway traffic simulation.

He is currently pursuing his PhD at Caltech, where he was awarded an Institute Fellowship. He plans on continuing his research in biophysics.

SEMPER *from page 5*

and instruments to work in high energy physics for a few years.

When a job at the Exploratorium opened in 1977, Semper decided to take it. "I was always interested in teaching nonscientists science," says Semper, explaining his reasons for moving out of the lab and into the museum.

—Courtesy of Physics Central.com

MEETING BRIEFS

Texas Section, October 7-9, 2004. The APS Texas Section held its annual fall meeting October 7-9 at Baylor University in Waco, Texas, in conjunction with the corresponding regional division of the American Association of Physics Teachers (AAPT) and the Society of Physics Students (SPS). The first plenary session focused on industrial and applied research in Texas, featuring talks on photoprotective light filters based on synthetic melanin, advanced materials for the semiconductor industry, and medical physics. A second plenary session features talks on spectroscopy of exotic x-ray sources, massive elementary particles and black hole physics, the lifetime of the universe, and ultrafast optical physics. Friday evening's banquet speaker was renowned science cartoonist Sidney Harris.

Four Corners Section, October 15-16, 2004. The APS Four Corners Section held its annual fall meeting October 15-16 at the University of New Mexico in Albuquerque, also in conjunction with the relevant regional groups of the AAPT and SPS. Friday afternoon's keynote address on pulsars and extreme physics was given by Jocelyn Bell-Burnell (AFFIL), and that evening's banquet speaker was John Marburger, who provided a governmental perspective on scientific ethics.

In addition to a focus on Einstein's seminal 1905 papers, several talks were devoted to the question of scientific ethics, on such aspects as achieving diversity, professional integrity in research and authorship, Einstein's ethics, and tenure and academic freedom. Other invited talks covered such topics as Bose-Einstein condensates, pursuing Einstein's legacy in the Four Corners region, and the first nuclear explosion.

New York State Section, October 15-16, 2004. The APS New York State Section held its annual fall meeting October 15-16 at the New York City College of Technology, CUNY, in Brooklyn, New York. Organized around the theme, "Physics of the Microworld: From Quarks to Nanostructures," the meeting featured numerous experts in the field discussing new developments in elementary particles, nuclear and atomic physics, and the physics of nanostructures.

The meeting program also featured a public-lecture by MIT's Alan Guth on cosmic inflation and dark energy.

Ohio Section, October 15-16, 2004. The APS Ohio Section held its annual fall meeting October 15-16 at Oakland University in Rochester, Michigan, in conjunction with the AAPT's Ohio section. Organized along the dual themes of physics in medicine and teaching 20th century physics in the 21st century, the technical program featured a plenary session on MRI to celebrate the contribution of physics to the 2003 Nobel Prize in Physiology or Medicine.

In addition to MRI, topics of plenary lectures included using Java-based materials to enhance learning of basic physics concepts, from introductory courses to quantum mechanics.

New England Section, October 22-23, 2004. The APS New England Section held its annual fall meeting at Pratt and Whitney in East Hartford, Connecticut, in conjunction with the AAPT's New England section.

Organized along the theme of climate and flight, the technical program featured invited lectures on the discovery and meaning of global warming, climate change in the New England region, and the physics of flight.

Saturday's lunch featured a series of physics demonstrations, while Friday evening's after-banquet speaker was Donald Rethke (*a.k.a.* "Dr. Flush"), formerly of Hamilton Sundstrand. He spoke on "Life After Liftoff: The Moon and Beyond."

Southeastern Section, November 11-13, 2004. The APS Southeastern Section held its annual fall meeting November 11-13, 2004, at Oak Ridge National Laboratory in Oak Ridge, Tennessee.

Thursday morning's sessions focused on updates on the Spallation Neutron Source project at ORNL and the possibility of a deep underground science and engineering laboratory at Kimballton, as well as upgrades at Jefferson Lab's CEBAF accelerator and Duke University's free electron laser laboratory.

Thursday afternoon featured a session on core-collapse supernovae. On Friday, invited session topics included talks on nanobiology, the quest for quark-gluon plasmas, and neutrino oscillations.

New Results from RHIC Highlight 2004 DNP Meeting

Scientists reported new evidence for the experimental observation of a quark gluon plasma at Brookhaven National Laboratory's Relativistic Heavy Ion Collider (RHIC) at the 2004 fall meeting of the APS Division of Nuclear Physics (DNP), held October 28-30 in Chicago, Illinois. Other recent RHIC results presented at the meeting included the first experiments with a polarized hydrogen jet target. The meeting also featured a special session on the future of nuclear physics and nuclear science education.

Quark Gluon Plasmas. The quark-gluon plasma (QGP) is a new state of matter that may have been observed in ultra-relativistic nucleus-nucleus collisions at RHIC. Several scientists presented results from the most recent experiments in heavy-ion physics at very high energies. There is strong evidence for the observance of a new state of matter with unique long and short wavelength properties, which is believed to be a QGP, albeit somewhat different than the weakly interacting plasma that scientists expected to find at asymptotically large energy densities.

Polarized Hydrogen Jets. Targets of pure spin-polarized hydrogen have proven useful to study nucleon structure functions at DESY, as well as nucleon-nucleon and three-body interactions at the Indiana Cyclotron Facility and the COSY accelerator at Jülich. This is because experiments with polarized proton beams at very high energies require a means to measure the polarization of the stored beam to an accuracy of a few percent. A polarized hydrogen jet target was recently installed at the RHIC facility to successfully observe pp elastic scatting of a 100 GeV proton beam by polarized hydrogen atoms. The results nonetheless had some limitations in terms of absolute accuracy, and further improvements are expected to be made.

Degenerate Fermi Gases. Scientists at Duke University have developed an all-optical approach to trap lithium-6 atoms using ultrastable CO_2 lasers. The atoms are evaporatively cooled to produce a highly degenerate, strongly interacting sample of a Fermi gas, split equally between spin-up and spin-down atoms. Ultracold, strongly interacting Fermi gases provide useful models for exotic systems in Nature, including high-temperature superconductors, neutron stars, and QGPs.

The Future of Nuclear Physics. The growing evidence that neutrinos have mass has caused nuclear physicists to contemplate the first significant revision to the Standard Model in several decades. Stuart Freedman (University of California, Berkeley) described the conclusions and recommendations of a recent study of the present and future of the US neutrino program, sponsored jointly by the APS Divisions of Nuclear Physics, Particles and Fields, Astrophysics, and Physics of Beams.

A concurrent need to prepare the next generation of nuclear physicists led to a similar study assessing current nuclear science education efforts at the NSF and DOE by an NSAC subcommittee. Rutgers University's Jolie Cizewski discussed preliminary findings and recommendations of the report, which was based on surveys of undergraduate and graduate students, postdocs, and recent PhDs in nuclear physics, and includes projected employment demographics. The subcommittee also looked at ways nuclear scientists could participate in K-12 education and public outreach.

ANNOUNCEMENTS

Newly Launched Travel Grant Award Program Seeks Partners

This December, the APS Forum on International Physics (FIP) launched its Travel Grant Award Program (TGAP) to promote international scientific collaborations with scientists in developing countries. Up to five awards are planned for the next 5 years based on 6-month competitive cycles. FIP expects to expand this program as additional funding partners are identified.

FIP recognizes that funding for collaborations between US and developing country scientists is often insufficient to meet existing needs and opportunities. While the needs are great, and though FIP has only limited resources to stimulate such collaborations, even a modest Travel Grant Award Program can make a significant difference. Toward this end, FIP will award up to $2000 for travel and lodging expenses for international travel for visiting a collaborator. The trip can be in either direction, with preference given for travel from developing countries to the United States. A TGAP-supported collaborative visit must be for a period of at least one month; FIP expects the host institution to provide for local expenses.

For now, the Program requires that one, preferably both, participants (co-applicants) in the collaboration must be APS/FIP members. If additional sponsors join this effort, larger awards with broader aims will be developed.

The first award recipient will be selected from the initial applicants on December 15. For additional information on the Program and the future application deadlines, please visit: www.fit.edu/fip/tgap.htm.

APS CONGRESSIONAL SCIENCE FELLOWSHIP 2005-2006

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

QUALIFICATIONS include a PhD or equivalent in physics or a closely related field, a strong interest in science and technology policy, and, ideally, some experience in applying scientific knowledge toward the solution of societal problems. Fellows are required to be US citizens and members of the APS.

TERM OF APPOINTMENT is one year, beginning in September of 2005 with participation in a two-week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

A STIPEND of $50,000 is offered in addition to allowances for relocation, in-service travel, and health insurance premiums.

APPLICATION should consist of a letter of intent of approximately two pages, a list of key publications, a two-page resume, and three letters of reference. Please see the APS website (http://www.aps.org/public_affairs.fellows.html) for detailed information on materials required for applying and other information on the program.

ALL APPLICATION MATERIALS MUST BE POSTMARKED BY JANUARY 17, 2005 AND SHOULD BE SENT TO THE FOLLOWING ADDRESS:

APS Congressional Science Fellowship Program
c/o Jackie Beamon-Kiene
APS Executive Office
One Physics Ellipse
College Park, MD 20740-3843

LASER SCIENCE *from page 3*

ror made of a thin membrane, just 10 millimeters across, coated with aluminum. The deformable mirror stretches on command to change the focus of each pixel of light as the display projects different objects. Just one tiny mirror can control all the pixels in the display as it scans by changing the focus of that beam very quickly—in this case, twice as fast as the display refreshes. Viewers can converge their eyes and focus their eyes at the same distance—just like when viewing real objects. Also as in real life, no screen is needed to see the objects—the display changes the light's intensity and color, so "a high-resolution full-color picture can be painted right onto the retina," Schowengert said.

Shedding New Light on Embryonic Cell Development. Chi-Kuang Sun of the National Taiwan University presented a new high-resolution optical technique for imaging the embryonic development of living organisms non-invasively in their natural environments.

Demonstrated in the zebrafish, the technique could potentially be applied to following the development of human stem cells. Infrared laser light safely penetrated all the way through the zebrafish embryo and yielded highly detailed images (400-nanometer resolution) of its interior, enough to discern important cell features such as the neural tubes, structures which later develop into the spinal cord, spine, and brain.

Called "harmonic optical microscopy," the technique scans infrared laser light across the living specimen, which then generates light in the second and third harmonics. Detectors capture this "higher harmonic" light to build up images of the specimen. By using light that does not get absorbed by the embryo, Sun could continuously image the embryo for 12 hours without heating it or otherwise damaging its viability.

—James Riordon, Ben Stein and Phil Schewe contributed to this article.

The Back Page

Rebuilding Science in Iraq, One Scientist at a Time

By Alexander Dehgan

*[**Editor's Note**: Alexander Dehgan is an AAAS Science and Technology Fellow who worked in Iraq this year in a US program designed to direct Iraqi weapons scientists into new scientific careers. The following article is adapted with permission from a telephone interview conducted by AAAS senior writer Edward W. Lempinen on 2 September 2004.]*

When I arrived in Baghdad, Iraqi science was in a complete state of disarray. This was due to the devastating effect of three wars on the country's infrastructure, the militarization of the scientific community during the Iran-Iraq war to feed Saddam Hussein's military machine, and the continuing militarization of the science sector. But there was a waxing and waning of the scientific community between working on weapons systems and then pulling away from weapons systems, and then working on weapons again. This had a really disruptive effect on the community.

There were also the economic sanctions that served to isolate the scientific community as well. They restricted access to journals and to new laboratory equipment for the universities, to basic materials to carry out science. There was a deep suspicion of individuals who had any ties to the West, which only worsened the isolation. And then finally, after the last war, the looting of scientific equipment, where seemingly every piece of equipment was taken or destroyed, dealt the final blow.

You also had certain numbers of scientists that were high-level Baath Party members who had been intimately involved with the weapons programs who were sitting at home and doing nothing.

Not all the scientists were Baath Party members. Many scientists weren't. One of the mistakes people have made with regard to the Baath Party was that they compare it to the Nazis, rather than comparing it to the Communist Party, which I think is the more appropriate example.

People joined the Baath Party for career advancement. There was a restriction, under the CPA, against hiring people from the four highest levels of the Baath Party. Although the fourth level was one of the prohibited levels, scientists joined it because that was what was necessary to become a director of some companies—there were a lot of companies under the military-industrial commission—or for career advancement. People had different degrees of adherence to the Baath Party that they adopted. They were looking at moving ahead.

We had to gain their trust. Under Saddam's system, if you had contact with foreigners, you were persecuted. If you stood out from the rest, you faced the risk of death under Saddam. We had to overcome these barriers. Transparency was especially important in explaining to the scientists exactly what we were doing. We would interview scientists and work with scientists. Under Saddam, the government controlled most aspects of the economy. We were helping the Iraqi scientists to privatize, to develop some of their ideas, to help fund their ideas to meet markets in the Middle East.

The majority of people in Iraq were civil servants to one degree or another. To get them to break out of that safety net, to get them to take the risks that people take in a capitalist society, to recognize the rewards and dangers of those risks, was something we had to do.

There were no typical days in Baghdad. In the first meeting of the scientific advisory council, there was automatic gunfire all around our building. We moved all the scientists into this safe room and then we found out it was just celebratory fire because some local leader had gotten a post and his people were celebrating.

Meanwhile I've got all these scientists, this large council group, stuffed into one room. Our guards are on the roof patrolling the boundaries with their weapons drawn, people are running through the center, it was chaotic. That's how much of a risk these scientists were taking to participate in our program. They trusted us by working with us, even though that could be a death sentence for them.

Every day was different. There would be emergencies. A car bomb was set off next to the house of one of our employees. There were threats that would come up that we would hear about against our center. It was just getting basic things—one of the most difficult things we had to find was a good conference table. And it's hard enough going into a society that has been through three decades of war and trying to find these items. It's even harder when you're in a continuing war zone.

I spent nearly every day working outside of the Green Zone, in the area I call the Red Zone—you had to compartmentalize. There are risks you can control and there are random chance events that you cannot control. What you do is take all the precautions to minimize risks you can control and you have to literally put aside fear of events you can't. You have to think like a scientist. The statistical chance of getting hit by a mortar or car bomb—those random risks are pretty low. The University of Chicago was a far scarier place in my opinion.

What people within the Green Zone who didn't leave it on a regular basis didn't understand is that Baghdad is a city of 4 million people where people try to live an ordinary life. There are parts of the city that you wouldn't normally go to, just like there are parts of any American city that you don't go into at night. You don't routinely go for a walk in Sadr City. But there are people who are living their lives, every day, visiting relatives, shopping for food, going to work. You can make use of this reality to travel around the city, by integrating into it, and by doing things that most people wouldn't think you would do.

Alexander Dehgan at work.

One of the most reassuring signs I ever saw while I was in Baghdad was that someone opened up an eclair shop. It was an eclair shop that could've been in Soho—London or New York—that produced these magnificent pastries. And it was beautiful and it was architecturally well-designed. I realized that someone is not going to put this much time into opening something like this unless they have faith in the future. And so you adopt that faith that the Iraqis have.

It's a monumental task. Because we are not rebuilding just from one war—one short war—and the looting that happened afterward. We are rebuilding from many, many years of what went on under Saddam's leadership. We are rebuilding for decades, for many years of what has gone wrong in this country.

At the third meeting of this scientific advisory council that advised the science center we were sitting around the table and I was trying to get the Iraqis to prioritize what they believed were the most important projects that they needed to work on. And people kept giving me projects that were really of the most interest to that particular scientist rather than projects that would really be beneficial to the country.

And then half way through the meeting I realized that the real problem wasn't the Iraqis, the real problem was the fact that I was sitting at the table. I excused myself and went out for an hour and a half and I asked them to give me when I came back a list of what they felt the priorities were and how they'd address those priorities.

It was phenomenal—they broke themselves into groups, divided by discipline, and came up with a list of challenges that they needed to address and indicated how their scientific expertise could be used. At that point I recognized that the whole problem had been me.

It wasn't a question of trust. I think it had more to do with the fact that they were deferring to me and the leadership role I had within the science center. At the scientific advisory council, they were all of equal rank. You needed to have the thing that makes science in the Western world beneficial, which is the freedom of discussion and debate among scientists. That is the hallmark of science in the West—the scientific method and independence of thought and the right to argue for a perspective you believe in as a scientist, and to document it with facts. That's what makes science—something that's built on merit and independence of thought. Under Hussein, this was something that was taken away from them.

The challenges facing the Iraqi scientific community are many. It is clear that we need to work on the power structure, on sanitation, on the environment, which has been used as a weapon in the last 15 years. We need to work on building an economy that provides stability and incentives for the Iraqi people to participate in their country. Science and technology will play an integral role in developing these things. We need to rebuild Iraqi agriculture. And we need to reinvigorate the scientific culture that is based on merit, transparency, and independence of scientific thought and overcome what has happened under the previous regime.

Second, we need to unite the community to work on the rebuilding of the country and addressing the substantial problems I mentioned, such as the environment.

Third, we need to rebuild and equip Iraq's laboratories, universities and scientific institutions. The key is this must be more than the donation of equipment or the building of schools. It has to extend to developing programs that allow us to reintegrate weapons scientists, nonweapons scientists, and reclaim Iraq's lost generation of science students, to achieve the basic goals of the reconstruction process.

Fourth, we have to reintegrate Iraq's scientific and technical community into the greater global scientific community. This means that our global scientific societies and our universities must reach out to Iraqi scientists as collaborative partners, as host institutions for cultural exchange. I think these exchanges must run both ways. I think we need to send scientists to Iraqi universities to share ideas but also so that we have an idea of what they are going through. And we need to provide training for graduate students, because right now they have no opportunities within their country.

Finally, we must work to integrate ethics into the scientific community. This is a challenge and responsibility not limited to Iraq, but which we face in the US and other countries.

One thing we tend to do is we lie to ourselves as scientists that our actions don't bear any consequences beyond the laboratory. And I think the reality is that we uphold the public trust in exchange for the freedom that we have as scientists to study questions that are integral to me, to search for truth in the physical, biological and chemical world.

We have to understand the potential consequences of our research, both good and bad. And then, probably most importantly, we must educate the public about our findings and to work to integrate those findings into the fabric of our society.

I think the future of the country will depend on two things: the Iraqi leadership and Iraq's economic recovery. I think both of those depend on the scientists. Scientists have to be actively involved in economic recovery. The scientists have to be there to help with developing sources of support for the country, to give individual Iraqis an incentive to prevent the violence that renders apart the country.

Most recently, Hussain Shahristani [the Iraqi nuclear physicist and victim of torture under Saddam], who is starting up the new Iraqi National Academy of Sciences, was considered for the post of prime minister. And it is because of his ethics, and because of his resistance to participating in Saddam's weapons programs, and because of his stature as a world-class scientist, that people looked up to him.

In these societies, education and being educated—particularly in engineering, science and medicine—is sort of a status symbol. It gives you the respect of the people, and having that respect allows you to take a leadership role.

The Iraqi scientists and Iraqi people are great survivors. They are people who have unbelievable potential because of their flexibility and their ability to adapt to extremely difficult circumstances that they've endured over the last three wars. They have lived and have had to deal with an unbelievable amount of fear.

I got to go back to the Green Zone at night. The Iraqis *live* outside of the Green Zone. They've lived through wars, they lived through Saddam Hussein and his regime. They lived through a lot of terror—Saddam Hussein used weapons against his own people and he tortured his own people. They survived all of these things. They were very adaptable. Many of them are courageous, hard-working people that want to see the reconstruction of their country, and they want to see Iraq reclaim its role as a leader of science in the Middle East. And I think they have substantial potential to do so.

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