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Physicist is *New York Times* War Correspondent
see page 5

Fellows by the Bay

Photo by Darlene Logan

APS Fellows (l to r) Janice Button-Shafer (Berkeley), George Trilling (Berkeley), and Elliott Bloom (SLAC) enjoy the Bay Area Fellows reception that APS hosted at the Berkeley Faculty Club on October 16. Frances Hellman, Chair of the UC Berkeley Physics Department, served as the local host. APS President-elect Arthur Bienenstock of Stanford chaired the program, which featured remarks by APS Executive Officer Judy Franz, Director of Education and Diversity Ted Hodapp, and Director of Public Affairs Michael Lubell. In addition, as the picture indicates, there was plenty of time for the Fellows to enjoy the refreshments and each other's company.

The Big Easy Hosts 2008 March Meeting

The 2008 APS March Meeting will be held March 10-14 in New Orleans, Louisiana. It is the largest annual gathering of professional physicists in the country. The scientific program will feature more than 90 invited sessions and 550 contributed sessions, at which approximately 7000 papers will be presented, 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, and Quantum Information, as well as the forums on Industrial and Applied Physics, Physics and Society, History of Physics, International Physics, Education, and Graduate Student Affairs.

Special scheduled events include the annual prize and award presentation, a one-day workshop on energy research for graduate students and postdocs, a panel discussion with APS journal editors, a students lunch with the experts, a physics sing-along, and a High School Teachers' Day on Tuesday, March 11, which will be held at LIGO-Livingston.

In addition to the regular technical program, there will be eight half-day tutorials offered on Sunday, March 9.The tutorial topics are: Basics of Density Functional Theory, Static and Time-Dependent; Spintronics; Fundamentals of Quantum Entanglement; Neutron and Synchrotron Scattering in Novel Materials; Will Carbon Replace Silicon? The Future of Graphitic Electronics; Nanomagnetism: Manufacture, Physics, Devices, and Modeling; Quantum Noise, Quantum Limited Measurements, and Conditional Quantum Evolution; and Ethics Education.

The 5th APS Workshop on Opportunities in Biological Physics, organized by the Division of Biological Physics, will be held on Sunday, March 9.

On Saturday, March 8 and Sunday, March 9, the Division of Polymer Physics will host a special short course: High-throughput Approaches to Polymer Physics and Materials Science.

New Orleans is an exciting city, and has achieved significant recovery from hurricane Katrina. The French Quarter is thriving and the many fine restaurants and shops are within walking distance of most of the conference hotels. The headquarters hotel is the New Orleans Marriott on Canal Street, just steps away from the French Quarter. A guide to attractions in New Orleans, compiled for APS by Jim McGuire, chair of the physics department at Tulane University, is available online at the meeting website.

This year small child care grants of $200 will be available to assist meeting attendees bringing small children. The application form is available on the meeting website. A parent-child quiet room will also be available.

More info about the meeting: http://www.aps.org/meetings/march/index.cfm

April Meeting Plenary Speakers Set

Eight of the nine plenary lectures at the APS April Meeting in St. Louis, Missouri, April 12-15, 2008, have been confirmed. The slate features many distinguished speakers on a broad range of topics. They are:

Bruce Remington LLNL, "Probing Matter at the Extremes: New Frontiers in High Energy Density Physics"

Roger Blandford, Stanford, "Recent Developments in Plasma Astrophysics"

Paul Chu, University of Houston, "High Temperature Superconductivity 20 Years Later: Achievements, Promises and Challenges"

Witek Nazarewicz, ORNL/University of Tennessee, "Science of Rare Isotopes: Connecting Nuclei with the Universe"

Michael Peskin, SLAC, "Dark Matter in the Cosmos and in the Laboratory"

Michael Kramer, University of Manchester, "The Double Pulsar: A Unique Gravity Lab"

Sara Seager, MIT, "Exoplanets: Interiors, Atmospheres, and the Search for Habitable Worlds"

Robert Cahn, LBNL, "New Paths to Fundamental Physical Law."

Information and registration for the April Meeting is online at http://www.aps.org/meetings/april/index.cfm.

New Insights Into QGPs and Supernovae Highlight 2007 DNP Meeting

Nuclear physicists from around the world converged on Newport News Virginia for the annual fall meeting of the APS Division of Nuclear Physics (DNP), held October 11-13. Among the highlights of the technical program were talks on the latest news from the Relativistic Heavy Ion Collider (RHIC), new insights into nucleosynthesis gleaned from observations of metal-poor stars, and the latest research on quark gluon plasmas, including potential insights to be gleaned from string theory.

Odd Coupling. Collisions of high-energy gold nuclei at Brookhaven's Relativistic Heavy Ion Collider (RHIC) create exploding droplets of quark-gluon plasma (QGP), the stuff that filled the universe microseconds after the Big Bang. However, the QGP turns out to be close to an ideal liquid, and also attenuates high-energy quarks attempting to pass through it–both properties that standard QCD calculations have not been able to explain satisfactorily.

To help resolve this issue, theoretical physicists are turning to string theory (particularly the gauge-string duality), which has revealed a deep connection between quantum gravity and gauge theories similar to QCD, according to MIT's Hong Liu. Along with several other speakers, he discussed examples where string theory techniques have been used to shed light on existing data from RHIC, and to make at least one prediction that can be experimentally tested in the near future.

Princeton University's Steven Gubser has been finding interesting comparisons between QCD and string theory computations regarding thermalization time, energy loss by heavy quarks, and the formation

DNP MEETING continued on page 7

Apker Recipients Study Galaxy Clusters, Entangled Photons

The LeRoy Apker Award is given for outstanding research accomplishments in physics by an undergraduate. Two categories are recognized, one for an undergraduate at an institution that grants the PhD, and the other for an undergraduate at an institution that does not grant the PhD. This year's recipient in the PhD category is Matthew Becker of the University of Michigan. Working under Timothy McKay, he conducted his senior thesis research on the dynamics of galaxy clusters in the Sloan Digital Sky Survey. He is currently a graduate student at the University of Chicago, pursuing his PhD in astrophysics and cosmology.

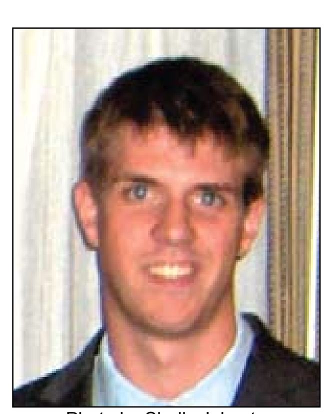

Photo by Shelly Johnston

Bryce Gadway

Matthew Becker

The recipient in the non-PhD category is Bryce Gadway of Colgate University. In his senior-year research, conducted under the supervision of Kiko Galvez, he created an ensemble of single photons entangled in their polarization and direction of momentum, and used them to test theories of nature based on non-contextual realism. The experimental results ruled out realism or non-contextuality, or both. Gadway is now a graduate student at Stony Brook University, pursuing a PhD in physics.

Members in the Media

"The award reminds us that expert advice can influence people and policy, that sometimes governments do listen to reason and that the idea that reason can guide human action is very much alive, if not yet fully realized."

***Michael Oppenheimer**, Princeton University, on the Nobel peace prize,* The New York Times*, October 13, 2007*

"It's a sad thing to turn a satellite off, but we had a lot of great years."

***Warren Moos**, Johns Hopkins University, on the end of the FUSE mission,* Baltimore Sun*, October 19, 2007*

"People have been working on nanoelectronics for many years, and there have been advances at the device level on switches and wires. This work takes a step towards showing nanoelectronics in systems."

***Peter Burke**, UC Irvine, on a radio built from carbon nanotubes,* Wired*, October 17, 2007*

"He has failed us in the worst possible way. It is a sad and revolting way to end a remarkable career."

***Henry Kelly**, Federation of American Scientists, on racist remarks made by James Watson,* Newsday*, October 18, 2007*

"When we get to the basics of why things happen, only then can we get to the next level. They (students) are the ones who are going to be doing that."

***Nandini Trivedi**, Ohio State University, on demonstrations for children at a physics festival,* Columbus Dispatch*, October 21, 2007*

"I tell students they're lucky. They're getting in at the right time–it's right before we see something."

***Rana Adhikari**, Caltech, on the LIGO gravitational wave search,* Wired*, October 22, 2007*

"We could use it as a way to reduce our carbon emissions. This is not charity; this is self-interest."

***Ashok Gadgil**, Lawrence Berkeley National Laboratory, on a plan in which wealthy countries pay for clean energy for poor countries in exchange for carbon credits,* Providence Journal*, October 22, 2007*

"There's a two-thirds chance there will be a disaster, and that's in the best scenario."

***Steve Chu**, Lawrence Berkeley National Laboratory, on global warming,* The New York Times Magazine*, October 21, 2007*

"We are looking at trying to change something that has been static for a long time. It would be naive to think it will happen overnight."

***Carl Wieman**, University of British Columbia, on getting professors to change their teaching style from lecturing to actively engaging the students,* The Globe and Mail*, October 30, 2007*

"We certainly have seen comets that have had a brightening period, a burst of some level, sometimes quite dramatic, but nothing a million fold. So that's got everybody's attention."

***John Radzilowicz**, Carnegie Science Center, on comet Holmes, which recently brightened inexplicably,* Pittsburgh Post Gazette*, October 30, 2007*

"A good fastball that drops 18 inches before crossing the plate [at Fenway] will drop 22 inches at Coors."

***Alan Nathan**, University of Illinois at Urbana-Champaign, on the effect of high altitude on the World Series games played in Denver,* Boston Globe*, October 27, 2007*

"It literally is like tomography in the medical sense. You can image big things–like 100-meter-sized things–with a couple of months' worth of data."

***Roy Schwitters**, University of Texas, on his idea of using muon detectors to image chambers hidden under Mayan temples,* Discovery News*, October 31, 2007*

This Month in Physics History

December 1938: Discovery of Nuclear Fission

In December 1938, over Christmas vacation, physicists Lise Meitner and Otto Frisch made a startling discovery that would immediately revolutionize nuclear physics and lead to the atomic bomb. Trying to explain a puzzling finding made by nuclear chemist Otto Hahn in Berlin, Meitner and Frisch realized that something previously thought impossible was actually happening: that a uranium nucleus had split in two.

Lise Meitner was born in Vienna in 1878. She grew up in an intellectual family, and studied physics at the University of Vienna, receiving a doctorate in 1906. As a woman, the only position available to her at that time in Vienna was as a schoolteacher, so she went to Berlin in 1907 in search of research opportunities. Meitner was shy, but soon became a friend and collaborator of chemist Otto Hahn. In 1912 the Kaiser Wilhelm Institute for chemistry was established, and she obtained a position there. During World War I Meitner volunteered as an x-ray nurse in the Austrian army. Upon returning to Berlin she was made head of a physics section at the KWI, where she did research in nuclear physics.

Lise Meitner

After the neutron was discovered 1932, scientists realized that it would make a good probe of the atomic nucleus. In 1934 Enrico Fermi bombarded uranium with neutrons, producing what he thought were the first elements heavier than uranium. Most scientists thought that hitting a large nucleus like uranium with a neutron could only induce small changes in the number of neutrons or protons. However, one chemist, Ida Noddack, pointed out that Fermi hadn't ruled out the possibility that in his reactions, the uranium might actually have broken up into lighter elements, though she didn't propose any theoretical basis for how that could happen. Her paper was largely ignored, and no one, not even Noddack herself, followed up on the idea.

Following Fermi's work, Meitner and Hahn, along with chemist Fritz Strassmann, also began bombarding uranium and other elements with neutrons and identifying the series of decay products. Hahn carried out the careful chemical analysis; Meitner, the physicist, explained the nuclear processes involved.

Meitner, who had Jewish ancestry, worked at the KWI until July 1938, when she was forced to flee from the Nazis. Her research was her whole life, and she had tried to hang on to her position as long as possible, but when it became clear that she would be in danger, she left hastily, with just two small suitcases. She took a position in Stockholm at the Nobel Institute for Physics, but she had few resources for her research there, and felt unwelcome and isolated. She kept up her correspondence with Hahn, and continued to advise him about their joint research.

In December 1938, Hahn and Strassmann, continuing their experiments bombarding uranium with neutrons, found what appeared to be isotopes of barium among the decay products. They couldn't explain it, since it was thought that a tiny neutron couldn't possibly cause the nucleus to crack in two to produce much lighter elements. Hahn sent a letter to Meitner describing the puzzling finding.

Over the Christmas holiday, Meitner had a visit from her nephew, Otto Frisch, a physicist who worked in Copenhagen at Niels Bohr's institute. Mietner shared Hahn's letter with Frisch. They knew that Hahn was a good chemist and had not made a mistake, but the results didn't make sense. They went for a walk in the snow to talk about the matter, Frisch on skis, Meitner keeping up on foot. They stopped at a tree stump to do some calculations. Meitner suggested they view the nucleus like a liquid drop, following a model that had been proposed earlier by the Russian physicist George Gamow and then further promoted by Bohr. Frisch, who was better at visualizing things, drew diagrams showing how after being hit with a neutron, the uranium nucleus might, like a water drop, become elongated, then start to pinch in the middle, and finally split into two drops.

After the split, the two drops would be driven apart by their mutual electric repulsion at high energy, about 200 MeV, Frisch and Meitner figured. Where would the energy come from? Meitner determined that the two daughter nuclei together would be less massive than the original uranium nucleus by about one-fifth the mass of a proton, which, when plugged into Einstein's famous formula, $E=mc^2$, works out to 200 MeV. Everything fit.

Frisch left Sweden after Christmas dinner. Having made the initial breakthrough, he and Meitner collaborated by long-distance telephone. Frisch talked briefly with Bohr, who then carried the news of the discovery of fission to America, where it met with immediate interest.

Meitner and Frisch sent their paper to *Nature* in January. Frisch named the new nuclear process "fission" after learning that the term "binary fission" was used by biologists to describe cell division. Hahn and Strassmann published their finding separately, and did not acknowledge Meitner's role in the discovery.

Scientists quickly recognized that if the fission reaction also emitted enough secondary neutrons, a chain reaction could potentially occur, releasing enormous amounts of energy. Many scientists joined the efforts to produce an atomic bomb, but Meitner wanted no part of that work, and was later greatly saddened by the fact that her discovery had led to such destructive weapons. She did continue her research on nuclear reactions, and contributed to the construction of Sweden's first nuclear reactor. Hahn won the Nobel Prize in chemistry in 1944, but Meitner was never recognized for her important role in the discovery of fission.

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Many Disciplines Have Stake in Underground Laboratory

About 200 scientists gathered in Washington, DC November 2-4 to discuss the next phases of the study of a deep underground science laboratory to be located in the abandoned Homestake mine in South Dakota.

At an open session Friday afternoon, scientists, representatives of government agencies, and government officials from South Dakota described the process, the need for a Deep Underground Science and Engineering Lab (DUSEL), the technical design, and scientific opportunities DUSEL could provide.

The site-independent study group of DUSEL organized the workshop, which was sponsored by the University of California's Institute for Nuclear and Particle Astrophysics and Cosmology. The November 3-4 sessions also received support from NSF.

With space to go as deep as 8000 feet, DUSEL would be well shielded from cosmic ray backgrounds, making it useful for a variety of physics experiments. The lab would also provide significant research opportunities in biology, geosciences, and engineering, as well as a strong education and outreach component.

The site-independent study group, which included hundreds of scientists from various disciplines, recommended strong support for deep underground science, a cross agency deep science initiative, and construction of a deep underground lab. The study group mapped out some of the compelling scientific questions that could be studied deep underground. "Deep underground science and engineering represents a new frontier," said Bernard Sadoulet of UC Berkeley, one of the leaders of the study group.

An underground laboratory would help answer several important questions in particle physics, nuclear physics, and astrophysics, such as: What is the dark matter? What happened to the antimatter that was present at the big bang? Are protons unstable? What can neutrinos tell us? How did the universe evolve?

A quiet environment shielded from cosmic rays is crucial to detecting elusive objects such as dark matter and neutrinos as well as rare nuclear processes such as proton decay and neutrinoless double beta decay. Trying to observe dark matter at ground level would be like trying to listen to music in the middle of Manhattan, said Hitoshi Murayama of UC Berkeley. "We have to go where it's quiet," he said. In response to a question about the odds of DUSEL detecting dark matter, Murayama said, "My gut feeling is it's pretty high."

In addition to the scientific prospects, DUSEL would provide a great education and outreach opportunity, said Murayama. "This kind of science would open up young minds to new ideas," he said.

Around the world, there is a growing interest in underground science and an increasing demand for underground labs. "Underground labs around the world are already producing exciting science opportunities," said Art MacDonald of Queens University, Canada. Underground labs in other countries are open to US scientists, but they are already largely subscribed. DUSEL, which would be the largest and deepest underground lab in the world, would make the US a world leader in underground science, speakers at the meeting said.

DUSEL is still in the early planning stages. "Cost is an important issue," said Jack Lightbody, deputy assistant director of the mathematical and physical sciences directorate of NSF. Reliable, responsible cost estimates will be crucial to the success of the project, he said.

Planning for DUSEL began after the Homestake gold mine announced it was closing in 2000. "Never has the closing of a business caused so much excitement in the scientific community," said Joe Dehmer, director of the physics division of NSF. In the years since, several studies of the prospects for a deep underground lab have been conducted. After a competition between several potential sites, NSF announced on July 10 the selection of the Homestake mine near Lead, South Dakota, as the site for DUSEL. The team, headed by Kevin Lesko of UC Berkeley, was chosen to lead the design effort. They will receive $15 million over 3 years for the technical design of the laboratory.

The NSF has not yet committed funds for facility construction or development of the first suite of experiments. A rough timetable would have the earliest construction start in FY11, with construction expected to take seven or eight years. The project would cost about $500 million for the initial phase, split evenly between facility and experiments. DUSEL must go through an approval process that could take years before it can be built. "It's not a done deal," said Dehmer.

Governor Mike Rounds of South Dakota said that his state was enthusiastic about hosting the deep underground lab. "I have 780,000 people in my state. They are nearly unanimous in their support of this project" said Rounds. Rounds was especially excited about the lab's outreach and education opportunities, saying that he believed it would spark children's interest in science.

South Dakota has appropriated $19.9 million for the underground lab, which is a lot of money for South Dakota, said Rounds. "We believe in it. We want to see it move forward," he said.

In addition to the funds from the state of South Dakota, philanthropist S. Denny Sanford has committed $70 million to the Sanford Underground Science and Engineering Laboratory. The Sanford lab, at 4850 feet below ground, will serve as the first phase of DUSEL, and should be open for science late next year. DUSEL will develop deeper levels.

Currently the mine is flooded up to a depth of 5000 feet. The water level is still rising, and the water will have to be pumped out before the deeper levels of the site can be used as a science and engineering laboratory.

Jose Alonso has recently been selected as the head of Sanford lab. Alonso is a physicist who retired in 2002 from Lawrence Berkeley National Laboratory, where he was involved with developing and managing the Bevelac project, a large accelerator facility. He also served on the management team for the Spallation

LABORATORY continued on page 7

APS Honors BCS, Joseph Henry in Historic Site Ceremonies

As part of its historic sites initiative, APS recently commemorated two major achievements in physics in the US: the discovery of magnetic self-inductance by Joseph Henry in 1832, and the formulation of the microscopic theory of superconductivity by John Bardeen, Leon Cooper and J. Robert Schrieffer in 1956-1957. The site of Henry's discovery was the Albany Academy, a preparatory school for boys that was founded in 1813. The school is still in existence, and in the photo at left John Rigden, chair of the APS Historic Sites Committee, watches as Head of the School Caroline B. Mason signs the APS register of historic sites, part of the ceremony surrounding the plaque presentation. After leaving Albany Academy, Henry became a professor at Princeton, and later the first secretary of the Smithsonian Institution in Washington.

Bardeen, Cooper and Schrieffer did their work at the University of Illinois at Urbana-Champaign. APS President Leo Kadanoff (right) presents the historic sites plaque to UIUC Chancellor Richard Herman. The presentation was part of a celebration of the 50th anniversary of BCS theory, held at UIUC in October. The plaque reads, "In this building, the home of the University of Illinois' Physics Department from 1909 to 1959, John Bardeen, Leon Cooper, and J. Robert Schrieffer created the 'BCS' theory of superconductivity, a great achievement of theoretical physics, in 1956-1957. For their work, they were awarded the 1972 Nobel Prize in Physics."

Smashing Eggs in the Name of Science

By Erika Gebel

Ed. Note: *Each year APS sponsors two mass media fellows as part of a program run by the AAAS. Typically graduate students in physics or a related field, they spend eight weeks over the summer working for a mass media outlet, learning how to communicate science to the public. Last month APS Media Fellow Merek Siu wrote about his experiences; this month it's Erika Gebel's turn. She spent the summer at the* Philadelphia Inquirer *and is now completing her PhD in biophysics at The Johns Hopkins University.*

Surrounded by a medley of physics teachers–young, old, female, male, four-eyed, two-eyed–I sat in the back of a classroom that was strangely alive amongst the empty July halls of Ridley High School. Occasionally one of the throng would shoot me a curious glance. I was an interloper. Catching up being impossible, it probably seemed like I had no business showing up in the middle of an intensive three week workshop on "modeling" pedagogy.

Soon, my contact announced my intentions and the skeptical inquisitiveness turned to enthusiastic acceptance. I was from the *Philadelphia Inquirer*, where I was spending the summer as AAAS mass media fellow generously supported by APS, and writing a story on the "modeling" methodology. Once the teachers found out my reporter status, they were eager to talk with me, often interrupting each other in an effort to fill my ear. This was not an unusual reaction to the presence of a reporter in the world of science; I had already noticed how scientists are often excited to talk about their

research, especially with someone who can act as their translator and, perhaps, champion.

A science writer is essentially an interpreter, but also an educator and entertainer. It's quite a balancing act, but one I found I am quite apt for. With the physics education story, I was going to have to wear all these hats. Physics in itself is difficult for many to grasp and indeed the mere mention of it will send some into a shivering cold sweat. I had to ease my readers into the story with something anyone could enjoy and that required little physics know-how to understand–smashing eggs.

An integral part of the workshop involved exploring Newtonian physics with gadgets, which, on the day I visited, included a two-story long spring, a weight, and an egg. The object of this game was to demonstrate one's mastery of physics through determining to what displacement the spring-attached weight should be raised such that it would just kiss an egg placed on the ground beneath it. Once I painted that image for my readers, I hoped I could get them to continue reading in order to learn the fate of the unsuspecting egg. In the meantime, I was going to tell them about physics "modeling".

Providing entertainment was a common strategy I employed to keep readers interested in science. For a story I wrote about proteins, entropy, and drug design, I likened the motion of proteins to a mating dance. People love to hear about health too, and that translates into stories about pharmaceuticals. In addition to explaining the basics of the research, I was careful to tie the findings directly into drugs and disease. If journalists are to compete with television, radio, and the internet, we need to paint pictures, tell stories, and provide visual representations to enhance the enjoyment and understanding of our readers. This is what I tried to do for every story and that strategy managed to get the "intimidating" topic of physics onto the Inquirer's front page—twice.

Letters

Not with a Bang, but a Whisper

Isn't the metaphor "whispering cosmos" a more accurate and aesthetic description than "big bang" for the very cool microwave background radiation the permeates the entire universe?"

In 1949, astronomer Fred Hoyle coined the term big bang to deride Belgian priest George Lemaître's prediction that the universe had originated from the expansion of a hot "primeval atom" in space-time. Lemaître had based this on Einstein's equations of general relativity. Hoyle referred to Lemaître's "primeval atom" sarcastically as "this big bang idea" during a program broadcast on March 28, 1949 on the BBC. Hoyle said this because it contradicted his own steady state theory, which postulated that matter was continually being created as the universe expanded in accordance with Edwin Hubble's measurements.

The cosmic microwave background noise or whisper comes from every direction of the cosmos. This rustling whisper is evident to us today as we tune between television and radio stations. In the early 1960s, Robert Dicke of Princeton had predicted, as had George Gamow, Ralph Alpher and Robert Herman in 1948, that Lemaître's hot "primeval atom" should have cooled to a few degrees above absolute zero as it expanded to form the present universe. The radiation was discovered by Arno Penzias and Robert Wilson in 1964, for which they received the Nobel Prize in 1978.

Fred Hoyle's continuous creation or steady state theory cannot explain the microwave background radiation or cosmic whisper, which has cooled from the expansion of a hot "primeval atom". Yet the term big bang persists. Big bang makes no physical sense, as there was no matter (or space) needed to carry the sound that Hoyle's term implies. The big bang is a hypothesis. There was no one there to observe it! Other hypotheses may be discovered that can predict the observed Whispering Cosmos as well as the nature and origin of dark matter and dark energy that still challenges physicists.

How can conservatives be faulted for rejecting the imprecise big-bang metaphor? I believe the Whispering Cosmos is more accurate, eternal, and beautiful. It is consonant with Astronomer Mario Livio's aesthetic cosmic principle (*The Accelerating Universe: Infinite Expansion, the Cosmological Constant, and the Beauty of the Cosmos*. New York, John Wiley & Sons, 2000). Since scientific theories express the harmonies found in nature, the theories themselves should be aesthetic. The Whispering Universe is cooler cosmology than the big bang.

Paul H. Carr
Hanscom, MA

Genesis and Angular Momentum

In a letter in the October *APS News*, Mike Strauss explained the discrepancy between Genesis and modern cosmology regarding the age of Earth as due to the "long" Hebrew days in Genesis. Would he be so kind to explain the following in Genesis 1 (and similarly in Genesis 1, 8- 31):

4: And God saw the light, that it was good: and God divided the light from the darkness.

5: And God called the light Day and the darkness he called Night. And the evening and the morning were the first day.

I am particularly interested in the reconciliation of "long" days or "periods of time" with the current short days and the conservation of angular momentum of Earth. How did the earth's rotation increase by such an enormous amount?

Alfred A. Brooks
Oak Ridge, TN

Mike Strauss responds:

I'm glad that Alfred Brooks is looking carefully at the text of Genesis. As with any language, the meaning of the words is found primarily in the context. The same word can have two or more different meanings even in the same sentence, as in, "On Christmas day it snowed all day, but cleared up at dusk." In that sentence the first use of the word "day" refers to a period of about 24 hours, while the second refers to a period of daylight, maybe 10 hours. The context tends to reveal the best meaning. The Hebrew word "yom," translated "day," has many different meanings, including (1) 24 hours, (2) the part of a solar day that is light, and (3) a long period of time like an "era" or "epoch". There are places in Genesis, like parts of verse 4 and 5 as pointed out by Alfred Brooks, where the best meaning of the word "yom" is given by (2) above. However, many Hebrew linguists believe that the meaning of "yom," when referring to the six "days" of creation, is best given by (3) above, an "epoch". The scholar Gleason Archer Jr. wrote, "On the basis of internal evidence, it is this writer's conviction that 'yom' in Genesis 1 could not have been intended by the Hebrew author to mean a literal twenty-four-hour day." (From "A Survey of Old Testament Introduction" (1994)). The context indicates that, when referring to the six "days" of creation, the word "yom" in the Hebrew text may best be translated into English as six "epochs" of creation, with each epoch taking many hundreds of millions of years or so. There is then no problem with conservation of angular momentum, and no time-scale discrepancy between the biblical text and the known 14-billion-year age of the universe.

zero gravity

The Lighter Side of Science

2007 Ig Nobel Awards

The 2007 Ig Nobel Prizes, honoring achievements that first make people LAUGH, and then make them THINK, were awarded at Harvard University's historic Sanders Theatre in October before 1200 spectators. The event was produced by the science humor magazine Annals of Improbable Research (AIR), and co-sponsored by the Harvard-Radcliffe Science Fiction Association and the Harvard-Radcliffe Society of Physics Students, and the Harvard Computer Society.

The event was broadcast live on the Internet, and can be seen in recorded form at <http://www.improbable.com>. An edited recording of the ceremony will be broadcast on National Public Radio's "Science Friday" program on the day after Thanksgiving.

And the 2007 winners are….

MEDICINE PRIZE

Brian Witcombe of Gloucester, UK, and Dan Meyer of Antioch, Tennessee, USA, for their penetrating medical report "Sword Swallowing and Its Side Effects."

PHYSICS PRIZE

L. Mahadevan of Harvard University, USA, and Enrique Cerda Villablanca of Universidad de Santiago de Chile, for studying how sheets become wrinkled.

BIOLOGY PRIZE

Prof. Dr. Johanna E.M.H. van Bronswijk of Eindhoven University of Technology, The Netherlands, for doing a census of all the mites, insects, spiders, pseudoscorpions, crustaceans, bacteria, algae, ferns and fungi with whom we share our beds each night.

CHEMISTRY PRIZE

Mayu Yamamoto of the International Medical Center of Japan, for developing a way to extract vanillin–vanilla fragrance and flavoring–from cow dung.

LINGUISTICS PRIZE

Juan Manuel Toro, Josep B. Trobalon and Núria Sebastián-Gallés, of Universitat de Barcelona, for showing that rats sometimes cannot tell the difference between a person speaking Japanese backwards and a person speaking Dutch backwards.

LITERATURE PRIZE

Glenda Browne of Blaxland, Blue Mountains, Australia, for her study of the word "the"–and of the many ways it causes problems for anyone who tries to put things into alphabetical order.

PEACE PRIZE

The Air Force Wright Laboratory, Dayton, Ohio, USA, for instigating research & development on a chemical weapon–the so-called "gay bomb"–that will make enemy soldiers become sexually irresistible to each other.

NUTRITION PRIZE

Brian Wansink of Cornell University, for exploring the seemingly boundless appetites of human beings, by feeding them with a self-refilling, bottomless bowl of soup.

ECONOMICS PRIZE

Kuo Cheng Hsieh, of Taichung, Taiwan, for patenting a device, in the year 2001, that catches bank robbers by dropping a net over them.

AVIATION PRIZE

Patricia V. Agostino, Santiago A. Plano and Diego A. Golombek of Universidad Nacional de Quilmes, Argentina, for their discovery that Viagra aids jetlag recovery in hamsters.

Ask the Ethicist

My question concerns letters of recommendation into graduate school.

If I ask someone to write a letter of recommendation for me to get into grad school, and they say: "Write it yourself, then I'll sign it," how far down the ethical slope have I traveled if I do write this letter, but under the following conditions: a) the letter itself, written by me, is truthful in content and contains no false statements (except when I say I am someone else) or exaggerations; b) the letter is read closely by the signer for accuracy and proximity to the signer's own ideas; c) the letter may or may not matter in the selection process and could either be a more or less articulate of saying the same thing that the signer would write.

If I were to answer the question myself, I definitely would say I would be unethical in this case, certainly in an absolute sense; however, I feel the letter might be so similar to what the signer would have written, and maybe much less enthusiastic than what the signer could have said, that in the end I say I would gain no real advantage. But how can I say? If I were to go through with this and mail a graduate office a ghostwritten letter, I believe the ethical thing to do would be to withdraw my application.

Thanks- MT in North Carolina

Jordan Moiers replies:

Dear MT,

If the person you ask for a letter requests it, there's nothing unethical about ghostwriting your own letter of recommendation (unless a university explicitly forbids it, but I'll get back to that in a moment). No one knows your accomplishments better than you. Why should you rely on the potentially faulty memory of someone else when it comes to something as important as furthering your education?

You have to assume, of course, that the person you're approaching for the letter will diligently read the recommendation, and will be ready to make any necessary corrections (striking out the line about your ability to leap tall buildings, while adding in the Nobel Prize you forgot to mention). The most effective references often come from the most productive and accomplished people you know. But productive people are busy, which means that they may not have the time to write the recommendation letter you deserve even if they're willing to make the attempt.

Grad program administrators should be interested in getting the best possible candidates into their programs, not in testing the writing skills of the people recommending you. There are some graduate schools with application guidelines that specifically forbid ghostwritten recommendation letters. Those institutions, however, are misguided in their quest for the moral high ground. They make a demand that they can't possibly verify or enforce, ensuring that anyone willing to violate the guidelines has an advantage over those who obey the rules. What an excellent filter to help eliminate the most upstanding prospects. It may be a great way to select law students, but not so good in the sciences where ethics are a vital ingredient of good research.

There's nothing preventing your reference from modifying your letter or discarding it altogether and starting from scratch. For all you know, that glowing, ghostwritten masterpiece could have inspired your reference to whip out a quick note about your hubris and delusions of grandeur, which they discovered upon reading your draft of the recommendation letter. The only ethical breach in the process would occur if your reference was unwilling to scrap a ghostwritten letter when necessary.

-JM

From Physicist to War Correspondent: Mr. Glanz Goes to Baghdad

By Alaina G. Levine

Stop the presses. The new Baghdad Bureau Chief of *The New York Times* is a physicist.

Jim Glanz, who received his PhD from Princeton's Astrophysical Sciences Department with a concentration on "all kinds of funky waves," as he says it, has worked for the *Times* since 1999 when he was hired as a science writer. He filed stories about the engineering and scientific issues pertaining to the fall of the World Trade Center, which he and a colleague compiled into a book, and in 2004 he became a war correspondent. He has since been reporting from Baghdad every few months. His tenure as Bureau Chief began officially this summer and will likely last at least a year.

His decision to take the position, "at the center of the world's biggest story," was a no-brainer. "Once you get in the middle of a story like this…you want to see how it all comes out, how the story in effect ends," he explains. "I was asked to be Bureau Chief, I thought it over and I realized I wanted to continue reporting the story and accepted the job."

As Bureau Chief, he will concentrate on administrative, security, and editorial issues. Glanz is responsible for the hiring of Iraqi staff, financial concerns such as salaries and expenses, and of course, getting juicy stories.

"You have to try and stay ahead of the news and make sure your folks are covering the right topics at any given time," he states. "You're moving the pieces around on the board quite a bit and at the same time you have to be a reporter and file stories and still be productive in that respect."

Glanz loves being a journalist. But don't get him wrong. He enjoys physics as well, and has since high school. However, his foray into physics was driven, ironically, by financial necessity. As an undergraduate at the University of Iowa, "I thought I was going to major in journalism, and to tell you the truth I was broke and I walked into the physics lab to get a job," he recalls. Because he had been around radio stations with his DJ and sportscaster father, "I was more familiar than I even realized with basic electronics, so when I walked [into the lab], the guy said 'can you read a circuit diagram?' and I lied said 'yeah, of course.' And I sort of realized I had been spending all my life around stuff like this and I turned out to be very good at that kind of thing. Eventually I became passionate about physics too and I changed my major."

Soon "physics became the center of my world…it kind of gained momentum and all of a sudden I had a scholarship to go to Princeton and I took it," he says.

But he never stopped writing, and in fact envisioned combining physics and writing in his career, perhaps in the vein of Stephen Jay Gould, who remained in the academy while authoring essays. This was not to be, says Glanz, because, "I really wasn't a genius [at physics], but you have to be really, really smart to have a lot of fun at physics. Otherwise, it gets tunneled into the narrow specialties and I don't really like that. And at the same time I tend to really focus hard on things and that never really worked well when I tried to divide my time between physics and writing."

So upon graduation, although he was offered a job with Lawrence Livermore National Laboratory in the laser physics program, he accepted a much lower paying position at *R & D Magazine* as a staff writer on the biotechnology and environmental issues beats. "I just felt that was a better way for me to go and I've never looked back," Glanz says.

He stayed at R & D for a few years, wrote a book on soil science and got a job with *Science Magazine*. And in 1999, after he broke the story about the existence of dark energy and its relationship to the accelerated expansion of the Universe, he was offered a coveted science reporter slot at *The New York Times*. The lesson: trump the *Times* and you may just come out ahead.

On September 11, Glanz got to the office before either tower had fallen. "I was rushing by the editorial pod in the science section and the deputy science editor was handing out assignments from her desk," he

Photo by Robert Nickelsberg

Jim Glanz (right) interviews the Iranian ambassador to Iraq, Hassan Kazemi Qumi, in the Iranian Embassy in Baghdad

recollects. "She just looked at me as I went by and said 'structure.' That meant I was supposed to do a low profile story on how the skyscrapers were put together because these planes had hit them."

But when the towers fell and it became a very high profile story on what made the towers come down, Glanz started going to Ground Zero to investigate. He teamed up with a *Times* metro reporter and together they wrote 200 articles on the science of the site. They were finalists for the Pulitzer Prize.

Glanz's experience from Ground Zero gave him his first understanding of how his physics background gave him a certain "street credibility" in reporting and speaking with sources.

"I wrote about the cleanup which involved engineers and I spoke their language," he says. "It wasn't just a way of understanding what they did, it was also a way of getting them to talk to us. There were all these reporters clamoring for their attention, [and] we had a big advantage because we were out ahead knowledge-wise…We came off as some of the most knowledgeable reporters down there. We had our ducks in a row and we constantly got access and tips on stories."

This entrée into story scoops continues today in Iraq. "It's been a real boost for me because…I have a natural connection to all the engineers who were left here," Glanz describes. As he interacts with Iraqi engineers, he is seen as someone who can speak a language more important than Arabic or English, that is, the language of science.

"The language of science is so universal it allows you to make this immediate connection with someone who otherwise might seem completely different from you," Glanz says, "and I used that again and again and again to gain interviews and get insights into people and to get help with stories."

Glanz concedes that he misses the day-to-day action of being in physics, and refers to himself as a "former physicist." He compares the lament he experiences of not being a "practicing physicist" to that of an amputee: "It's sort of a lost limb thing–they say if your hand gets chopped off you feel pain in your pinky every now and again and I do feel that pain."

But he has an advantage. Glanz opines that being a journalist is "not that different from when I was a physicist. At some basic levels you want to say the best thing is grappling with reality, learning about it and being able to write about it to some kind of public. I love all aspects of it. I love the reporting, I love the writing, I love the fact that…there's reality that you're using as material for that whole process, which for me is a very visceral kind of thing and one I can't imagine living without."

Gonzalez Labors in the "Trenches" of Cancer Treatment Research

Medical physics is not a well-known field, but it's an extremely important one, says medical physicist Albin Gonzalez. As chief medical physicist at the Firelands Cancer Center in Sandusky, Ohio, Gonzalez works with a team that is responsible for patient treatment and safety. Every day, Gonzalez applies his knowledge of physics, biology, medicine, and computer technology to give patients the best possible treatment.

Gonzalez works with high-tech machines, commercial versions of the same type of accelerators used in cutting-edge science. His clinic recently moved to a new building and bought two new linear accelerators "with all the bells and whistles," he says.

With the rapid improvement in cancer treatment, Gonzalez is constantly learning new technology. "We are actually implementing new technology to do new types of treatments," he says. Physicists have been responsible for many of the improvements in cancer treatment, Gonzalez says. For instance, just a few years ago, people who had some types of cancer were treated with large beams of radiation that damaged healthy cells. But now, a new type of treatment called intensity modulated radiation therapy allows doctors to shape the beam more precisely, so the beam hits only tumor cells and avoids harming healthy tissue. "And all this improvement has been done by physicists. Physicists have been the champions of bringing a lot of new technology," says Gonzalez.

Like many medical physicists, Gonzalez has a PhD in physics. Originally from Panama, Gonzalez came to the United States to pursue an advanced degree in physics at Vanderbilt University in Nashville, Tennessee. While searching for a topic for his PhD thesis, he happened to find a research group that was working in medical physics. That subject caught his interest, and he decided to join the group. He soon realized he wanted to

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GEC Conference Features Latest Research on Plasma Phenomena and Processes

Carbon nanowalls, space plasma propulsion, and applying cold plasmas to facilitate wound healing were among the highlights of the annual Gaseous Electronics Conference, held October 2-5 in Arlington, Virginia. The meeting's focus is on basic phenomena and plasma processes in partially ionized gases, and on the theory and measurement of basic atomic and molecular collision processes. There are also sessions devoted to related applications, including plasma processing of materials, gas lasers, ion sources, gas discharge lamps, diagnostics, and plasma aerodynamics, among other topics.

Building Carbon Nanowalls. Carbon nanowalls (CNWs) are two-dimensional nanostructures made of layers of graphene, with much potential as an ideal material for catalyst support for fuel cells and gas storage, thanks to their high surface-to-volume ratios. One graphene sheet could potentially demonstrate high electron mobility and large sustainable current, thereby enabling various kinds of electric devices using this material. Masaru Hori of Nagoya University reported on a novel plasma enhanced chemical vapor deposition (PECVD) technique to synthesize CNWs with a wide range of morphologies and structures, some with excellent characteristics for building new functional devices (such as biodevices), including good electron field emission and water repellency of the surface area. Exposing the surface to a plasma makes it hydrophilic.

Accelerating Ions for Plasma Propulsion. Edgar Choueiri of Princeton university reported on a recently discovered mechanism for ion acceleration that appears to occur naturally in Earth's ionosphere, and holds promise as a means of energizing ions for thermonuclear fusion and electrodeless space plasma propulsion. Previous known mechanisms used electrostatic (ES) waves, which only accelerate ions with initial velocities above a certain threshold. This new mechanism involves pairs of beating ES waves, and is capable of accelerating ions with small initial velocities, thereby offering a more effective way to couple energy to plasmas. Choueiri believes this fundamental insight can be applied to develop novel plasma propulsion concepts.

Cold Plasmas Heal Wounds. Ten years ago, scientists found it a challenge to create plasmas at temperatures cool enough not to damage surfaces, but this can now be done fairly easily. Cold plasmas are proving useful as a means of sterilizing heat-sensitive medical tools, and decontaminating surfaces, particularly skin wounds. This has already been demonstrated in vivo, according to Eva Stoffels of Eindhoven University of Technology, who has developed a "cold plasma needle." This is a specially designed plasma source with a low-power discharge below the threshold of tissue damage.

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Focus on APS Topical Groups

Featured Topical Group: GSNP

The topical group on statistical and nonlinear physics (GSNP) brings together people studying widely diverse phenomena, from earthquakes and bird flocking to traditional nonlinear systems and chaos.

Work in statistical and nonlinear physics overlaps naturally with fluid dynamics, computational physics, biological physics, condensed matter physics, and polymer physics.

"It's a very interdisciplinary group. GSNP includes researchers working on a wide spectrum of nonlinear and nonequilibrium problems that span many disciplines, from biology to earth science," says GSNP chair Cristina Marchetti of Syracuse University. "One of the goals of the Group has been to strengthen and highlight the connections between these disparate fields and topics."

Many GSNP members work in areas of nonlinear dynamical systems and chaos, including chaotic behavior that arises in nonlinear pendulums, turbulent fluid flow, and pattern formation. Some of these areas of study have a very natural overlap with fluid dynamics, says Marchetti. In addition to classical chaotic systems, some GSNP members now study quantum chaos.

Other GSNP members are working on complex materials, or soft condensed matter. This area includes many important systems, such as understanding granular media, liquid crystals, colloids, cells, the collective behavior of bacteria, and the study of earthquakes and crack propagation. Self-assembly and self-organization play key roles in many of these systems.

Yet another class of problems that has caught the attention of statistical physicists lately is the study of networks. Examples of networks include the internet, cell signaling networks, and power grid networks. "There are ideas and mathematical techniques that can address questions that are relevant to all these systems," says Marchetti.

These seemingly disparate topics actually have a lot in common, says Marchetti. "What unifies them are the common ideas that are often used to study them," she says. Principal among those are the notions of scaling and universality. The concept of universality, which has been around for some time, has its roots in the study of phase transitions and critical phenomena that occur in systems composed of many interacting units. At certain characteristic parameter values, these systems exhibit cooperative behavior and undergo a phase change. Near this phase transition, the system is universal in that the behavior of the system at large scales does not depend on the microscopic physics. Consequently, many seemingly disparate systems involving the onset of collective or emergent behavior, can be characterized using these concepts and techniques.

As physics itself has become more interdisciplinary, interest in statistical and nonlinear physics has grown. "The field has really exploded because statistical physics, particularly what we call nonequilibrium statistical physics, is now relevant to a very broad set of disciplines. It is also very important in biology," says Marchetti.

The field has its roots in equilibrium statistical physics, but has evolved to encompass and emphasize nonequilibrium and dynamical phenomena. It is a field in rapid evolution, with a constantly changing focus. "For a long time physicists have focused on systems at or near thermal equilibrium. Equilibrium statistical mechanics is an old and well developed subject, although many open questions remain," says Marchetti. On the other hand, the majority of phenomena in nature are not in equilibrium, Marchetti points out. This is clearly always the case in biology.

The membership of GSNP has grown steadily in recent years. Most of the GSNP activities take place at the March Meeting, where every year GSNP sponsors many Focus Sessions and Invited Symposia, often in conjunction with other units. Although most of the GSNP members attend the March Meeting, there is also significant GSNP representation at the annual DFD November meeting. Each year GSNP recommends several APS Fellows to Council for election.

GSNP also sponsors two other activities at the March Meeting. The first is the "Gallery of Images" modeled after a similar exhibition started years ago by DFD. GSNP members are invited to submit a poster or video that provides some striking, yet informative display of work in the area of statistical or nonlinear physics. Such images arise from experiments or from numerical studies, and can be strikingly beautiful while carrying critical scientific information. For example, drops splashing on surfaces create fascinating images when caught by a high speed camera. The entries are displayed at the March Meeting, and winning entries are published in the journal Chaos. Examples from recent contests include visual representations of the community structure in the U.S. House of Representatives, the crowd synchrony on the London Millennium Bridge, and the edge of chaos in pipe flow. Starting next year there will also be a cash prize for the winning entry.

The second GSNP-sponsored activity at the March Meeting is an award for the best graduate student talk in the field. GSNP members are invited to submit nominations of students for the award, and a number of students are selected to give a presentation in a special session at the March Meeting, with a cash prize awarded for the best presentation.

The Group also has a deep interest in education. Last year, GSNP and the Forum on Education jointly held a symposium on the teaching of non-equilibrium statistical physics, a subject that is not systematically taught in graduate schools.

With nearly 900 members, GSNP, which was formed in 1998, is now one of the largest of the APS topical groups.

Determined Leadership

Photo by Ken Cole

The governing board of the American Institute of Physics met in College Park, MD on November 2. As the largest member society of AIP, APS has seven members on the board, including APS President Leo Kadanoff. Here Kadanoff (right) meets with AIP Executive Director and CEO H. Frederick Dylla for some high-level discussion.

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The plasma needle does not cause fatal cell injury and allows for precise and localized cell removal, as well as bacterial disinfection. Stoffels reported that the plasma does not necrotize the cells, has clear antimicrobrial effects, and stimulates fibroblast cells towards faster attachment and proliferation. Concerns remain about potential cytotoxicity, but Stoffels' recently completed in vitro studies on long-term cellular damage were "satisfying," paving the way for clinical applications such as disinfecting wounds and dental cavities.

Pattern Recognition. Deep etching of silicon is used widely to build MEMs and other microelectronics components, but Remi Dussart of the Université d'Orléans' GREMI program is interested in developing the cryoetching process as a faster and cleaner alternative. A major challenge is achieving precise control of the formation of the wafer's passivation layer. He and his GREMI colleagues have developed an improved cryoetching process using SF_6 and O_2 as basic gases that form an SiO_xF_y passivation layer in an inductively-coupled plasma (ICP) reactor at very low temperatures.

Despite the widespread use of plasma-based etching to produce device features with precisely controlled nanoscale dimensions, surprisingly little is known about the interaction of the plasma with the organic molecules arranged in the surface pattern, not to mention the chemical, morphological and topographic changes induced by these interactions. Gottlieb Oehrlein of the University of Maryland, College Park, described his recent collaborative work aimed at improving our understanding and control of plasma-surface interactions with advanced polymers for nanoscale patterning of materials.

According to Koichi Sasaki of Nagoya University's Plasma Nanotechnology Research Center, laser-aided plasma diagnostics offers a powerful tool for exploring reactive plasmas, as well as for monitoring the operation of conditions of plasma processing tools in factories to achieve efficient mass production. He discussed two examples of laser-aided precise diagnostics for lab experiments, as well as a new method for monitoring reactive plasmas. The latter is based on diode laser absorption spectroscopy, enabling low cost, maintenance-free operation.

INSIDE THE BELTWAY: WASHINGTON ANALYSIS AND OPINION

It's the Emotion, Stupid!

by Michael S. Lubell, APS Director of Public Affairs

"Enough, already," Laura whispered in my ear, can't you see people's eyes are glazing over." I have to admit, it shut me up pretty fast.

Later, on the way home from the dinner party, she picked up where she had left off. "Physics, no matter how fascinating you may find it, bores most people to death. It's not that they can't understand what you're saying–you are, after all, a very good teacher. But it's too cerebral."

"Too cerebral, what's so cerebral about the greenhouse gas effect or renewable energy? Al Gore just got the Nobel Peace Prize and an Oscar for his movie, Inconvenient Truth," I replied, perspiration beads of irritability beginning to show on my brow.

"He didn't win them for science. He won them by scaring the living @&#$ out of his audience," Laura said, with her usual refreshing bit of vernacular. "People don't spend their time 24-7 thinking with their brains; they mostly react with their emotions. You physicists just don't get it."

She had it right, at least if you believe the results of recent neuropsychological brain-scan experiments–which ironically have used the tools physicists helped to create. And it pretty much explains why science rarely gets even a nanosecond's worth of attention during any political campaign, the 2008 marathon thus far fitting neatly into the customary mold.

As Drew Westen, a well-known Emory University psychologist, notes in his recent book, *The Political Brain – The Role of Emotion in Deciding the Fate of a Nation* (Public Affairs Books, New York, 2007), Republican guru Karl Rove had it figured out perfectly, years ago, well before brain-scan technology gave the principle any scientific gravitas:

It's no accident that George W. Bush used terrorism as the winning strategy in the 2004 election or that his father used the Willie Horton ad to destroy Michael Dukakis in 1988. Or that two decades earlier, Lyndon Johnson ever so briefly used the granddaddy of fear-mongering negative ads–a mushroom cloud over a field of daisies–to torpedo Barry Goldwater's White House campaign ship in 1964.

The flip-side of fear, love, also works wonders. Bill Clinton "felt everybody's pain" in 1992 and, despite being tainted by more than whiffs of scandalous sexual adventures and comparative inex-

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DNP MEETING continued from page 1

of sonic booms. The string theory computations hinge on dynamics of black horizons in a fifth dimension, but Gubser argues that while such horizons "may appear fanciful, they in fact provide very practical and direct tools for computing dynamical properties of analogs of the QGP." There are a few string theory predictions that are quite close to experimentally favored values, although he cautions that there are still significant barriers to making those predictions more precise.

Elemental Matters. According to NSCL's Fernando Montes, recent observations of the abundances of metal-poor stars suggest that an additional mechanism besides the known r-process is responsible for the production of material within a specific region (nucleosynthesis). He finds that mixing the r-process pattern found in such stars with a light element primary process (LEPP) can explain these observations. He has used the LEPP abundance pattern based on those observations to explore the astrophysical conditions that would create it.

Why Stars Explode. Physicists continue to explore potential explosion mechanisms for core-collapse supernovae explosions, an area of research that spans four decades. While much progress has been made in understanding the basic physics and hydrodynamics, there is still no truly satisfactory explanation. According to Adam Burrows of the University of Arizona, an acoustic mechanism and one relying on magnetohydrodynamics jets are the newest candidates for the core collapse mechanism. In addition, a new class of energetic supernovae, called "hypernovae," has been discovered. "As a result, the study of the supernova mechanism has assumed a far wider portfolio and a greater richness than ever in the past," he said. It will require a synergistic interplay between nuclear physics and sophisticated numerical simulation to shed further light on this phemoenon.

The Future of Nuclear Theory. Nuclear theory has reinvented itself in the last 10 years, creating new paradigms for matter under extreme conditions, and developing better methods for investigating the structure and interaction of hadrons in few-and many-body systems. The renaissance is far from over, according to David Kaplan of the Institute for Nuclear Theory, who cited the advent of petascale computing as providing even more opportunities for theorists to solve complex open questions in the field.

For instance, over the next decade, there will be a number of experimental studies of neutrinos and fundamental symmetries, and nuclear theory will play a critical role in interpreting those results and their implications for the "New Standard Model" of fundamental interactions. Michael Ramsey-Musolf of the University of Wisconsin-Madison discussed a few of the biggest challenges for nuclear theory, including neutrino-less double beta-decay, electric dipole moments, and precision measurements of neutrino properties and electroweak processes.

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do more than just academic research, he wanted to directly affect patient care by working in a clinical setting.

Gonzalez has been doing that for several years now, working "in the trenches" he says, at the Firelands Cancer Center. He is certified by the American Board of Radiology.

Gonzalez collaborates with a team that includes the radiation oncologist, radiation therapists, and a dosimetrist, who calculates the dose of radiation for each patient. Gonzalez enjoys working with this group of people. "It's a wide environment," he says.

On a typical day, Gonzalez and his coworkers must check patient charts and review treatment plans. Gonzalez must also check the equipment. He describes a lot of his work as "quality assurance." He uses detectors to make measurements to check that the machines are delivering the right doses of radiation. He also has to check several computers that control the treatment, and make sure all these computers are working together properly.

Most of the time, Gonzalez does not work directly with patients, but occasionally he is called upon to talk with them. For instance, some patients receiving some types of radiation therapy worry that they are radioactive and dangerous to their family if they go home. Gonzalez explains the physics involved in the treatment, and assures them that from a radiation safety standpoint that they are quite safe.

Gonzalez likes the challenge of solving new problems every day. Sometimes the technology is so new that it's not known how best to use it, and there is often trouble with the equipment. Gonzalez has to understand the principles of how the treatments work so he can find and solve the problems. That's where his physics training is useful. "I think the most important thing is that as a physicist, you have problem-solving skills," he says. In the clinical setting, it's extremely important that everything work correctly, because people's lives and health are at stake. "This is actually taking care of real people. You cannot put people in danger," he says.

Gonzalez wishes people knew more about medical physics. "There is a lot of need. There are a lot of jobs out there," he says. Being able to help patients is one of the biggest rewards of the job, he says. "We can make a real difference treating cancer patients. The more we know about this disease and how to treat it safely, the better quality of life we can give these people."

–Courtesy of PhysicsCentral

LABORATORY continued from page 3

Neutron Source at Oak Ridge National Lab, and since his retirement has been active in the development of the Large Hadron Collider.

Over the November 3-4 weekend, working groups from all the underground disciplines met to focus on the next phases of the project, organize the designs for the first suite of experiments, define needed research and development, explore education and outreach possibilities, and discuss coordination with existing labs and funding agencies.

ANNOUNCEMENTS

APS CONGRESSIONAL SCIENCE FELLOWSHIP 2008-2009

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 2008 with participation in a two-week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

A STIPEND is offered in addition to an allowance for relocation, in-service travel, and health insurance premiums.

APPLICATION should consist of a letter of intent of no more than two pages, a two-page resumé: with one additional page for publications, and three letters of reference. Please see the APS website (http://www.aps.org/policy/fellowships/congressional.cfm) for detailed information on materials required for applying and other information on the program.

ALL APPLICATION MATERIALS MUST BE SUBMITTED ONLINE BY JANUARY 15, 2008.

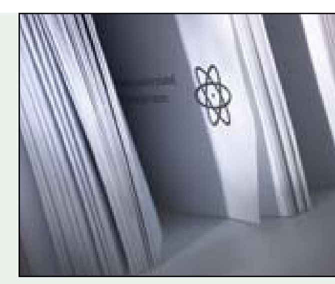
Now Appearing in RMP: Recently Posted Reviews and Colloquia

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

Fermi-liquid instabilities at magnetic quantum phase transitions
Hilbert v. Löhneysen, Achim Rosch, Matthias Vojta, and Peter Wölfle

Fermi-liquid theory, which describes in particular the state of electrons at low temperatures, is one of the central pillars of modern condensed-matter physics. Instabilities of the Fermi-liquid state are therefore of fundamental interest, in addition to leading to very remarkable observable properties. In this article the authors discuss one way for the Fermi-liquid state to break down, namely, the system undergoing a quantum phase transition, and difficulties in understanding the latter within the framework of simple theories.

Manhattan Project Session at the April 2008 APS Meeting



On **Sunday, April 13, 2008 at 10:30 AM** there will be a session devoted to the Manhattan Project, particularly Los Alamos during the war years 1943-45.

There will be two invited talks, by Val Fitch, who was a member of the Special Engineering Detachment, U.S. Army, and Cynthia C. Kelly, who is President of the Atomic Heritage Foundation, and Editor of the just-published book *The Manhattan Project*.

Los Alamos alumni of that period are invited to attend the session, and to participate in a panel discussion (space permitting) that will take place after the two invited talks. Those alumni whom we have not yet contacted are urged to email one of the session organizers: Ben Bederson, ben.bederson@nyu.edu or David C. Cassidy, chmdcc@optonline.net, or write to Ben Bederson, Physics Department, 4 Washington Pl., New York NY 10003. Contributed papers concerning that period are also welcome.

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perience on the national stage, he eased his way into 1600 Pennsylvania Avenue. And in 1984 Ronald Reagan made everyone feel warm, and cozy with his campaign theme, "It's Morning in America!" and, despite a faltering economy, he cruised to a second White House term.

Westen, whose treatise has made it onto the "hot" reading list for anyone on the 2008 campaign trail, notes that you can't reach people intellectually until you engage them emotionally. A campaign (Gore in 2000 or Kerry 2004) based solely on ideas is a loser. Put an emotional wrapper around those ideas, though, and it can be a winner.

Hillary Clinton has opened up a significant lead on her Democratic presidential primary opponents, and she connects well with people one-on-one, as I can personally testify. But she has difficulty creating an emotional bond with voters in larger settings. That, analysts say, could pose problems for her in the general election, where the opportunity for personal contact all but vanishes.

But former New York City mayor Rudolph Giuilani, whom many pundits had written off as far too socially liberal to have a decent shot at the Republican nomination, has used the 9-11 fear-factor to seize the front position in a crowded GOP field of wannabes. The emotional connection he has successfully forged with a sizable slice of voters, combined with Hillary Clinton's unfavorable rating–46 percent in recent polling–probably explains why he is in a statistical dead heat with her in early national polling.

November 4, 2008, is still a far way off, and the election dynamics will take many unexpected turns, but if Westen is correct, the next occupant of the White House will likely be the person who most effectively taps into the emotions of the American voter. Competence will count heavily, as well, but policy specifics, that have no emotional context, no matter the clarity of the communication, will have little to do with the outcome.

Physicists may cringe at such a prediction. Good, unbiased science, after all, must be free from emotional content.

But nowhere is it written that effective communication of science should not tap into the emotion of the listener. In fact, Westen's studies suggest it must. Whether the audience is policy makers, elected officials, the general public, or students in the classroom, establishing an emotional connection is an essential precursor to communicating serious information. Lighting up the amygdala gets the rest of the human brain to pay attention.

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The Back Page

Boosting America's Energy Security Requires Multi-Front Effort, New Thinking

by Byron Dorgan

For the past three decades, we Americans have debated the growing threat to our nation's energy security and what to do about it. Each year we hear the warnings. Each year we hear the same solutions suggested. Each year we hear the same objections. It's as if the debate has been on an endless loop.

In all that time, only one thing changed. Our energy vulnerability grew much worse.

The threat we face is not new. The OPEC oil embargos in the 1970's were a major wake-up call to action. While the OPEC oil embargos spurred some changes, they have not been enough.

Now the threat to our energy security is much more dramatic than it was in the 1970's.

We used to worry about oil embargos. Today the threat is terrorism, and a red hot shooting war raging in the Middle East, one of the most volatile regions of the world, and the source for much of America's petroleum.

Unlike in the Cold War, our increasing dependence on imported oil and the need for access to secure energy resources play a central role in this new struggle. Yet, we still argue the same old policies.

One side–as it has for thirty years and more–says the answer is conservation. The other–as it has for thirty years and more–says just as forcefully that the answer is to produce more energy here at home.

Both are wrong. And both are right.

They are wrong because there is no single answer. They are right because more conservation and energy efficiency and greater production of energy here at home are very important parts of the solution. We need both.

As Chairman of the Senate's Subcommittee on Energy, and the Appropriations Subcommittee on Energy and Water, that's the path I'm working to pursue. It's also the philosophy at the heart of bipartisan legislation I have introduced, the Security and Fuel Efficiency Energy Act (SAFE) Energy Act.

We simply cannot afford or risk another thirty years of gridlock.

My plan is a comprehensive approach that recognizes there is no magical "single bullet" that will solve America's dependence on foreign oil.

Frankly, my plan advances certain policies many of us did not support as stand-alone proposals. Some of us actively opposed them in the past. But when they are part of a comprehensive package that asks no single effort to carry the whole load, they make sense.

The SAFE Energy bill relies on four cornerstone principles to reduce the use of oil in our economy:

1.) Achievable, stepped increases in fuel efficiency of the transportation fleet;

2.) Increased availability of alternative fuel sources and infrastructure;

3.) Expanded production of domestic oil and natural gas resources; and

4.) Improved management of alliances to better secure global oil supplies.

Are some of the provisions of our legislation controversial? You bet. But our reliance on foreign oil is too dangerous for Congress to continue to avoid taking up controversial issues. The only way we are going to break our dependence and achieve energy security is to set robust, long-term goals and work to achieve these goals through programs, incentives, mandates, and increased investments.

Since the introduction of the SAFE Energy Act, I have worked to ensure that any bipartisan legislation moving through the Senate incorporates these principles.

The Senate recently passed major energy legislation that included significant progress toward meeting three of these four principles. I am pleased with the progress we made in the the Energy bill. I remain committed to making further progress and to achieving all four goals of the SAFE Energy Act.

Here's what the Senate has done so far this year:

• Increased fuel efficiency standards: The most recent Senate Energy bill reforms the old corporate average fuel economy, or CAFÉ, system and raises fuel efficiency standards for our nation's passenger automobile fleet to 35 miles per gallon by 2020.

Nearly four decades after the first OPEC oil embargo, America remains over 60 percent dependent on foreign oil, including oil coming from some of the most troubled parts of the world. Because the transportation sector is where we use 67 percent of the oil in our economy, this is the sector that contributes most to energy insecurity.

Senator Byron Dorgan (D-ND)

For decades, most Members of Congress deferred the decision making on fuel economy standards to the National Highway Traffic and Safety Administration (NHTSA). Since the mid 1980's NHTSA has done little to to boost fuel efficiency standards, and we've made little progress as a result. With all the technological marvels made to passenger vehicles in 25 years–keyless entry, better cup holders, automatic trunk openers–fuel economy has not increased.

Over the past two decades, automakers have made substantial gains with respect to convenience, safety, power and performance. In the next two decades, we need to focus our incredible innovative efforts on improvements in fuel economy for all vehicles. Congress must now weigh in to take a much more pro-active role in setting fuel economy standards.

Raising the automobile fuel efficiency standard to a fleet average of 35 miles per gallon in the United States by 2020 will, alone, save 2 to 2.5 million barrels of oil per day.

Unlike the old CAFÉ standards, this new system will group vehicles into separate classifications based on their attributes such as by weight, size and other features rather than pitting different vehicles against each other. Also, medium and heavy duty trucks have been brought into the system for the first time.

• Expanding the availability of renewable fuels–The Senate Energy bill also expanded the current renewable fuels standard (RFS) to 36 billion gallons by 2022. The original renewable fuels standard in the Energy Policy Act of 2005 called for 7.5 billion gallons of renewable fuels like ethanol and others to be used in our fuel mix by 2012. Increasing the RFS ensures that we will not only further use our expansive renewable resources from starch-based ethanol, but will also increasingly look to cellulosic fuels in the future.

• Improved alliances on global energy supplies–The Senate Energy bill also strongly encouraged strengthening our ties with other nations in order to increase cooperation and increase our energy security. Even as we seek to be more energy independent, it is clear we will also need to work through diplomatic alliances to reduce the risk of an international energy crisis.

One area where we also must do more is domestic energy production. Our work to spur production of more renewable fuels is a big part of that effort. We need to produce more oil and natural gas here at home.

We can no longer simply watch OPEC ministers sit around a table and decide how far to turn the spigot that feeds our addiction to foreign oil. One disruption in the global oil supply could put our economy flat on its back.

The SAFE Energy bill strongly encourages the production of more oil and natural gas. We specifically recommend that more production of both could be developed in the Eastern Gulf of Mexico and near Cuba. We also call for a further inventory of resources in the Southeastern U.S. waters.

Our production opportunities are substantial in this area and build upon the legislation Congress passed just a year ago to allow exploration and production in the Gulf region known as Lease Sale 181. Bringing this area into production, even with our insistence that it be done in an environmentally sound way, will not be easy. Some in the Senate are working hard to block that effort.

We must realize that even as we develop alternative fuels and use our resources more efficiently, the development of our own resources is a safer and more sensible course than continuing our increasing and precarious dependence on other nations' oil.

In 2006, U.S. payments abroad for oil were more than $250 billion, a third of our country's $800 billion current account deficit. Between the summer of 2003 and the summer of 2006, world oil prices rose from roughly $25 per barrel to more than $78 per barrel.

Oil dependence, by the U.S. and our allies, reduces the leverage of the world community in responding to threats from oil-exporting nations. Emerging nations with substantial oil resources have embraced economic inequality and autocracy, which spawns violence.

Today, the most prominent threat comes from Iran, whose nuclear ambitions could further destabilize the Persian Gulf and put terrifying new weapons into the hands of terrorists.

Congress must also get to work helping to develop the next generation of energy technologies. Let's use America's innovative spirit! I am working to harness that innovation to increase our energy security through my work on the Senate Appropriations Committee. As the Chairman of the Energy and Water Appropriations Subcommittee, I've worked to provide funding to programs that seek to develop and demonstrate a wide array of new energy technologies.

The need to develop new energy technologies is not only urgent but long over-due. For that matter, we put gas in a 2007 Ford the same way that we did in a 1927 Ford. It's time to think and act differently.

I am proud to say that the Energy and Water Subcommittee, under my chairmanship, has funded the Department of Energy's energy programs–the programs seek to develop new energy technologies–with $3.715 billion for the coming year. That funding is $536 million above the President's request. While the President often speaks about the importance of energy, we are following through with increased funding for that effort.

Specifically, our Subcommittee has provided $228 million to develop hydrogen technologies, $244 million for biomass and renewable fuels, $230 million for vehicle technologies, $168 million for electricity and transmission research, and $808 million for coal, oil, and natural gas research.

Funding for these important initiatives lays the groundwork for the goals we seek to achieve in our SAFE Energy legislation. By adequately funding our research and development programs, we will be able to take these technologies and ideas into the marketplace. Automakers can use the advances we achieve to make more advanced, fuel efficient vehicles. Companies will be able to produce the next generation of ethanol and biodiesel, especially cellulosic ethanol. We will be able to use new technologies and ideas for the development of unconventional oil and gas resources. All of these investments contribute to greater energy security for America.

In short, if we are to strengthen America's energy security –and we must because the consequences of not acting to do that could be catastrophic–we must do many things.

We must make better use of our own fossil and renewable energy resources here at home.

We must do more to increase our energy efficiency, especially when it comes to automobile fuel economy standards.

We must work with our allies to expand and strengthen the diplomatic infrastructure critical to avoiding policy disputes that can disrupt energy supplies and in helping to resolve those disputes so they don't disrupt our energy supplies.

If we do all this, Americans and our economy will be less vulnerable. We can shift our military resources away from protecting the global oil system and begin committing more resources to preserve the Planet Earth for future generations by protecting the environment.

Our energy security problems are urgent and long-standing. Continuing to think, act, and argue the same old debates exactly the way we have for the past 30 years will take us no where closer to solutions than in the past.

It's time to end the stalemate and act to make America's energy future a more secure one.

US Senator Byron Dorgan, Democrat of North Dakota, is Chair of the Indian Affairs Committee, Energy and Water Appropriations Subcommittee, Energy Subcommittee, and Interstate Commerce, Trade and Tourism Subcommittee.

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