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Latest Research in BECs, MgB_2, Among March Meeting Highlights

The biggest physics meeting of the year, the APS March Meeting, was held March 18-22, 2002 in Indiana at the Indianapolis Convention Center. An estimated 5000 talks were delivered.

The March Meeting is traditionally a showcase for important fundamental physics as well as the kind of practical research that shows up — five, ten, or even 20 years later — in the productive labor-saving devices we take for granted.

This year's conference was no exception, as speakers presented the latest research results in Bose-Einstein condensates (page 1), physics-based tools for medicine (page 6), and the future of information technology. In addition to the technical sessions—several highlights of which are described below—there were also a series of workshops on Sunday, including one on career planning and development (page 3) and successful strategies for women physicists (page 1).

Hopes for a Hole-Doped Metal Superconductor.

Last year a new record was set for a superconductor transition temperature, 40 K, for an all-metal compound. Much more is known now about these MgB_2 materials.

There is now hope that a related compound, LiBC, might operate at temperatures at high as 100 K, as much as twice as high as for MgB_2.

At the APS meeting, Warren Pickett of UC Davis pointed out that the interactions that are the essence of superconductivity, the pairing of electrons brought about by the interactions between electrons and concerted flexings (phonons) in the material lattice, are potentially twice as strong in LiBC than in MgB, especially if holes (the momentary vacancies left behind by departed electrons) can be injected into the sample by a "field-effect" process.

This is a common procedure in transistors, where a gate electrode forces holes into a channel between the other two electrodes, thus enhancing the conductivity in that region, inducing a metallic state and producing superconductivity.

A field-effect setup helped to boost the superconducting transition temperature in a crystal of carbon-60 molecules up to 117 K last year.

Terahertz Imaging: A New Inspection Technology.

Physicists are still discovering useful regions in the rainbow spectrum of electromagnetic radiation.

One such region is the realm of terahertz radiation, electro-

See **HIGHLIGHTS** *on page 3*

March Meeting Prize and Awards Recipients

Photo credit: MediaWright, Inc. Photography and Video

Front row (l to r): Jim Eisenstein (research advisor for Kathryn Todd); Kathryn Todd, Deborah S. Jin, Chris G. Van de Walle, Robert Wagner. Back row (l to r): Nicholas Read, Robert J. Soulen, Jr., James Allen, Tom Witten, Thomas Timusk, Donald S. Bethune, Jainendra Jain, Robert Willett, Sumio Iijima, Timothy J. Bunning, Carlos Bustamente, Anatoly L. Larkin, David Goldhaber-Gordon.

Women Physicists Explore Survival Skills at March Meeting

Looking around at a physics conference like the March Meeting, it is not difficult to see that there are not many women attendees. Indeed, it has been no secret that women are severely under-represented in physics. To address this issue, the Committee on the Status of Women in Physics (CSWP), for the first time, hosted a special workshop on the Survival Skills for Successful Women Physicists in conjunction with the March Meeting. The half-day workshop was held on Sunday, March 17 and was chaired by APS Executive Officer Judy Franz and Dongqi Li of Argonne National Laboratory. A total of 42 people, evenly distrib-

Photo credit to Jessica Clark

Mildred Dresselhaus addresses the workshop.

See **SURVIVAL SKILLS** *on page 6*

International Conference Grapples with Issues of Women in Physics

Concern over the low number of women in physics worldwide was one of the underlying themes at a groundbreaking international conference on women in physics, held 7-9 March in Paris, France, and organized by the International Union of Pure and Applied Physics (IUPAP). More than 300 delegates — about 15% male, and another 15% or more women in their early careers— in 65 national teams gathered to discuss such issues as attracting more girls into physics, balancing family and career, and getting more women into the physics leadership structure. Their job was not only to try to understand the severe under-representation but also to develop and implement strategies to increase women's participation in the physics community. By comparing differences between regions around the world, many new insights were gained. A list of 8 resolutions was passed unanimously by the delegates and can be read, along with a further list of recommendations, at http://www.if.ufrgs.br/~barbosa/conference.html.

"It was an amazing experience to look out over a room filled with women physicists from all parts of the world," said Judy Franz, APS Executive Officer and Associate Secretary General of IUPAP, who, along with the IUPAP Working Group on Women in Physics took responsibility for organizing the conference. "Women from almost every country in Europe and North America as well as many African, Asian, and South American countries shared a common sense of commitment to physics and to women physicists."

While the conference may be over, the work certainly isn't. The teams returned home with renewed commitment. "I have never been to any conference as interesting and inspiring from the beginning to the end," wrote Corinna Kausch, a delegate from

See **PARIS WORKSHOP** *on page 4*

Goldhabers Galore

The Goldhaber family is famous as a physics dynasty. Maurice Goldhaber, now 90, is still active after a long and distinguished career. He is a winner of the Wolf Prize, the Enrico Fermi Award, and the Bonner Prize of the APS, and he served as APS President in 1982. Among the other noted physicists in the family are his late wife, Gertrude Scharff Goldhaber, and their son, Alfred Scharff Goldhaber. Professor at the C. N. Yang Institute at SUNY Stony Brook.

Alfred's son, David Goldhaber-Gordon, is the recipient of this year's Valley Prize for outstanding research done by a physicist under age 30. On the occasion of the presentation of the Valley Prize at the APS March meeting, members of the Goldhaber clan gathered in Indianapolis, and in addition to David's prize talk, the meeting featured papers from Maurice and Alfred, as well as from David's wife Ilana (who is really a biologist).

Shown here (l to r) are: Robert Gordon (David's father-in-law and professor of chemistry at the University of Illinois, Chicago), Ilana Goldhaber-Gordon, David Goldhaber-Gordon, Marc Kastner (head of the physics department at MIT and David's thesis advisor), Alfred Scharff Goldhaber, Alfred's wife Suzan, and proud paterfamilias Maurice Goldhaber.

Physicists Achieve Molecular BEC, Coexistent "Fermi Sea"

A molecular Bose-Einstein condensate (BEC) has been achieved by Carl Wieman and his colleagues at the University of Colorado. Wieman reported at the APS March Meeting in Indianapolis that his team had observed a quantum superposition of diatomic molecules and disassociated atoms in a trap.

Wolfgang Ketterle of MIT, like Wieman a recipient of the 2001 Nobel Prize in physics for BEC discoveries, spoke at the same session, and reported on some of his latest findings.

Having long used Rb-87 in his BEC experiments, Wieman has as of late been studying Rb-85 which, although it is harder to condense, possesses just the right fine-grained set of quantum energy levels (hyperfine levels) so that the application of a magnetic field can alter the interaction force among the atoms in the trap, even as they reside in the single quantum state which is the hallmark of Bose Einstein condensates. By adjusting the magnetic field to be very close to the point where the interatomic force goes from attractive to repulsive, a "Feshbach resonance" occurs and some of the atoms form molecules.

The atoms and molecules are thought to be coherent, at least locally, and maybe over longer distances too. In this process the condensate appears first to implode and then rebound somewhat like a supernova, even to the extent of sending out jets of particles and leaving behind a remnant. The physics behind this "Bosenova" be-

See FERMI SEA on page 3

Highlight

5

ViewPoint: *A Climate Change Policy for America*

Members in the Media

"It's important to stay on top of the industry. . . because if you bet wrong, you can be out of business in a very short time."

—George Whitesides, Harvard, on why nanotechnology will be important to industry, The Futurist, March 1, 2002

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"What the space station allows us to do is open a whole new realm of tests that are either inaccessible or would be very difficult to conduct down on Earth."

—Robert Bluhm, Colby College, UPI Science News, March 3, 2002

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"We've chosen what on the face of it ought to be the world's worst laser medium — a reflective powder that's difficult to energize — and we've managed to get continuous ultraviolet laser activity for the first time."

—Stephen Rand, University of Michigan, UPI Science News, March 3, 2002

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"There's no doubt in my mind that superpositions are real. This is one of the essential properties of matter."

—Anton Zeilinger, University of Vienna, on quantum weirdness, New Scientist, March 9, 2002

✶✶✶

"I didn't realize when I woke up this morning this was my day."

—Eric Cornell, NIST Boulder, when the state of Colorado named a day after him and fellow Nobelist Carl Wieman, Denver Post, March 7, 2002

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"I would have never guessed that 75 years after Scopes I would still have to be doing this. Instead of actually having to ask about improving science education, we have to head off things that would make it worse."

—Lawrence Krauss, Case Western Reserve University, on his testimony against the adoption of 'intelligent design' as part of the science curriculum in Ohio, Newsday (NY), March 11, 2002

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"The time left for me on earth is limited. And the creation question is so formidable that I can hardly hope to answer it in the time left to me. But each Tuesday and Thursday I will put down the best response that I can, imagining that I am under torture."

—John Archibald Wheeler, on trying to unravel the mysteries of nature at age 90, New York Times, March 12, 2002

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"It's one of the ways I simplify my life. I don't want to be plugged in all the time. I don't use a cell phone either. I think that having private space where a person can hear his own thoughts and have silences and time for contemplation is extremely important. The modern world in which we're plugged in all the time makes it harder and harder to have those private spaces. Refusing to use e-mail is just one small way in which I've attempted to create more private space for myself."

—Alan Lightman, MIT, on why he doesn't use e-mail, The Daily Cardinal (U. of Wisconsin), March 12, 2002

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"Even if you don't buy anything I said about the impact and potential for discovery, and the fact we may come up with something that can transform the way we live, even if you say that is a load of hokum, I think you should be extremely excited about this."

—Howard Burton, Waterloo, Ontario, on the founding of the Perimeter Institute, Kitchener- Waterloo Record, March 14, 2002

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"The students are smart. They're following the money."

—Vern Ehlers (R-MI), on why degrees in the life sciences have doubled while those in engineering have declined, Washington Internet Daily, March 14, 2002

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"If the pitcher's mound was level with home plate, it would be harder for the pitcher to throw consistent strikes. Players intuitively know how to take into account gravity."

—Alan Nathan, University of Illinois, Washington Times, March 14, 2002

✶✶✶

"The U.S. has conventional military forces that dwarf those of all possible adversaries combined. If the U.S. plans to resort to nuclear weapons to fight far weaker opponents, what does that tell those who do not yet have nuclear weapons?"

—Kurt Gottfried, Cornell University, on plans by the Bush Administration to expand the role of nuclear weapons, US Newswire, March 13, 2002

✶✶✶

"If you tell me there's a warhead in New York, it's just hopeless. You just hope you never get to the point where you have to track down one of these in a city."

—Steven Fetter, University of Maryland, on the difficulty of detect-

See *MEDIA* on page 6

This Month in Physics History

May 24, 1844: Morse and the Telegraph

Sometimes technological innovation can come from the most unlikely sources. Samuel Finley Breese Morse was born in Charlestown, Massachusetts in 1791, the son of a local pastor. He was not trained as a scientist, but rather was a professional artist. Although largely an indifferent student, his interest was piqued by the then newly-developing subject of electricity. After graduating from Yale in 1810, he lived in England, studying art, exhibiting his work at the Royal Academy in 1813 and spending roughly 10 years as an itinerant artist specializing in portraiture, unaware that his passing interest in electromagnetism would eventually revolutionize global communication.

The electric telegraph makes use of the relationship between magnetism and electricity. During the early 1790s, the Italian scientist Alessandro Volta invented an electrochemical cell that made a steady source of electric current available. In 1820, the Danish physicist Hans Christian Oersted discovered that an electric current will cause a magnetized needle to move. This principle is the basis of the telegraph, in which a current is varied systematically according to a code. [As a telegraph key is moved up and down, it makes or breaks an electric circuit and transmits a signal as a series of electric pulses.] In 1825 the British electrician William Sturgeon invented the electromagnet, and physicists William F. Cooke and Charles Wheatstone, working together in Great Britain, used this discovery to develop a rudimentary telegraph in 1837.

In 1832, while returning to the U.S. on the ship Sully from another period of art study in Europe, Morse overheard a conversation about the newly discovered electromagnet and conceived his own version of an electric telegraph, which ultimately proved to be more successful than the British version for a number of reasons, most notably its simple operation and relatively low cost, and eventually was adopted as the standard technique. Morse created his first model telegraph in 1835 and spent the next several years perfecting his invention with two colleagues, Alfred Vail and Leonard Gale. His electromagnetic machine worked by clicking dashes and dots to create or break current between the machine's battery and receiver. By 1843 he received government funding for his invention and constructed a mini-telegraph system along a railroad line between Washington, DC, and Baltimore, MD. On May 24, 1844, the first telegraph message was transmitted: "What hath God wrought!"

Morse is also credited with the development of the International Morse Code, a system of dots and dashes that can be used to send messages by a flash lamp, telegraph key, or other rhythmic device. The most famous Morse Code signal signifies distress: dot dot dot dash dash dash dot dot dot (SOS). While wire telegraphs were long ago replaced by new technologies, Morse Code is still used by professionals and amateurs alike in radio telegraphy.

By 1869, the first telegraph connected the East and West Coasts, and by the decade's end, the Associated Press began operations, transmitting news throughout the world. Outside newspaper offices in major cities around the country, crowds would gather to hear World Series scores and election results transmitted by telegraph. In the early 1900s, thousands of Western Union Telegraph Company offices sprung up in both small and large towns, connecting an ever-expanding frontier of the U.S. The telegraph became the world's primary communications tool — one that not only linked cities and nations together, but a medium that connected loved ones separated by distance.

The telegraph also played a pivotal role in military operations, first used at Varna during the Crimean War in 1854. It was widely used in the American Civil War, where rapid deployment techniques for land-lines were developed, and Abraham Lincoln became the first president to direct armies in the field from the White House. [Prior to this, presidents would wait days and sometimes weeks for news from the battlefields of distant wars.] Newspaper correspondents first used telegraphy during the Spanish American War in 1898. The first military use for radio telegraphy was during the Russo-Japanese War in 1904-05.

After a bitter legal battle with Vail that culminated in the U.S. Supreme Court, Morse's patent finally became official in 1854. Today, that first telegraph is housed in the Smithsonian Institute's National Museum of American History in Washington, DC. But Morse's contributions to society extend beyond the telegraph. He formed the National Academy of Design in New York City to promote American art appreciation, serving as its first president for almost 20 years. He also gave generously to educational causes, helped found Vassar College, and twice ran for mayor of the city, unsuccessfully. He died in New York City on April 2, 1872, at the age of 81.

Further Reading:

Mabee: The American Leonardo, Samuel F.B. Morse (1943)

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Editor ..... Alan Chodos
Associate Editor ..... Jennifer Ouellette
Special Publications Manager ..... Elizabeth Buchan-Higgins
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Proofreaders ..... Ken Cole, Edward Lee and Sue Otwell

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MEETING HIGHLIGHTS, *from page 1*

magnetic radiation corresponding to far-infrared light. Terahertz radiation is transparent to many packaging materials, making it attractive for product inspection, quality control, and detection of explosives, including plastic ones. It's very sensitive to water, making it useful for environmental monitoring. It also can produce images with details smaller than a millimeter.

Daniel Mittleman of Rice University kicked off a Wednesday focus session on terahertz technology, followed by Irfan Siddiqi of Yale, who discussed experimental results on a device for "terahertz astronomy," which would make astronomical observations in the far-infrared region, where optical and radio astronomy techniques often falter. THz astronomy is especially promising for watching the birth of stars in molecular clouds

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Helium in Aerogel

Douglas Osheroff of Stanford garnered a Nobel Prize for observing how helium-3 becomes superfluid at a temperature of .0027 K. Since then scientists have sought to understand the mysteries of liquid He-3, which exists in not one but three superfluid phases, which have different magnetic and mechanical properties.

One approach is to insert liquid helium into aerogel, that airy material hardly denser than air. The microscopic filaments of aerogel are supposed to act like one-dimensional impurities (rather than the usual point defects), and this acts to disrupt the process by which He-3 atoms pair up in the act of becoming superfluid. On Thursday, Osheroff reported the first observation of a transition between the A and B phases of liquid helium-3 in aerogel.

Slime Propulsion

Many types of bacteria get around by gliding across surfaces. Hair-like structures called pili propel the microorganisms when they travel in groups during herd-like migrations known in the field as social or s-type motility. The mechanism that bacteria use when they venture out alone (adventurous, or A-type, motility), however, has long been a mystery.

Charles Wolgemuth (University of California at Berkeley) and coworkers think they have identified the vehicle that facilitates a bacterial walkabout—slime. Wolgemuth presented a slime propulsion model and experimental evidence for the unsavory conveyance in a Tuesday session.

Vive La Différence

Sex, it seems, has both advantages and disadvantages. Ayse Erzan of the Istanbul Technical University has modeled some of the issues facing single-celled organisms that reproduce either through sexual pairing or through asexual division, and found clues that indicate why sex gives many organisms an evolutionary upper hand.

Ezran's talk was one of a dozen in a Thursday session dedicated to the dynamics of evolution. Later in the session, Graeme Ackland (University of Edinburgh) and Michael Clark (Institute of Terrestrial Ecology, Scotland) painted a picture of a world covered in flowers as they discuss the thermodynamics of an evolving system as it applies to Lovelock's "daisyworld"— a hypothetical two-dimensional world consisting of an infinite plain of daisies.

The mechanisms that help clawed frogs detect their prey, optimal wiring in the cortex, and the molecular evolution of a genetic switch were just a few of the other subjects competing for attention in the session.

The Whip

Vigorously twirling the plastic tube is James Watson, of Ball State University, who with his wife Nancy led a workshop on the physics of toys at the High School Physics Teachers' Day held in Indianapolis as part of the March meeting. Each participant in this workshop received one of these tubes and about thirty other inexpensive toys that students can use for informal physics learning.

The Computer Never Forgets

When you turn off an ordinary computer, its RAM (random access memory) is lost. On Thursday, Jimmy Zhu of Carnegie Mellon University described a new memory technology, called magnetoresistive random access memory (MRAM), which is nonvolatile: its memory is retained even after the computer is shut down. Whereas traditional RAM uses electric charge to store 0s and 1s of data, MRAM exploits the magnetic properties of electrons in the device. MRAM stores data by taking advantage of the fact that electrons act like tiny bar magnets in the presence of an magnetic field: 0 can represent the bar magnet when it is aligned with a field and 1 when it is opposite the direction of the field.

MRAMs have many attractive features, yet a major drawback has been their relatively large power consumption: in traditional MRAM designs, less than 1% of the power is used to write the 0s and 1s of data, while over 99% of the power is wasted in delivering the electric current for writing the data.

Zhu's novel memory device design consumes significantly less power and is much more stable than previous designs. Such a design may bode well for miniaturizing this technology to the nanometer dimensions necessary for many commercial applications.

Phillip F. Schewe, Benjamin P. Stein and James Riordan of AIP and David Harris of APS contributed to the coverage of March Meeting sessions in this issue.

Workshop Seeks New Ways to Prepare Students for the Job Market

The APS Committee on Professional Development spearheaded a special half-day workshop just prior to the APS March Meeting in Indianapolis, entitled "Careers in Industry: Preparing Your Students." The workshop was organized to help department chairs and APS Career and Professional Development Liaisons grapple with how to better prepare their students to compete in today's job market.

The academic job market for Ph.D. physicists is the strongest it has been in a decade, with an estimated 500 tenure and tenure track openings per year, according to Roman Czujko of AIP's Education and Employment Statistics Division, who presented some of the latest findings, to be featured in an upcoming report. However, he cautioned that not all such positions are filled, and that academia hires from all sectors, including industry and government laboratories, not just recent PhDs. He also reported that while Ph.D. production went down 4% in 2000 and is expected to decline through 2003, the number of graduate students admitted is slowly starting to rise, and the production of BS degrees in physics went up 4% in 2000.

Educational consultant Sheila Tobias discussed innovations in science education, most notably the Sloan Foundation's pilot program for the development of professional master's degrees programs at U.S. universities [see APS NEWS, January 2002]. Such an approach views degrees as launch pads for a wide variety of careers, but most science and math majors don't realize this. The fledgling programs feature new applications of classical subjects, such as financial mathematics or biotechnology, connected to local industry, with interdisciplinary courses and a required internship for hands-on training. According to Tobias, such programs can be new sources of research funding for university professors, since more funding may come from the private sector in the future.

One often overlooked area for job opportunities is medical physics, according to Charles W. Coffey, professor and chief clinical physicist at Vanderbilt University Medical Center and immediate past president of the American Association of Physicists in Medicine (AAPM). There are currently 3000 practicing medical physicists in the U.S., usually specializing in radiotherapy physics, diagnostic physics, or medical radiation safety physics, which are the prevailing hot topics in this field. There are two pathways to entering the field — getting an MS and a Ph.D. in medical physics from a suitably accredited program, or getting an MS or Ph.D. in physics followed by a medical physics residency — and the AAPM has recently established a mentoring program to foster student interest in such a career.

The final speaker was Ed Esposito, formerly of Alcatel, now a professor at the University of Texas at Dallas, who addressed how industrial physicists are managing their jobs in these uncertain times. He believes that the despite the economic downturn, "The high-tech revolution is here to stay," with unabated increases in the overall growth and evolution of the high-tech marketplace. Likewise, R&D funding will be increasingly market driven. While physics remains at the core of the industry, physicists themselves are perceived to be at the periphery of the talent pool, even as the boundaries between physics and traditional engineering disciplines becomes fuzzier. Esposito suggested maximizing one's exposure to industry prior to graduation through internships, etc., to learn

See **JOB MARKET** *on page 4*

Online Resources

Sloan Science Master's Outreach Program: www.ScienceMasters.com
American Association of Physicists in Medicine: www.aapm.org
***The Industrial Physicist* magazine:** www.tipmagazine.org
Science's Next Wave: www.aps.org/memdir/nextwave.shtml
AIP Statistical Research Center: www.aip.org/statistics
Career & Professional Development Liaison Website: www.aps.org/jobs/cpdl
Industrial and Applied Speakers Lists: www.aps.org/FIAP/speakers.html
Women and Minority Speakers Lists:
www.aps.org/educ/women-speaker.html www.aps.org/educ/minority-speaker.html
APS Technical Network: www.aps.org/TN

FERMI SEA, *from page 1*

havior is still a mystery.

Ketterle reported findings in three areas. First, he has used a sodium-23 BEC to help cool a gas of lithium-6, a fermionic atom. The Pauli-exclusion principle forbids such atoms from falling into the single state available to bosonic atoms such as Na-23, but the Li-6 atoms can, if cooled low enough, occupy all the lowest energy quantum states possible.

This has now been done in the MIT experiment, the first time such a "degenerate Fermi sea" has coexisted with a large BEC. One wants to see how such a fermi gas behaves at nK temperatures and whether the atoms can be coaxed (by manipulating the interaction between them) into forming Cooper pairs, becoming thereby a superfluid.

Ketterle also reported the propagation of a condensate in a magnetic waveguide. First, his group made a large (2 million atoms) BEC, then loaded it into a magnetic trap, and finally loaded it into a microtrap on a printed circuit board.

The micro-journey around the chip was partly smooth and partly bumpy, especially when the cigar-shaped BEC came toward a Y divide. At the divide the condensate wiggled itself into a snake shape. Close to the chip surface, the condensate broke up into several detached segments. Future atom chips will need better control of surface roughness.

Another goal is the generation of pair correlated atoms. Ironically, the atoms in a condensate all share a single quantum state but are not otherwise entangled.

The MIT researchers have created two BEC blobs (let us call them 1 and 2) together with another small "seed" condensate (blob 3). The elastic collision of these blobs produced a fourth blob in a process called four-wave mixing.

In effect, the atoms in blobs 1 and 2 help to amplify blob 3 (a gain of 20, in this case). For each atom added to blob 3, one atom is put into blob 4. This creates two pair-correlated atomic beams.

In some future experiment this pair correlation might be verified directly if one could detect single atoms in the two condensates, which are moving off in opposite directions.

Right now it is difficult to spot single neutral atoms in a BEC. Single-atom detection is likely in helium BECs since the atoms, deliberately put into an excited state in order to confine and cool them in the first place, are easily ionized, making it far easier to detect them.

Chris Westbrook, a member of Alain Aspect's team at Orsay, summarized recent helium work and described a scheme for producing helium molecules within a BEC.

This, he said, might allow an atom-wave equivalent to the current process of down-conversion, by which UV photons can be converted, in a special crystal, into a pair of lower-energy but entangled photons; if one photon has a horizontal polarization, the other must have a vertical polarization. A beam of related atoms could, analogously, be sundered into beams of pair-correlated atoms.

LETTERS

First authorship does not determine real leader

It is curious how long the controversy over C.-S. Wu's role in that famous experiment on parity violation has persisted (APS News, December 2001 and February 2002). I recall hearing a long time ago that when the experiment was over and the paper completed, the team was to decide who would be first author. After an embarrassingly long silence somebody suggested that it should be the only lady on the team – Mme Wu. Nobody objected, and the paper appeared with her name first.

This case, important for the history of physics as it might be, revives the question of the order of authors on a joint paper. When I was doing my Ph.D. at University College London, my supervisor, Mike Seaton, told me that his rule was to put the authors in alphabetical order, except when it was the first paper of one of the authors (in order to encourage the beginner). I have been applying this rule throughout my career and it works very well.

In every joint research project there is a principal collaborator who conducts the work on the subject. Under most circumstances this rule does not do injustice to the real leader. As Cervantes' count said to his peasant guest of honor, he (the count) will chair the table wherever he may be sitting.

Petar Grujic,
Belgrade, Yugoslavia

Book may redefine what's rational

In his Viewpoint in the February APS News, Pakistani physicist Pervez Hoodbhoy advises that the interests of the United States lie in "rationally dealing with complaints against its international behavior." Would I be the only one who reads this as an attack on US support of Israel, in view of the steady stream of anti-Semitic propaganda from this part of the world? I invite Professor Hoodbhoy to read the book "From Time Immemorial" by Joan Peters, to get a different slant on what he conceives to be rational.

Elmer Eisner,
Houston, Texas

PARIS WORKSHOP, *from page 1*

Germany. "I returned home with a lot of new energy!" Delegates plan to distribute the conference resolutions to physical societies and government agencies within their own countries and form strong networks to stay in touch with each other. As a result of the conference the European Physical Society has already voted to start a working group on women in physics, as have both the Japanese Physical Society and the Japanese Society of Applied Physics.

Prior to the conference, the IUPAP Working Group teamed with AIP's Statistical Research Center to complete an international study of women in physics, collecting demographic information from more than 900 women in 65 countries, including education and employment histories and individual experiences and concerns. "We were looking for critical moments that have either helped or hindered a woman's career," says Roman Czujko, who heads the Center. Results from this study will also be available at the conference website listed above.

JOB MARKET, *from page 3*

what skills companies seek, which include a broad, interdisciplinary knowledge base; good communications and interpersonal skills; versatility and adaptability; and often, personal mobility.

The talks were followed by a panel discussion moderated by the NSF's Rajinder Khosla. The panelists noted that there is currently not enough mentoring taking place to prepare physics students for careers in industry. Several pointed out that universities can mentor simply by bringing industry speakers in for special colloquia, which would help expose students to alternative career opportunities.

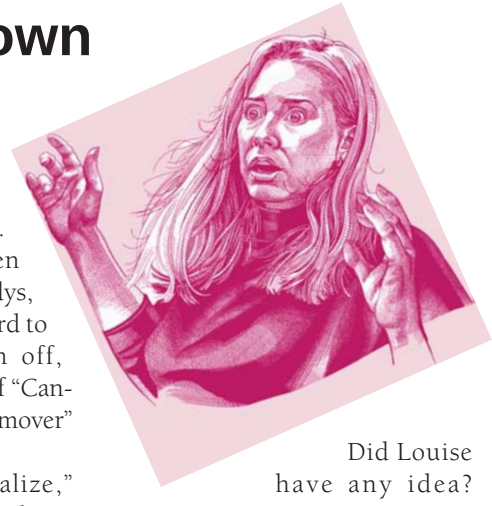
Sunday's program concluded with a luncheon keynote address by Venky Narayanamurti, dean of Harvard University's Division of Engineering and Applied Sciences, who has had a varied career in industry, government and academia.

zero gravity

The Lighter Side of Science

Table-top fusion controversy heats up In small Massachusetts town

By Martin Bridge



In a startling development in the world of tabletop fusion, a controversial experiment at Oak Ridge National Laboratory appears to have been confirmed at a beauty parlor in Swampscott, Massachusetts. *(The Oak Ridge experiment, reported in the March 8 issue of Science, claimed to achieve fusion in a beaker of deuterated acetone. Bubbles were created in the acetone by a pulsed neutron beam, and these bubbles were made to expand and then collapse catastrophically by applying an intense sound wave to the liquid.)*

Patrons of Gladys's Hair and Nail Salon on Main Street in Swampscott were atwitter to discover that their everyday establishment had been catapulted into the forefront of cutting-edge scientific research.

"You'd think we'd found the Higgs Boson or something," said Emily McTavish, who has been having her hair done at Gladys's every other Wednesday as long as anyone can remember. "This tabletop fusion stuff just seems to send the press completely off the deep end." And indeed, hordes of media, their notebooks and cameras ready, could be seen prowling through every inch of the small salon with its four vinyl-covered chairs, old fashioned hair dryers, and small waiting area strewn with out-of-date *Readers' Digest* and *Woman's Day* magazines.

Rodney Colquist, a physics teacher at Swampscott Community College, was the one who discovered what was going on when his wife, Samantha, came home after her appointment at Gladys's in a frenzy of excitement and disbelief. She had sat down in the number-one chair, and confided to Gladys that she wanted to change the color of her nails from deep red to bright pink. Samantha's nails had been deep red for years, so Gladys, figuring that it might be hard to get the layers of polish off, brought out a new brand of "Can-do heavy-duty nail polish remover" imported from Canada.

"Little did Gladys realize," Colquist explained, his eyes dancing in appreciation of the irony of the situation, "that heavy-duty meant made with heavy water that had been left over from filling the vessel of one of Canada's nuclear reactors. The stuff was almost pure deuterated acetone."

Gladys carefully removed Samantha's watch from her wrist, and dipped the fingers of her left hand into the bath of polish remover.

Colquist explained that Samantha's watch was an heirloom, handed down from her mother, with an old-fashioned radioactive dial that glows in the dark. "The numbers had been getting dim, so I took it down to the lab to repaint them just last week," he said. "I must have used some pretty powerful paint, because, even though it was a few inches away, that watch was irradiating the acetone and creating lots of tiny bubbles inside the liquid."

Then Gladys started telling Samantha the latest gossip about how old man McGillicuddy had left his wife of 51 years and run off with a young waitress from Marblehead that he'd met on a fishing trip the month before.

Samantha could not contain her surprise.

"Hooo-EEE!

Did Louise have any idea?

Hooo-EEEE!"

Gladys was just about to tell Samantha that Louise McGillicuddy was actually glad to be rid of the old weasel at last, when she noticed a strange expression on Samantha's face.

"Gladys," Samantha said, her voice a hoarse whisper. "Something weird is going on. When I screamed just now, this polish remover heated up a good ten degrees. And when I screamed again, it got really hot!"

Gladys dipped her own hand into the liquid. It still felt warm.

"Go ahead," she said, "do it again."

"Yeee-HAW!"

Samantha screamed with all her might. Heads turned clear down to Roy's Bait and Tackle Shop two blocks away. Both women hastily pulled their hands away as the polish remover started to boil.

Asked what he planned to do next, Colquist said he had originally thought of reporting the results in a paper for *Physical Review Letters*.

"*PRL* is a journal that physicists really respect," he said. "But then I thought the better of it. Why risk getting the paper rejected by the referee? I decided to submit it to *Science Magazine*."

Princeton Meeting Honors Wheeler's Contributions to Physics

"Science and Ultimate Reality," a meeting about forefront theoretical and experimental physics, was held at Princeton, 15-18 March, in honor of John Wheeler's 90th birthday and his many contributions to quantum mechanics, cosmology, and information science.

The Princeton meeting served up an impressive menu of hot topics and notable speakers, including the subject of decoherence, the process by which a quantum system converts to a classical system by subtle but often swift interactions with the surrounding environment; the many-worlds interpretation of quantum mechanics, according to which a quantum system does not suffer a "collapse of probability", but the universe itself continues to bifurcate into multiple versions corresponding to the many possible histories available to the quantum system as it moves through spacetime; and the entanglement of ions in an atom trap for the purpose of forming logic gates for a future quantum computer.

At the heart of the meeting was the keynote speech by the always interesting Anton Zeilinger (Vienna), who paid tribute to John Wheeler's many physics insights. One of those ideas was a proposal for a "delayed choice" experiment in which the dissipation of wave-like interference effects brought about by the experimenter's efforts to determine which of several possible paths a particle took in going toward a detector might be avoided by delaying the observation of the path until the particle (or wave) had made its mark. Zeilinger has carried out just such an experiment with entangled photons in a setup he referred to as a "Heisenberg microscope."

Several speakers addressed the persistent problem of bringing quantum mechanics and general relativity into a single framework. Prominent issues here include the fate of information supposedly lost inside black holes; comparisons of string theory with the rival quantum loop gravity theory, which holds that space is not a mere platform for interactions but is itself a sort of dynamical thing; how gravity behaves in extra dimensions; and the effort to detect gravity waves.

One purpose of the meeting was to promote freewheeling debate on all of the above issues, including the role of human consciousness in the measurement process. Young scientists were especially encouraged to engage in this debate, for which scholarships were given for attending the meeting. In fact, a Young Researchers Competition was held for papers on quantum reality. The joint winners, from among 64 entries, were Raphael Bousso from UC Santa Barbara and Fotini Markopoulou-Kalamara from the University of Waterloo in Canada.

—Phillip F. Schewe

Viewpoints...

A Climate Change Policy For America

By J.C. Watts, Jr.

Farmers in Elk City, Oklahoma woke up this morning to the tough job of nurturing their wheat crop through another month of drought. As a Member of Congress from Oklahoma, I can tell you those farmers will not complain. They will do their job. And so will I. I will work to ensure those farmers are best served by the federal research programs on climate change. But the current program is failing the farmers of Elk City.

Oklahoma suffers our share of extreme weather events. Drought isn't the only plight; the last five years have seen a record number of tornadoes wreak havoc. But my state isn't unique. The rest of the country also faces disastrous weather events. In fact, while the nation's center has been struggling through drought, some of the East Coast has endured record floods. Last summer, the citizens of Grundy, Virginia saw the Levisa River roar down their main street.

As the nation struggles to cope with these weather cataclysms, the federal Global Change Research Program has focused on calculating if increasing carbon dioxide in the atmosphere will cause more extreme weather events 100 years from now. That work is important. But, my congressional colleagues and I share a common concern: without greater

resiliency, some of our towns won't last 100 more years.

As important as it is to refine long-term computer predictions, it will not stem the floods in Grundy or make the crops more drought resistant in Elk City. These towns need better methods to be more resilient to extreme weather.

They need the federal government to help them assess their vulnerability to extreme weather events. Then, they need options that minimize the threat to life and property, improve their resilience to, and reduce the economic impacts of, extreme weather events — regardless of their cause.

The federal Global Change Research Program seeks to understand long-term climate change, and the extent to which human activities contribute to these changes, but federal programs must also begin researching strategies that can immediately help Elk City, Grundy and thousands of other vulnerable towns scattered across the country deal with extreme weather.

Call it a "no regrets" strategy. It is a strategy that best serves America. It is a climate policy that can be enacted right now, in absence of a scientific agreement on the magnitude and extent of the impact on the climate of increasing carbon dioxide in the atmosphere. And, it is a policy that recognizes that many things can contribute to a community's vulnerability, including changing demographics and shifts in the nation's wealth distribution.

I fully support our nation's scientific effort that seeks to understand the effect of increasing carbon dioxide on the future climate. That work will continue. In fact, President Bush has been using the results of that research to develop his recently announced policy of carbon reduction. His policy has carefully considered the scientific findings as well as our nation's economic interests. As the scientific predictions become more precise, the president will advance the policy appropriately.

I challenge our best scientists to turn some of their attention to shorter-term climate and weather variations and produce the kind of assessments and resiliency research that can help the farmers in Elk City and town planners in Grundy.

I plan to introduce legislation in the House of Representatives that would create an Office of Vulnerability and Resilience Research that would coordinate vulnerability research across the U.S. Global Change Research Program. The office will assess those regions of the U.S. that are the most vulnerable to climate change and climate variability. And it will fund scientific research that will lead to greater resiliency.

The office will be charged with examining:

- severe weather events;
- annual and interannual climate events, such as the El Nino Southern Oscillation;
- sea level rise and shifts in the hydrological cycle;
- natural hazards, including tsunami, drought, flood and fire; and
- alteration of ecological communities.

As a result of this program, I foresee a stronger partnership between scientists at the cutting edge of climate research and city planners who are on the front lines of the battle with nature's violent side.

Unfortunately, the citizens of Grundy couldn't wait for the results of this program. The rising waters have forced them to make a quicker decision. Lacking other options, the town decided to blast the top of a mountain off on the other side of the Levisa River. When that new space is cleared they will pack up every home, shop and stop light and move across the river.

The citizens of our nation's most vulnerable communities must have more options than simply packing up and moving. When this program is established and some of the nation's best scientists are working to provide solutions to local planners, our country will be better served. When people know what to expect, I know that they will make the right choices for themselves and their children. While we must continue to anticipate and solve the challenges of tomorrow, let's get to work on the problems of today.

Rep. J.C. Watts, Jr. (R-Oklahoma) is chairman of the House Republican Conference.

Public Relations for Physics Departments: Convincing the Community that Quarks are Cool

The Fundamentals of Launching a PR Program

By Alaina G. Levine

A strong public relations program can be of great importance to a physics department. Not only can effective PR improve the reputation of an individual department, but it can also serve the greater physics community by convincing the public that quarks, quantum dots, and nanostructures are cool. Building a solid reputation with the many constituents that a physics department serves can lead to greater media exposure, improved quality of student applicants, community and industrial partnerships, and even financial support.

It isn't difficult to create a strategic public relations program for your department, but it does take planning and commitment of resources. But before you begin to implement PR tactics such as a newsletter, an alumni relations program, public outreach, or an external board of advisors, there are some fundamentals of public relations that must be understood and remembered.

1) Establish the goals of your PR program: Don't enter into the PR game haphazardly. You must identify what your goals are before you begin to think about what tactics to take. Some of your goals might be to inform the publics (the plural is intentional and I will get to that shortly) about your department, bolster the department's reputation in the local community as well as the wider physics and national community, encourage an interest in and support of physics, and promote an understanding of the role physics plays in society. Your PR goals might mirror or act as an extension of the larger goals of your department, but they will not be the same as your wider mission.

2) Identify, remember, and build relationships with your publics: Whom does your department serve? Certainly you have internal constituents such as faculty, students, staff. But what about your alumni? And prospective students? How about parents, teachers, K-12 kids, and government and industrial representatives and organizations? And of course, one cannot forget the general public, nor the greater physics and scientific community. In designing a public relations program, it is absolutely necessary to remember whom you are targeting your PR strategy towards. Identify whom you want to receive the message you are delivering and this will give you the much-needed focus that you strategy deserves.

Great PR is all about building strong relationships with your publics. Once you identify whom your department serves, you can cultivate those relationships to achieve your PR goals.

3) Build your brand: One doesn't often equate a brand with a physics department, but it can be one of the most important tools you have in your public relations toolbox. A brand is a promise: people rely on a brand because they know that that the service or product that the brand represents will consistently deliver something to them. For example, Starbucks Coffee is an example of a successful brand. I know and you know that if we go into any Starbucks Coffee anywhere in the world, we will get the same Starbucks coffee as at the one down the street from us. Their brand is the promise to deliver the same coffee everywhere and their reputation (and success as a company) depends on this promise.

A physics department also needs to build its brand in order to create public support and interest. The most basic promise of a physics department to its publics is to provide excellence in teaching, research, and outreach, but of course there can and should be more to it. By building your brand with your constituents, you can greatly add to the successful and strategic growth of you department.

4) Any public interaction makes you a representative of science: Physics Department PR holds a lot of power. Every time your department is represented in public, either via a newspaper article about your research, or an outreach program for the general public, you not only represent your own department, but you represent all of physics, all physicists, and even all of science and scientists as well. You have the ability to bolster support, both financial and nonfinancial, for your department in addition to the wider scientific community because for much of the public your interaction with them is their first and only taste of science. Always keep this in mind when you execute any PR campaign.

These fundamentals are meant as a guide for you as you decide what PR tactics to take to achieve not only your PR goals, but also the larger goals and even the mission of your physics department. Public relations should not be looked upon as a burden for you and your staff and faculty to undertake, but rather as an essential and extremely effective instrument in your quest for departmental advancement and growth.

In future columns, I will describe how to create and implement PR tactics such a media relations program and an external advisory board.

Alaina G. Levine, the former Communications Director for the University of Arizona Physics Department, currently oversees public, media, and industrial relations for the UA College of Science and its 14 departments. A confessed physics aficionado and former SPS officer, she can be contacted at alaina@u.arizona.edu or 520-621-3374.

Researchers Present New Physics-Based Medical Imaging Techniques

Medicine has long drawn on physics-based techniques for a variety of imaging, measurement and testing applications. Several researchers described the latest developments in this area at the 2002 APS March Meeting in Indianapolis.

Micro-tesla MRI was reported by Robert McDermott, a member of John Clarke's group at UC Berkeley. The principle behind MRI is nuclear magnetic resonance (NMR), a process in which a magnetic field is used to orient atomic nuclei in space while a burst of radio waves explores the nuclear energy levels by charting the frequencies at which energy is absorbed resonantly.

In addition to establishing chemical identity, NMR can also be turned into an imaging method by carefully watching the timing and the location of the re-emitted radio waves.

A tumor, say, will have a slightly different water density from surrounding healthy tissue. Computer processing and contrast enhancement will disclose the tumor's position to a trained observer. Generally large magnets are required to produce sharp NMR images, and the development of a low-field version would benefit medical and scientific studies.

Mark Haacke of the MRI Institute for Biomedical Imaging in St. Louis discussed a new MRI technique called susceptibility weighted imaging (SWI). The technique measures differences among brain tissue in its magnetic susceptibility, essentially its magnetic response to the applied magnetic field of the MRI machine. Yielding unique information from veins and blood products, SWI has already provided more sharply detailed MRI images of blood vessels in the brain than previously possible and the presence of small hemorrhages in heretofore unavailable detail.

SWI can potentially detect angiogenesis, the growth of blood vessels caused by cancer, and may improve diagnosis of Parkinson's and Alzheimer's diseases, through its ability to monitor iron deposits in the brain.

Electrical measurements of individual living cells can provide powerful information without the use of optical techniques, which often require labeling the molecules of interest with fluorescent markers. Cells are not the clean, compartmentalized units depicted in high-school biology textbooks, but rather complex networks of interacting molecules which require new tools to be studied in living detail.

Proteins in particular are of great interest because they are the molecules that perform the most reactions in the cell, from metabolism to DNA replication. But while whole-genome technologies such as DNA microarrays can monitor quantitatively the relative abundances of all the mRNA species within a cell, they cannot take inventory of a cell's content's *in vivo*.

Towards these ends, Lydia Sohn of Princeton University described several electrical biosensors at the APS meeting, including one that can measure the amount of DNA in single living cells. Passing through a small fluid chamber in between two metal electrodes, a cell changes the electrodes' capacitance in a way that is directly proportional to the amount of the cell's DNA (which carries a negative charge). This technique can potentially identify the stage of a cell's development and also distinguish cancerous cells from normal ones.

Omar Saleh, part of Sohn's group at Princeton, also presented an artificial pore, a microchip device that can determine the size of a tiny object (such as a cell) by detecting changes in electric current as the object passes through a tiny opening, or pore in a fluid chamber containing a pair of electrodes.

The ultimate goal of Sohn's lab is to be able to take inventory of a living cell's protein contents, something that cannot be done with current protein assay techniques, which require the lysing (destruction) of cells. Ideally, they would like to "watch" the proteins "interplay" with one another in the so-called protein network.

Despite its name, the AFM (Atomic Force Microscope) does not produce atomic-resolution images of proteins or other large molecules. To extract more detailed information from AFM images of macromolecules, one can directly subtract the effects of the tip but the results are often inaccurate.

Steven Eppell and Brian Todd of Case Western Reserve University presented a new technique for obtaining submolecular information about proteins. Investigating aggrecan, a cartilage protein important in osteoarthritis, the researchers used a technique that combined AFM with genome information and transmission electron microscopy data.

All of the data were integrated by using a sophisticated image processing technique to provide a best guess at the 3D structure. The resulting refined structure yielded new information on the molecule, showing distinct locations of kinks as well as regions of mechanical flexibility.

The researchers hope to combine their results with AFM-measured force fields around cartilage proteins to link the biological and mechanical properties of cartilage with its molecular structure. This approach has the potential to provide information on molecular-scale mechanisms for arthritis and lead to intelligent drug design and other interventions to prevent or alleviate the disease.

SURVIVAL SKILLS, *from page 1*

uted in all levels from senior faculties to graduate and undergraduate students, attended the workshop.

Four highly respected women from the physics community gave invited talks in the first part and served as the panelists in the second part. Mildred Dresselhaus of MIT, Kristl Hathaway of ONR, Barbara Jones of IBM Almaden, and Beverly Hartline of ANL addressed a variety of issues such as establishing scientific identity and developing a successful career in research, finding funding for research programs, balancing family and career, and advancing professionally to achieve ambitions. The second part featured a professional trainer, Sandy Shullman of Executive Development Group, who led a lively discussion on leadership and gender issues in scientific settings. Both the panelists and the participants were actively involved by drawing from their personal experiences.

APS President-elect Myriam Sarachik chats with Tineke Thio of the NEC Research Institute at the reception following the survival skills workshop.

As the percentage of women Bachelors and PhDs in physics has slowly increases to 21% and 13% respectively (American Institute of Physics data for the year 2000), women still disproportionately leave physics at all levels, which is often referred to as the "leaky pipeline" issue. As a result, the percentage of women physics faculty at Ph.D. granting institutions remains in single digits, according to Dresselhaus. While the reasons for the leaky pipeline are complicated and deserve further discussion, the isolation experienced by many women physicists can hinder their career development. As their male counterparts learn the rules of the game from informal mentoring and networking with other male colleagues, women often find it harder to find the same information, or to find a role model to follow.

After the workshop, most of the speakers and participants continued their discussions at the CSWP/COM joint reception. The responses to the workshop were overwhelmingly favorable and enthusiastic. From the evaluation forms filled by the participants, 80% of them found it "extremely helpful" and about 20% found it "might be useful someday". Nobody responded that they thought it was "of little or no value." Some described the workshop as "exceptionally relevant and useful" and praised the choice of "excellent speakers." Another commented that "it was useful to all groups" from students to senior faculty members.

The participants said that they took away information that will be of great value as they continue in their careers, and they are eager to recommend the workshop to the others. They also suggested increasing the discussion time, which will be incorporated into the future programs. To benefit the broader community, CSWP will put the talks onto their web site.

Due to the success of this first workshop and the strong demand for future ones, CSWP has decided to continue them in coming years, alternating between the March and April Meetings, as part of the CSWP regular program. The next one is scheduled for the 2003 April meeting. Anyone interested in making suggestions on topics and speakers, or volunteer to speak, please contact Cynthia Keppel of Hampton University at keppel@jlab.org or Dongqi Li of Argonne National Lab at dongqi@anl.gov.

MEDIA, *from page 2*

ing nuclear weapons, New York Times, March 18, 2002

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"For gravity there's only attraction, so there's no way of constructing a Faraday cage for gravity."

—Raymond Chiao, Berkeley, on his plans to make a table-top gravity-wave detector, Dallas Morning News, March 25, 2002

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"It's like trying to hear the difference between a violin and a clarinet playing a middle C. Even though they are playing the same note, you can tell them apart by their timber and resonance."

—Gary Hinshaw, NASA, on how the MAP satellite will provide data about the early universe, Discovery News, March 22, 2002

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"Sometimes it is better for another set of eyes to be reading the textbooks — those who are not using the books every day — in order to check for accuracy."

—Lee Riedinger, Oak Ridge National Laboratory, on scientists helping to proofread textbooks, Memphis Commercial Appeal, March 25, 2002

✶✶✶

"I do doubt the existence of black holes. However, astronomers are sold on black holes, and talking to them I feel like Don Quixote fighting windmills."

—Martinus Veltman, University of Utrecht, San Francisco Chronicle, March 25, 2002

Party Animals

Photo by Malcolm Tarlton

Party Animals

Photo by Malcolm Tarlton
Passing through the parking lot at APS headquarters last March were science writer James Riordon (left) and a polyurethane pachyderm (right). The latter was on its way to the studio of James's mother, Elizabeth Cowan-Riordon, an artist and art teacher who was among those chosen by the District of Columbia Commission on the Arts and Humanities to paint a collection of 100 elephants and 100 donkeys. Comprising a public arts project called "Party Animals", these have been placed on display at various locations around Washington, and will later be auctioned off with the proceeds going to benefit the activities of the commission.

Incidentally, Elizabeth Cowan-Riordon is the daughter of Clyde Cowan, who, together with Frederick Reines, made the first observation of the neutrino in 1956.

Group Seeks to Spur Publications by Retired Physicists

Do retired physicists possess an untapped reserve of valuable knowledge that ought to be published? James Goff and Richard Strombotne of the Mid-Atlantic Senior Physicists Group (MASPG) think so, and they want to do something about it.

Under the headline *"Unpublished Knowledge is Like a Library Burnt"*, Goff and Strombotne recently sent a questionnaire to MASPG members seeking to gauge their interest in preparing papers for electronic publication.

To help the effort along, beginning on July 1, the APS has established a reduced subscription rate of $100 for senior members, which allows them to select one current APS journal on-line and also gives them access to PROLA, the Physical Review On-line Archive that contains all APS research publications from 3 years ago back to their inception.

MASPG will offer its members guidance in using the APS electronic publication resources.

MASPG has about 130 members in and around the Washington, DC area. It holds monthly meetings at APS headquarters in College Park, MD, and organizes lectures and excursions for its members.

APS helped launch the group in 1997, and would be willing to give some assistance to similar efforts in other parts of the country if there is sufficient interest, according to APS Director of Membership Trish Lettieri.

For more information on MASPG or starting a similar group in your area, contact Trish Lettieri at lettieri@aps.org or 301-209-3272.

ANNOUNCEMENTS

APS UNDERGRADUATE PHYSICS STUDENT COMPETITION

2002 APKER AWARDS

For Outstanding Undergraduate Student Research in Physics

Endowed by Jean Dickey Apker, in memory of LeRoy Apker

DESCRIPTION

Two awards are normally made each year: One to a student attending an institution offering a Physics PhD and one to a student attending an institution not offering a Physics PhD

- Recipients receive a $5,000 award; finalists $2,000. They also receive an allowance for travel to the Award presentation.
- Recipients' and finalists' home institutions receive $5,000 and $1,000, respectively, to support undergraduate research.
- Recipients, finalists and their home physics departments will be presented with plaques or certificates of achievement. The student's home institution is prominently featured on all awards and news stories of the competition.
- Each nominee will be granted a free APS Student Membership for one year upon receipt of their completed application.

QUALIFICATIONS

- Students who have been enrolled as undergraduates at colleges and universities in the United States at least one quarter/semester during the year preceding the **JUNE 15, 2002** deadline.
- Students who have an excellent academic record and have demonstrated exceptional potential for scientific research through an original contribution to physics.
- Only one candidate may be nominated per department.

APPLICATION PROCEDURE

The complete nomination package is due on or before **JUNE 15, 2002** and should include:

1. A letter of nomination from the head of the student's academic department.
2. An official copy of the student's academic transcript.
3. A description of the original contribution, written by the student such as a manuscript or reprint of a research publication or senior thesis (unbound).
4. A 1000-word summary, written by the student, describing his or her research.
5. Two letters of recommendation from physicists who know the candidate's individual contribution to the work submitted.
6. The nominee's address and telephone number during the summer.

FURTHER INFORMATION

See **http://www.aps.org/praw/apker/descrip.html**

DEADLINE

Send name of proposed candidate and supporting information by **JUNE 15, 2002** to: Dr. Alan Chodos, Administrator, Apker Award Selection Committee; The American Physical Society; One Physics Ellipse, College Park, MD 20740-3844; Telephone: (301) 209-3268, Fax: (301) 209-3652, email: chodos@aps.org.

Contributions Acknowledged Online

APS recently initiated a special web page to acknowledge the generous contributions from the Society's individual donors.

During 2001, an impressive number of APS members provided an annual gift in conjunction with their membership renewal, including more than 800 donors who gave $100 or more.

Many individuals also supported APS prizes and awards fund-raising efforts. By making a contribution, APS members help further the Society's education and outreach initiatives, international affairs programs, public information efforts and recognition of scientific accomplishments through prizes and awards. We very much appreciate all of these gifts.

The listing can be viewed by APS members on the Development Department's webpage at http://www.aps.org/development/donors.html

Call for Nominations for 2002 APS Prizes and Awards

Members are invited to nominate candidates to the respective committees charged with recommending the recipients. A brief description of each prize and award is given in the March 2002 *APS News Prizes and Awards* insert, along with the addresses of the selection committee chairs to whom nominations should be sent. Please visit the Prizes and Awards page on the APS web site at http://www.aps.org under the Prizes and Awards button for complete information regarding rules and eligibility requirements for individual prizes and awards.

PRIZES

Will Allis Prize for the Sudy of Ionized Gases
Hans A. Bethe Prize
Biological Physics Prize
Tom W. Bonner Prize in Nuclear Physics
Oliver E. Buckley Condensed Matter Physics Prize
Davisson-Germer Prize in Atomic or Surface Physics
Dannie Heineman Prize for Mathematical Physics
Einstein Prize in Gravitational Physics
Polymer Physics Prize
Frank Isakson Prize for Optical Effects in Solids
James C. McGroddy Prize for New Materials
Lars Onsager Prize
W.K.H. Panofsky Prize in Experimental Particle Physics
Earle K. Plyler Prize for Molecular Spectroscopy
Aneesur Rahman Prize for Computational Physics
J. J. Sakurai Prize for Theoretical Particle Physics
Arthur L. Schawlow Prize in Laser Science
Prize to a Faculty Member for Research in an Undergradate Institution
George E. Valley JR. Prize
Robert R. Wilson Prize

AWARDS

LeRoy Apker Award ***(June 14, 2002 Deadline)***
Joseph A. Burton Forum Award
Maria Goeppert-Mayer Award
Joseph F. Keithley Award for Advances in Measurement Science
Leo Szilard Lectureship Award

MEDALS AND LECTURESHIPS

David Adler Lectureship Award
Edward A. Bouchet Award
John H. Dillon Medal

DISSERTATION AWARDS

Outstanding Doctoral Thesis Research in Beam Physics Award
Dissertation Award in Nuclear Physics

NOMINATION DEADLINE IS JULY 2, 2002, UNLESS OTHERWISE INDICATED.

MEETING BRIEFS

•Texas Section. The APS Texas Section held its annual spring meeting March 7-9 at Stephen F. Austin State University in Nacogdoches, Texas and featured a program of general sessions on physics frontiers and innovations, as well as nine hands-on workshops for physics teachers. There were four plenary presentations on the role of Texas physics departments in preparing K-12 teachers; physics education research; atomic coherence effects; and a summary of recent results and prospects from the Fermilab Tevatron. Friday evening's banquet featured a lecture by Joseph Nagyvary of Texas A&M University on the science and art of violin making, followed by a musical performance using a violin manufactured by Nagyvary. Afterwards, participants had the opportunity to see a planetarium show or visit the SFA Observatory.

•New England Section. The APS New England Section held its annual spring meeting at Brandeis University in Waltham, MA, organized around the theme of expanding horizons in physics, with a program designed to introduce the audience to physics applications beyond the realm of traditional physics. The two-day program featured several invited lectures on such topics as whether cortical neurons act like transistors; NMR action studies of enzymes and signaling proteins; and Chandra and the X-ray universe. There were also education-oriented lectures on classroom assessment in physics and astronomy, and the impact on the classroom of one teacher's year at Fermilab. Friday evening's banquet featured an after-dinner lecture by Eric Mazur of Harvard University on stopping time.

•Ohio Section. The APS Ohio Section held its annual spring meeting April 12-13 at Youngstown State University in Ohio, organized on the theme of photon induced processes. The program included invited lectures on such topics as manipulating matter with light, as well as a talk by best-selling author Lawrence Krauss on the future of life in an ever-expanding universe. There was also a special "Town Meeting" session on Saturday morning focusing on physics education. Friday evening's reception banquet was held in the renowned Butler Museum of American Art, and featured a performance by a string quartet and a presentation by Tom Cvetkovic, artist/CEO of Chromagem, Inc., a multinational commercial high-volume hologram manufacturer.

•New York State Section. The APS New York State Section held its annual spring meeting April 12-13 at the State University of New York College at Oneonta, focusing on issues related to energy and the environment. Friday afternoon featured a session on alternative energy sources, such as fuel cells, plasmas for fusion energy, inertial confinement fusion research and nuclear power, followed by a banquet and lecture on renewable energy. Saturday's sessions covered such topics as energy-efficient solid state lighting, photovoltaic devices from organic semiconductors, clean coal technology, solar energy, and solar-powered cars.

CALL FOR NOMINATIONS

Einstein Prize

Purpose: To recognize outstanding accomplishments in the field of gravitational physics.

Nature: The prize consists of $10,000 and a certificate citing the contributions of the recipient. It also includes an allowance for the recipient to travel to a meeting of the Society to receive the award and deliver a lecture. It will be awarded biennially.

Establishment & Support: The prize was approved by the APS Council May, 1999, and was established by the Topical Group on Gravitation. It is supported by friends of the Topical Group.

Rules & Eligibility: The award, usually to a single individual, is for outstanding achievement in theory, experiment or observation in the area of gravitational physics. It is open to any scientist, worldwide. Nominations will remain active for three years. Members of the Topical Group on Gravitation Executive Committee shall not be eligible for nomination while sitting on the Committee.

Nomination Deadline: The deadline for submitting nominations for the 2003 Prize is July 2, 2002. Five (5)copies of each nomination with supporting documentation should be sent to the Chair of the 2003 Selection Committee. Clifford M Will (Chair), Dept. of Phys, Washington Univ, CB 1105, St Louis MO 63130-4899, Phone (314) 935-6244, Fax (314) 935-6219, Email CMW@WUPHYS.WUSTL.EDU

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The Status of the African-American Physicist in the Department of Energy National Laboratories

By Keith H. Jackson

The National Society of Black Physicists (NSBP) has been concerned about the small number of African–Americans with career scientific staff appointments at Department of Energy funded national laboratories. NSBP has also been frustrated with the overall lack of participation of Historically Black Colleges and Universities (HBCU's) in DOE-funded scientific user facilities such as high energy physics and nuclear facilities, Synchrotron Light Sources, and the Spallation Neutron Source. As a result of these concerns, the Technical Executive Officer of NSBP began to collect data, which were placed before the American Physical Society Committee on Minorities (COM). The American Physical Society Committee on Minorities formally took up the issue but first wanted to verify the data provided by NSBP, and to expand the study to include Hispanic physicists. COM enlisted and received the full support of both the National Society of Black Physicists and the National Society of Hispanic Physicists (NSHP).

Our data show that in general African American Ph.D. physicists are less than 0.5% of the Ph.D. physicists employed at the DOE labs. African Americans make up nearly 2% of the physics faculties across the United States, including the faculties of HBCU's. Looking at data compiled by Professor Donna Nelson at University of Oklahoma, we find that the percentage of African-Americans on the faculties of the top 50 physics departments in the U.S. is much smaller (N=60 or 0.6% of total).

What do these numbers mean and what is the connection between the universities and the DOE-funded national laboratories? The DOE labs are government-owned but contractor-operated (GOCO) and the contractor/operators are universities that do not have a single African-American on their physics faculties. The hiring practices and recruiting of the universities are mirrored at the laboratories which they manage. The NSBP has several hypotheses about the reasons:

•Many university faculty have joint appointments with the national laboratories and serve on the scientific staff committees responsible for hiring.

•Graduate students from the managing university, and post-docs from established collaborators, have first shot at post-docs and staff scientist positions. If you are not part of that informal network there is precious little chance at getting any position at the laboratory.

•Many African-American physicists have a natural affinity to the idea of teaching at an HBCU. While this is undoubtedly true, this really leads to a self-fulfilling prophesy, that is in fact motivated by hiring practices at other universities and the DOE labs. That is, academic appointments at these institutions are more available to African-American physicists since appointments in "top-50" departments and at the DOE labs are not available.

•The bottom line is that the labs have not been inventive and aggressive in recruiting domestic African-American and Hispanic-American scientific talent. What more important mission could there be for an organization that would claim to be a national laboratory?

Many of our colleagues would assert the "pool" or "external availability" of American-Americans with Ph.D.'s in physics is small, and that they know of no African-American with a Ph.D. in physics who is unemployed. But there is, for example, a top-10 university that has graduated over 34 African-Americans with Ph.D.'s in physics since 1974. This university also manages a DOE-funded laboratory. There is not a single African-American physicist on its physics or applied physics faculty. This may not be surprising, but in addition there is not a single African-American Ph.D.-level physicist on the staff of the national laboratory or on the research staff of the university period! There is a common misconception that African Americans somehow have an "affirmative action advantage" when applying for jobs at the national laboratories. If that were true, the statistics would be much better across the labs.

NSBP has some proposals for immediate action to address the diversity problem at the national labs. The labs should become intimately involved with the NSBP and the NSHP and other minority professional societies. These organizations have annual meetings that consist of technical and business sessions. At these meetings the labs will find serious scientists with whom their scientific staff can form authentic collaborations, partnerships and student exchanges. They will also find many students looking for research opportunities and mentorship.

The national laboratories could also benefit from a site visit by a team composed of members of NSBP, to review and give serious advice on the recruitment, hiring practices, workplace environment, and quality of scientific outreach activities of DOE labs. The members that make up these professional organizations possess considerable scientific expertise, and are well informed about science resources within minority communities.

The national laboratories should aggressively seek out and form research partnerships with faculty at HBCU's, Hispanic Serving Institutions (HSI's) and Tribal Colleges. AIP statistics reveal that 44% of African American students who earn a baccalaureate degree in the sciences do so at Historically Black Colleges and Universities, and most African-American physics professors are at HBCU's. Research partnerships between research-intensive institutions and HBCU's have historically paid great dividends in increasing the number of minority Ph.D. physicists. Each DOE lab should have active collaborations with HBCU's, HSI's and Tribal Colleges that include staff exchanges, *i.e.*, sending lab personnel to the schools as visiting professors, and having professors at the labs as guest scientists, along with their students as fellows. More importantly, national laboratories should pursue joint appointments with HBCU researchers.

The national laboratories should ensure that minorities participate on advisory committees and on annual divisional review committees at all levels. This is particularly true of laboratory divisions that operate publicly financed national user facilities. Diversity of the division staff and facility users also should be a topic to be reviewed. It is difficult to imagine how a review panel with no African-American scientists will ever raise the issue of collaboration with minority scientists. The guidelines of the review should state explicitly that the inclusion of underrepresented minorities in the scientific program is on an equal footing with the proposed science.

Diversity efforts at the national laboratories have to include the actual stakeholders, the senior scientists with actual hiring and program leadership responsibilities. Too often too much is left to the lab diversity officer. In our survey and follow-up research we have found that this is a fundamental disconnect at the national laboratories. Diversity officers often are not scientists and have few informal contacts among working scientists. We found that most of their job is to satisfy contractual obligations which may protect the

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laboratories from lawsuits but do not help to diversify the lab scientific workforce.

There is also a problem with senior lab personnel somehow equating K-12 science outreach efforts with diversity efforts. The labs will bring in high school children for a day of show and tell, but will not invite serious scientists to serve on review panels and policy boards. The idea is that exposure to science will somehow stimulate these students to major in science when they enter college. However a student of color might quickly come to the conclusion, seeing no people of color in scientific leadership roles, that there are in fact no opportunities to take advantage of and that science is not a viable career path. A student will see it is not a pipeline issue but more of a spigot issue. The lab won't open the spigot to hire a person of color.

The national laboratories need to be committed to programs to improve the distribution of scientific knowledge and high-level scientific and technical skills not only of professors and students from HBCU's, HSI's or Tribal Colleges, but of <u>all</u> US students of science. In many instances the hire of a foreign national in a scientific position at a laboratory is justified on the basis of that foreign national possessing some "special" skill. The national user facilities managed by DOE should play a leading role in providing US citizens with the special skills necessary to compete in the scientific workforce, for example a major investment in summer schools and workshops to train US undergraduate and graduate students in the science and technology embodied in major user facilities such as the national ignition facility, supercomputing, synchrotron light sources, neutron sources, and high energy physics and nuclear facilities. Why do we invest public money in these facilities if we are not going to invest an equal amount in training the next generation of US scientists and engineers in their use?

An example of best practices is the DOE office of Nuclear Engineering. Faced with the declining enrollment of US citizens in nuclear engineering programs , the DOE Office of Nuclear Engineering, Science and Technology moved some of its budget resources to support visiting professorships at HBCU's. This was a quiet effort, and this office should not be confused with the Office of Science, but it provides an example of best practices and education programs appropriate to the DOE mission.

Finally, the Congress must exercise some oversight muscle here. The fact is that the contractors, *e.g.*, University of California, University of Chicago, University of Tennessee, know that they are not about to lose the contract over diversity, and in fact these are sole source contracts which are not competitively bid in the first place. Given the non-competitiveness of these contracts it is very hypothetical of these institutions to talk about so called preferences in hiring of African - Americans. The diversity of the core scientific staff and scientific activity is not a major component of the management contracts. Congress must make sure that diversity <u>performance</u> is strongly and explicitly put into the management contracts, and oversee that performance as only Congress can.

We are dealing with very small numbers that perhaps defy rigorous statistical analysis and control grouping. The DOE laboratories and the academic departments managed by the universities studied by NSBP know what they are doing, or not doing. NSBP calls for congressional action because we are frustrated by commissions, reports, diversity plans and high-level statements. It is time to move directly to things we know will yield results. The Congress ultimately has the oversight responsibility for the national laboratories and we request Congress to turn its attention to this national problem.

Keith H. Jackson, a physicist at Lawrence Berkeley National Laboratory, is President of the National Society of Black Physicists.

DOE Funded Laboratory	Number of Ph.D. Physicists on the Scientific Staff	Number of African-American Physicists on Scientific Staff
Argonne Natl Lab	223	0
Brookhaven Natl Lab	335	1
Fermilab	472	1
Idaho Natl Engineering Lab	27	0
Jefferson Lab	79	0
Lawrence Berkeley Natl Lab	187	2
Lawrence Livermore Natl Lab	642	5
Los Alamos Natl Lab	686	2
Oak Ridge Natl Lab	182	0
Pacific Northwest Lab	66	0
Princeton Plasma Physics Lab	94	0
Sandia Natl Lab	264	0
Stanford Linear Accelerator Lab	115	0
Total	3372	11

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.