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Then they went and changed the Universe.

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By Davide Castelvecchi

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See whole story...

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See whole story...

Project M Reports Now On-Line

By Jean Deken

The Stanford University Physics Department 'Project M' reports dating from 1956 to 1962, including those produced by the Microwave Lab and the then-named High-Energy Physics Lab (HEPL), are now available on-line. Called Project M from 1956-1960, the collaboration was renamed 'The Stanford Linear Accelerator Center' in 1960. The 'M' in the project name was for 'Multi-Gev' or 'Monster.'

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"It is also a wonderful illustration of the value of very different disciplines working together: scientists from a synchrotron light source using a high energy physics linear accelerator to do an experiment on magnetism," said Ray Orbach, Director of the DOE Office of Science.

How Magnetic Field is Created

In a computer hard drive, the writing head hovers over a rapidly spinning disk. An electric current in the head creates a magnetic field which records data by magnetizing tiny areas of the disk's surface. The disk is coated with a special grainy material that allows only two, opposite directions representing the 0 or 1 of a basic unit of data, or bit. High recording speed requires the coating material to switch magnetic poles quickly enough to reliably record each bit.

The idea came to Siegmann in the mid-1990's, literally out of a lightning bolt. He realized that the linac could magnetically record the same way that lightning leaves a magnetic signature when it strikes a rock. The experiment relied on the unique capabilities of the linac, whose electron beam played the role of the electric current in the hard drive's writing head. The linac's electron bunches create magnetic pulses that are some of the world's strongest—at up to 10 Tesla, or 200,000 times the strength of the Earth's magnetic field—and the world's briefest, at 2 picoseconds (trillionths of a second).

Researchers shot up to seven electron bunches through samples of magnetic recording media placed in the FFTB. In the photographs of the results, the researchers had expected to see dark and light concentric rings around the focus point of the beam, corresponding to the two possible magnetizations of the grains. Instead, the pictures showed all shades of grey, indicating that the grains responded in an apparently chaotic, or random, way.

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A chaotic response was only expected with pulses lasting one femtosecond, or one thousand times shorter than a picosecond, according to Stöhr. The team hopes to carry out more systematic experiments in the future. "We are lucky we've gotten the support we had so far," Stöhr said. "Now we want to know more."

SLAC's Linac Coherent Light Source (LCLS), scheduled to start operating in 2008, will help researchers gain a better understanding of the magnetic properties of matter. The LCLS will produce x-ray pulses lasting just one femtosecond, enabling researchers to take snapshots of the magnetization process. "We will take images observing not only what has happened," says Stöhr, "we will be able to see those processes while they happen."

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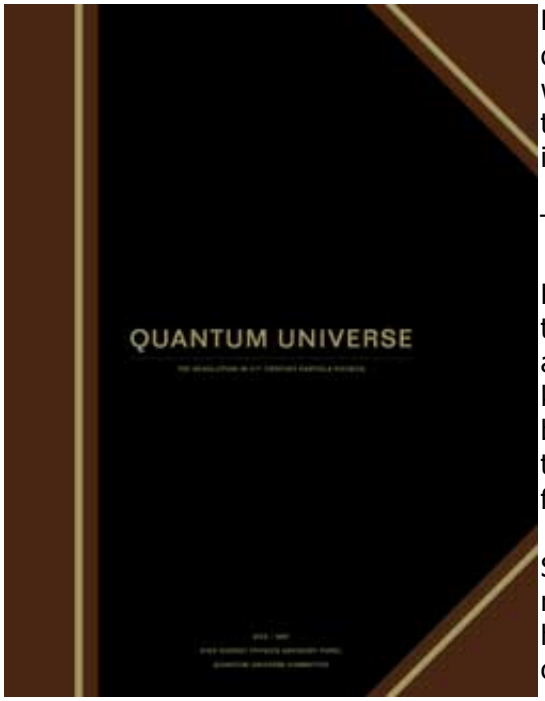

The committee unveiled the report 'Quantum Universe' at the April HEPAP meeting in Washington D.C.
(Image Courtesy of Judy Jackson)

Particle physicists spent the 20th century discovering, in incredible depth and with amazing precision, the particles that make up the world and the forces that determine how it works. The result was the Standard Model, the theory that answered the question "What is the Universe made of?"

Then they went and changed the Universe.

Recent astrophysical and cosmological discoveries have revealed the astonishing fact that the Universe we thought we knew is only about five percent of what's out there. The rest is....well, we don't know what it is. We call it dark matter and dark energy, for lack of better terminology. Dark matter is what's holding the Universe together. Dark energy is some unknown force that is driving it farther and farther apart.

Some have compared this revolution to Copernicus' 16th century recognition that we aren't at the center of the solar system. We have realized that we do not really know what our Universe is made of.

"Nothing's bigger than the Universe," wrote Science Editor-in-Chief Donald Kennedy. "The question is what it's made of." Science magazine called the confirmation of a dark Universe the Breakthrough of the Year for 2003.

Where Particle Physics Comes In

A High Energy Physics Advisory Panel (HEPAP) committee, appointed by Chair Fred Gilman and led by Persis Drell (RD), spent the past five months working on a report that explains what the field that brought

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you the Standard Model is doing in a Universe of matter and energy unlike any we have ever seen before.

"Recent scientific discoveries at the energy frontier and in the far reaches of the Universe have redefined the scientific landscape for cosmology, astrophysics and high energy physics, and revealed new and compelling mysteries," wrote the DOE and NSF officials responsible for U.S. particle physics research. "We are writing to ask the High Energy Physics Advisory Panel to take the lead in producing a report which will illuminate the issues, and provide the funding and science policy agencies with a clear picture of the connected, complementary experimental approaches to the truly exciting scientific questions of this century."

Drell said the report articulates a set of questions that define the science of 21st century particle physics and discusses how both current and future particle physics experiments can address those questions.

"This has been a great committee," Drell said. "The opportunity to collaborate with people from many different branches of physics has been a privilege. We have worked hard but also had a lot of fun. It is an exciting time in particle physics, and we hope that our report will help serve as a guide to where the search for understanding has taken us so far, and to where it is going."

"It's been an interesting process," said theorist Joe Lykken, one of four Fermilab members of the committee. "We wanted to make clear that the questions particle physics has always asked have not changed, but that they have a revolutionary new meaning in the context of these recent discoveries about the nature of the Universe."

The Quantum Universe report is available on-line at:
http://www.interactions.org/pdf/Quantum_Universe.pdf

Article excerpted from FermiNews, Vol. 27, April 2004, No 4.

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PEP-II's Luminous Life

By Mason Inman

Just as proud parents mark their children's height on the kitchen wall, SLAC staff marked a major achievement in the life of PEP-II on April 12.

"We've delivered a total of 200 inverse femtobarns to the BABAR detector since the start of the project," said Michael Sullivan (AD). An inverse femtobarn is a measure of the number of particle collisions in a period of time. Since July 1999, PEP-II has been colliding electrons and positions to produce B and anti-B mesons as fodder for the BABAR detector.

More collisions mean more data for experimentalists to analyze.

"PEP-II is trying to keep BABAR very busy but somehow they seem to keep up!" said John Seeman (AD). "Many thanks to all the support groups and operations staff that make PEP-II and BABAR such a great science tool," he added.

PEP-II is now smashing particles like never before. The whole system has been continually tuned and improved over its five-year lifespan, and it is currently producing collisions at roughly three times the rate it was in its early days.

PEP-II took about 27 months to deliver its first 100 inverse femtobarns, Sullivan said. Because of all the improvements, the current run ending in July should deliver a total of 100 inverse femtobarns in only nine months. This would meet a goal the team set for themselves at the beginning of the run, and bring the lifetime total to roughly 250 inverse femtobarns.

More collisions isn't the only benefit of making PEP-II run more smoothly. "When the machine is well-tuned, the backgrounds tend to remain low," Sullivan said. When the backgrounds are lower, then the data pouring out of PEP-II is less noisy, so experimentalists have to sift through less data to find the interesting physics.

Three recent improvements to PEP-II have increased its luminosity, a measure of how well the electron and positron beams are colliding, to a new record for the machine. The electron storage ring was switched over to trickle charge mode in March, in which more electrons are injected continuously into the ring, rather than in spurts throughout the day (see TIP, April 2, 2004). Keeping the number of electrons high all the time increases the number of collisions that are possible.

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In addition, the number of bunches of electrons and positrons traveling around the rings was edged up by 15 percent to 1,556, bringing the machine closer to its limit of 1,700 bunches. Yet another improvement was in squeezing down the beams, making them denser and making electron-positron collisions more likely. All these improvements have brought PEP-II to a peak luminosity of 8.34 x 1033/cm2s, approaching three times the design luminosity.

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Researchers at SSRL Map New Antibiotic Target

By Kate Metropolis

Addressing one of the world's pressing health problems, scientists working at SSRL have now obtained detailed information about an enzyme that plays a key role in bacterial self-defense. This advance could lead to a new approach to combating bacterial illnesses, which cause more than 10 million deaths a year.

After the penicillin family of antibiotics was discovered and developed in the 1940's, illness and deaths from infectious disease declined dramatically. However, an antibiotic works against specific bacteria for only so long before random mutations (that all bacteria undergo) reduce or eliminate the effectiveness of that particular drug.

Model of a novel class of antibacterials, superimposed over an example of the data used to discover them. *(Image Courtesy of Robert Scott)*

Today, according to the Centers for Disease Control, virtually all important bacterial infections throughout the world are rapidly becoming resistant to the antibiotics that have been used to treat them for decades. The Encyclopedia of Life Sciences puts the minimum yearly cost of antibiotic resistance in the U.S. alone at $150 million.

Recently, scientists from the University of Georgia, Utah State University, and Guilford Pharmaceuticals carried out studies at SSRL that could enable drug designers to gain the upper hand—at least for a while—by developing a new class of antibiotics.

Their work explored a novel antibacterial target—a step in the recipe most bacteria use to create the rigid wall that surrounds and protects individual bacterial cells. Two important components of the bacteria's cell wall are synthesized by the enzyme DapE. Deleting the gene that encodes DapE has been shown to be lethal to certain bacteria, including the strain that causes stomach ulcers and that also appears to be a major cause of stomach cancer. So, inhibiting the DapE enzyme looks like a promising approach for drug designers.
Because mammals use a different recipe to make their cell walls, an antibiotic that inhibits the DapE enzyme should be toxic to bacteria but not to human cells.

The researchers used a technique (analysis of extended x-ray absorption fine structure) possible only with synchrotron light to map the atomic neighborhood of the chemically active part of the DapE enzyme.

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This information is important for identifying a chemical component that can lock onto this site and prevent the enzyme from doing its job in production of the cell wall.

The investigators also obtained additional information useful in drug design—a view of the enzyme bound to inhibiting molecules and a glimpse of the enzyme in action.
The work was reported last year in the Journal of the American Chemical Society, vol. 125, no. 48, p. 14654 (http://pubs.acs.org/cgi-bin/abstract.cgi/jacsat/2003/125/i48/pdf/ja036650v.pdf)

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A Bird's Eye View of SLAC

By Linda DuShane White

Steve Williams (RD) loves to fly planes. In recent years, he has used his radio controlled plane to take spectacular photographs of the coast and of the SLAC site. Williams is active in the Peninsula Aeromodelers, a club with a runway located next to the ocean in Half Moon Bay.

An aerial photo of SLAC taken from the remote controlled plane. (Photo by Steve Williams)

Williams' enthusiasm is catching. "I first got interested in radio controlled planes back in 1967 when I was a graduate student at Berkeley. I used to fly a little airplane with a one-button radio in Tilden Park. Later on in the '70's I built a Heathkit and I flew it for many years down at Redwood Shores." His current plane is called an ARF or 'almost ready to fly'. The kit is quick and easier than designing your own.

Aerial photography came around recently due to the availability of small, light weight high quality cameras. In the 1970's heavy 35 mm cameras or instamatics were problematic because they didn't have autowind and could only take one picture at a time. The advent of lightweight digital cameras introduced the possibility of using the radio controlled airplane for something useful since you can now take one picture every three seconds continuously for 12 minutes.

Williams' largest plane has a seven foot wingspan, a brushless electric motor, nickel metal hydride battery 3AH (ampere hours) and 19 volts. It uses an electronic shutter between the radio receiver and the camera. "I bought it just for the purpose of flying high. It is a very gentle large flyer that can be seen from far away with its bright colors." He needs to be able to see the plane when it gets up high enough (~1,500 feet) to get dramatic shots, and this one is easy to see. A Sony U30 4.5 ounce, 2 megapixel camera that stores about 250 pictures was installed in the plane.

Williams uses his photographs as way of sharing SLAC with others. "It occurred to me that SLAC as a facility was pretty interesting. The pictures make a good way to communicate with people, to let them know what SLAC is all about."

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Williams also owns several smaller electric-powered planes mainly to fly aerobatics: rolls, loops and snaps. Picture miniature Blue Angels, unmanned and navigated by radio! His collection has a few park flyers, including one that looks like a ladybug. "I used to fly alcohol-powered engines planes," says Williams. "They are banned in many parks and ballfields because of the loud noise they make and they are messy because of the castor oil in the fuel."

Although they have a lot of power and fly quite well, Williams has sold his nitro-alcohol engines since electric planes have virtually the same performance without the mess and noise. "The advent of brushless electric motors and excellent high-capacity batteries that were developed for cell phones can power a plane for a long time, 10 or 20 minutes."

Williams came to SLAC in 1966 while working on his thesis for Berkeley. In 1969 he returned as a PostDoc, and has been at SLAC for a total of 34 years. He was away for four years for two separate forays. He went off to work in a medical research environment and found doctors got all the credit. He went off to industry and found out the financial people got all the credit there. "I'm glad SLAC keeps hiring me back. I came back to SLAC in 1988. SLAC is for physicists and that's where I want to be. It's run by physicists for physicists. I'm not leaving again."

For more aerial views, see the Picture Gallery: http://www.pam-rc.org/

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A Bird in the Nesting Box is Worth Two in the Bush

By Mason Inman

SLAC's trees are about to bear strange fruit. Hanging nesting boxes to house bluebirds will soon be installed around the site. Bluebirds like to set up housekeeping in tree cavities but their numbers have been declining in recent years due to a lack of suitable trees.

Bluebirds are adapting to new homes. *(Photo Courtesy of Max Grandfield)*

The Western bluebird has been hit by a double whammy—development has eliminated many trees and aggressive non-native species of birds hog the remaining nesting sites. As part of a nationwide project, a non-profit group called the California Bluebird Recovery Project (CBRP) has installed nesting boxes at the Stanford Golf Course and other local sites and birds have moved in.

"They're in trouble because of urban development and because there aren't too many backyard orchards anymore," said Howard Rathlesberger, CBRP county coordinator. He added that the English sparrow and the Starling, both originally from across the Atlantic, tend to beat out the bluebirds for nesting sites.

CBRP will supply the plywood nesting boxes. Each box is about one foot tall on a five inch square base with a flat, overhanging roof. They are topped with a metal hook for hanging from a tree branch. The door drilled in the side is just the right size for the Western bluebird, Sialia mexicana, the regional species of bluebird. The boxes will be hung about 10-12 feet off the ground—high enough to be out of harm's way, but low enough that volunteers can easily check on the boxes, count any eggs inside and band the birds so they can be tracked.

"Actually, any of the native cavity nesters are welcome, since they all face a common problem," said Kirk Stoddard (EP), who is helping to select a dozen or so suitable locations.

With the installation of the nesting boxes, bluebirds could become a bigger part of SLAC's menagerie. The program welcomes volunteers, especially those already on-site. If you are interested in helping monitor

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the boxes and taking data, please contact Stoddard at Ext. 3801 or Neil Calder (COM) at Ext. 8707.

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Site Lighting Upgrade Program

By Luda Fieguth

The Site Engineering and Maintenance Department (SEM) continues to implement the Site Lighting Upgrade Program. This program encompasses replacement of all outdated energy-inefficient lighting assemblies. Priority is given to replacement of incandescent lamps (the least energy-efficient) and outdated T12/electromagnetic-ballasts assemblies (their production will be discontinued after July 1, 2010).

In 2002-03, SEM implemented two phases of the Klystron Gallery Lighting Upgrade project in collaboration with the Waste Management (WM) team from ES&H. As a result 1,995 incandescent bulbs and 360 energy-inefficient fluorescent lamps/magnetic-ballasts lighting fixtures were replaced with new, energy efficient T8/electronic-ballast lighting fixtures. Most of the old materials including lamps, tubes, ballasts and sheet metal housings were recycled.

The project resulted in an estimated total annual electrical energy saving of 4.4 gigawatt-hours. This represents a reduction in carbon dioxide emission of 2,699 metric tons/year. There is also a significant maintenance cost savings resulting from extended lamp-life of the new lamps.

The project funding was a combination of DOE Federal Energy Management Program funds and the California Energy Commission (CEC) grant reimbursements. The estimated payback on the investment is less than three years. All of those concerned with energy management at SLAC appreciate the efforts and contributions of all the people who supported the Klystron Gallery Lighting Upgrade project.

In 2004, additional lighting upgrade projects are on the way. This includes replacement of outdated fluorescent lamps and ballasts and installation of occupancy sensors in the Central Lab and Annex (Bldgs. 40 and 84) and in the high-bay area of the Test Lab (Bldg. 44). These projects will save an estimated 430 megawatt-hours of electrical energy annually.

Please submit your energy conservation ideas on the Energy Management Website (http://www.slac.stanford.edu/slac/energy).

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Let Your Creativity Shine

By Joni White

This year's Family Day will be on Saturday, September 18. We know SLAC folks are multi-talented. Here are two fun ways you can participate!

T-Shirt Design Competition

Have you ever had an idea about what would make a really cool T-shirt?
This is your chance to show us your artistic ability. Submit your design for a logo or an image for Family Day which reflects the theme: Our Universe, Large and Small. Send files in either .psd (Photoshop) or .jpg format at 72 dpi.
Submit your 2-color, camera ready artwork for consideration by e-mail to Ginger DeContreras (gingerd@slac.stanford.edu) or Joni.White@slac.stanford.edu before June 30.

Star Search Talent Show

A friendly contest to showcase the best of SLAC talent!

Are you ready for your 15 minutes of fame? If you or your family members can sing, dance, play an instrument, read poetry, tell jokes or perform any other special talent, we invite you to join the Star Search Talent Show.

Prizes will be awarded in each category on Family Day. Please submit a brief description with your name and the type of act or music to Pauline Wethington (MS 58, lean@slac.stanford.edu).

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MILESTONES

Service Awards

10 Years
Dix, Brendan (MM), 5/9
Vaillancourt, Kurt (MD), 5/9

15 Years
Boeninger, Robert (MD), 5/1
Ko, Kwok (ACD), 5/4
Shin, Harry (SEM), 5/8
Stanfield, James (MD), 5/1

20 Years
Tankersley, Ricky (MD), 5/7

25 Years
Minister, Jerry (ESD), 5/14

35 Years
Larsen, Raymond (TD), 5/1

To submit a Milestone, see:
http://www.slac.stanford.edu/pubs/tip/milestoneindex.html

See Awards and Honors at http://www.slac.stanford.edu/slac/award

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Change to SLAC Pay Stubs

Beginning on May 22, your Social Security Number (SSN) will be printed on your paycheck stubs and direct deposit statements. The California Labor Code, Section 226, lists nine elements that must appear on paychecks and this includes the SSN.

The Office of the Labor Commissioner confirms that even with the increasing risk of identity theft, the law stands. To help reduce the identity theft risk, SLAC Payroll will only print the last four digits of your direct deposit account number (to help you identify the account).

Please exercise extra care in the disposal of your pay stubs and deposit statements since they will contain this personal information.

Contact: Marty Sorensen, Ext. 4240, mfsor@slac.stanford.edu

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Project M Reports Now On-Line

By Jean Deken

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The Project M Reports' web page has been a joint effort of the Technical Publications Department and Archives and History Office. They located, listed and scanned original reports retired to the Archives by the SLAC Library and by long-time Research Division staff. Users can follow links in a numeric list and view PDF files of the scanned publications. Please note the quality of some PDF files is poor because the original documents are blurred or indistinct. (Remember the good old days of purple ditto copies and black and white mimeographs?)

Fugitive Papers

Publications listed without links are reports that are known to have been published, but no hard copies have yet been located at SLAC. Your help in locating 'fugitive' papers is needed so they can be scanned and added. Anyone with a copy of these fugitives is encouraged to contact the Technical Publications Department (Ext. 2594) or Archives (Ext. 3091).

The new page (http://www.slac.stanford.edu/history/oldrepts.shtml) can also be reached from the Archives and History Office website via the SU Physics Reports link under Resources (www.slac.stanford.edu/history).

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So You Need to Be a Web Author

By Beck Reitmeyer

Do you find yourself responsible for updating pages within a SLAC Website–or even an entire Web–and are not quite sure how to do it? Although you understand basic HTML, would you like to learn how to apply style sheets? Can you work in FrontPage well, but you want to learn what goes on behind it? Then the new Computer Education Web classes are for you.

Beginning in May, Ruth McDunn and Beck Reitmeyer (TIS) will begin a series of classes focused on teaching HTML and CSS, ranging from quick 3-hour classes geared for those who just want to know the basics of operating in the SLAC Web environment to more intensive 6-week courses designed for those who want to know the details.

To sign up for classes, use the newly redesigned Computer Education Web site (http://www2.slac.stanford.edu/comp/edu/).

The Web Information Management site (http://www-group.slac.stanford.edu/wim/) contains valuable information including training and class descriptions.

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SLAC to Host Beyond Einstein Conference in May

By Mason Inman

The upcoming Beyond Einstein conference will center on three themes in astrophysics: the big bang, the properties of black holes and the nature of dark energy. Einstein's theories are central to all three themes. His theory of general relativity implied that the Universe began in a big bang and that black holes should exist. He was also the first to propose the idea of dark energy.

These theories, however, don't explain what powered the big bang, what dark energy is or what happens to matter at the edge of a black hole. Going beyond Einstein requires pushing his theories to their limits by using increasingly sensitive probes.

Two such probes have launches planned within the next decade. Constellation-X will look at x-rays given off by matter as it is sucked into black holes. LISA will look for gravitational radiation that ripples outward from massive objects, such as black holes as they orbit each other and merge.

Speakers will also discuss plans for another set of missions, called the Einstein Probes. These would survey black holes, search for direct evidence of dark energy and look at the microwave background radiation for evidence of inflation in the early Universe.

"The re-organization of NASA makes this a critical time for the Beyond Einstein program," said Roger Blandford (KIPAC), a member of the scientific organizing committee. "I am confident that this meeting will re-affirm the central importance of the scientific questions that this program will address and we are delighted to be hosting the meeting at Stanford."

Kip Thorne (Caltech) will give a free public lecture on Friday evening, May 14, on the Stanford campus in Braun Auditorium entitled, 'Probing Black Holes and the Birth of the Universe with Gravitational Waves.'

To register or for more information, contact Jennifer Formichelli (Ext. 2846, jlf24@slac.stanford.edu). For conference details including a list of speakers, see: http://www-conf.slac.stanford.edu/Einstein

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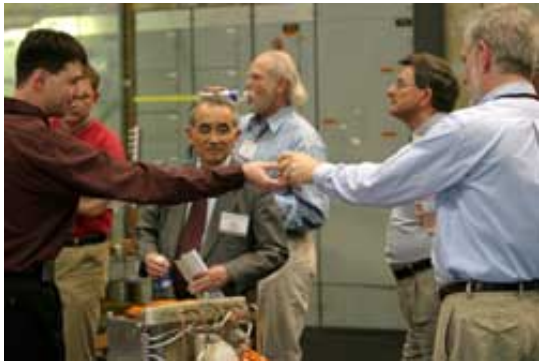

Photo by Diana Rogers

Left to right: Peter Tenenbaum and Marc Ross (both NLC), shown in front, help explain NLC technology to Akira Masaike (Kyoto University), Barry Barish (Caltech) and Jean-Eudes Augustin (Universite Pierre et Marie Curie) during the International Recommendation Panel (ITRP) tour of the Next Linear Collider Test Accelerator on April 26.

By next year, the ITRP will make a recommendation on which technology will be used for the future collider.

INTERACTION POINT
May 7, 2004

Award Winning Poem on Display

Janice Dabney proudly points to her award winning poem. *(Photo Courtesy of Janice Dabney)*

Over a year ago, Janice Dabney (TD) was chosen as a second place winner of a poetry contest hosted by the Palo Alto Public Art Commission. Her poem, entitled 'First Bike' is now prominently displayed on the wall of the Walgreen's store in Midtown Palo Alto on Middlefield Road between Moreno Avenue and Oregon Expressway. The dedication ceremony is scheduled for May 8 at noon.

Dabney is honored to be one of the six poets chosen for the Poetry Wall and hopes her short poem will inspire readers to remember the challenges in their lives and those who cheered them on.

First Bike

By Janice Dabney

Father's hands on my shoulders

push me gently to street,

balancing air

between spokes.

Neighbors shout

you can make it

smiles telling knees

ignore this rough road.

INTERACTION POINT
May 7, 2004

Bike to Work Day!

Thursday, May 20

For information see: http://511.org/btwd/

INTERACTION POINT
May 7, 2004

32nd SLAC Summer Institute

Nature's Greatest Puzzles
August 2-13

For information see:
http://www-conf.slac.stanford.edu/ssi/2004

INTERACTION POINT
May 7, 2004

SLAC Education Fair a Success

By Linda DuShane White

In April, Pauline Wethington (HR/COM) and Lisa Noble (University of Phoenix-NCAL) held the first SLAC Education Fair.

They were joined by representatives from many local educational institutions to promote the abundant educational opportunities available to SLAC staff and family members. Erin Smith (HR) was on hand to answer questions about the staff tuition program.

Photo by Diana Rogers

The Fair was well attended for a first-time event. Nadine Wright's (BSD) comment, "What a great idea!" sums it up quite well.

For photos of this event, see special events for 2004 at: http://www-project.slac.stanford.edu/slacpix/index.htm

For more information on the SLAC Academic and Career Counseling Center, see: http://www2.slac.stanford.edu/career/

For more information on training and development, see: http://www-group.slac.stanford.edu/hr/

INTERACTION POINT

May 7, 2004

Attention! Attention!

SLAC's 15th Annual
Juneteenth Celebration

Friday, June 18
3:00-6:00 p.m.

Please mark your calendar for this fun event for all!