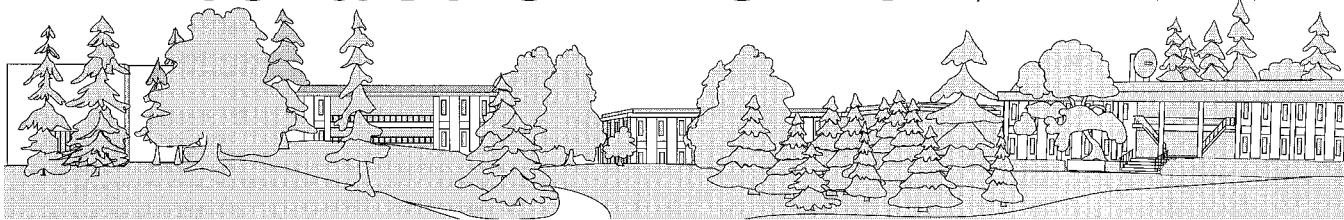


# The Interaction Point

Events and Happenings  
in the SLAC Community  
September 1994, Vol. 5, No. 9



1994 SLAC Summer Science Institute

## Looking Out to Astrophysics and Cosmology

by Jill Mhyre

PARTICLE PHYSICISTS have been known to joke about the tendency of theorists in astrophysics and cosmology to fly into the realm of science fiction with little supportive data. This summer, the particle physicists stopped joking. In the past couple of years, experiments in astrophysics and cosmology have begun to constrain the theorists by returning data faster than ever before. The 1994 SLAC Summer Science Institute, which traditionally has focused on issues in particle physics, paid tribute to these recent advances in data collection, and in the words of conference co-director Lance Dixon, "looked out, so to speak, to the interface between particle physics, astrophysics, and cosmology."

Professor Michael Turner of the University of Chicago opened the school with an overview of the Big Bang theory of the evolution of the universe. This series of three lectures outlined the modern view of astrophysics and cosmology, and highlighted the importance of the rapid explosion of new experimental data that has been acquired in recent years. This data continues to build support of the Standard Model Big Bang theory, even as it builds the conviction that we have seen only a small fraction of the matter around us. Turner began his lectures with an assertion that "dark matter does



In keeping with the focus of the 1994 SLAC Summer Science Institute, participants visit nearby Lick observatory.

exist," and this became the central theme of the school.

Theorist Joel Primack of UC Santa Cruz compared the current environment in astrophysics to the world of particle physics in "the mid seventies when the Standard Model of particle physics was created." He said, "We are living through an era like that. Data is streaming in all the time, and if all the data were true, then every theory would be ruled out. You have to have strong nerves to live through that kind of an era." He advised physicists to have several back-up theories in the event of incriminating evidence against their favorite.

Philip Lubin of UC Santa Barbara presented one example of the new data—the search for anisotropies in

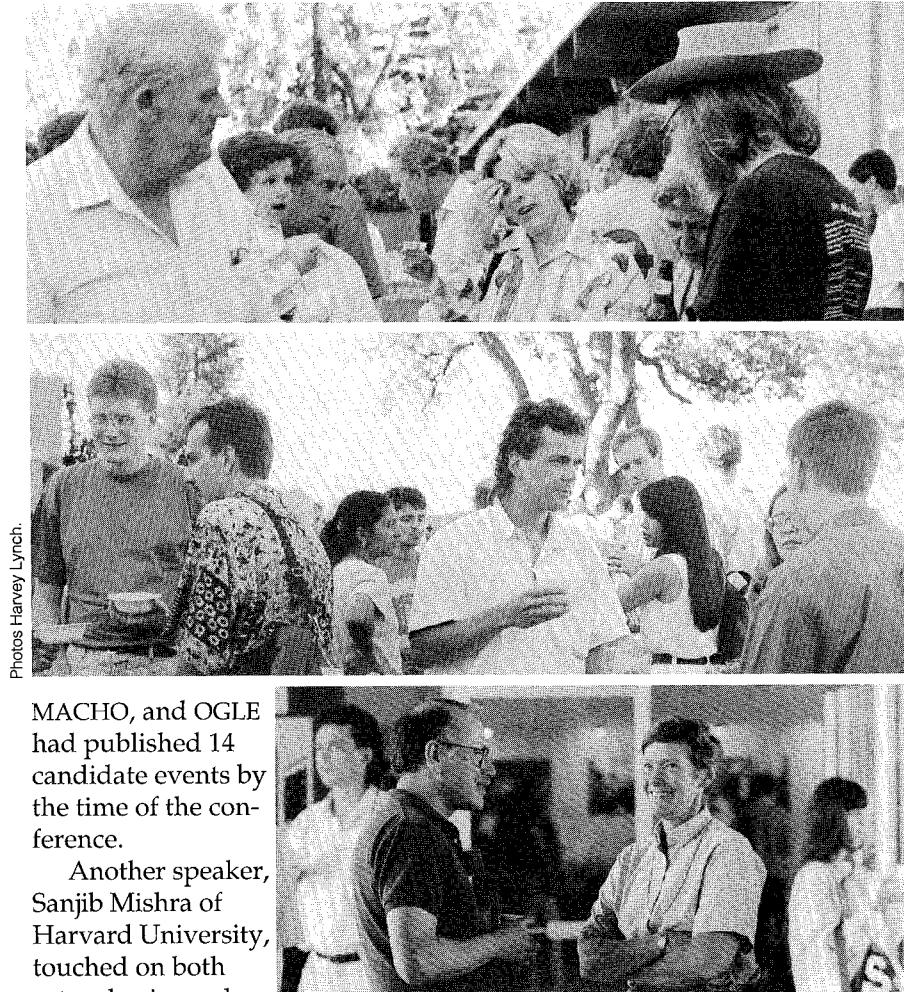
the microwave background. By pointing two antennae to the sky, separated by varying degrees, scientists can explore different angular and linear scales of background variation. The Cosmic Background Experiment (COBE) opened this field by scanning differences between angles of about 15 degrees, but newer experiments are looking at much smaller angular scales. Lubin works with the Advanced Cosmic Microwave Explorer (ACME) which measures anisotropy as a function of frequency at angular scales of about 1 degree. The results show a signal on the order of 100–200 micro Kelvins from peak to peak. If this data is cosmological and not the result of a galactic artifact, it

See **SSI**, page 2

agrees with the predictions made by cold dark matter theories.

ACME and other groups collecting microwave anisotropy data have the difficult task of separating the faint cosmological background from signals caused by atmospheric absorption, galactic synchrotron radiation, inter galactic dust, and radio stars. Bernard Sadoulet talked about the low noise CCD detectors and signal-processing techniques used to resolve the small signal from a stream of detector noise.

Presenting another example of recent data collection, Charles Alcock of Lawrence Livermore Laboratory described the work of the Massive Compact Halo Object (MACHO) group and similar experiments called EROS and OGLE, and Christophe Magneville of DAPHNIA-Saclay, France discussed EROS in more detail. All three groups are looking for microlensing events to provide evidence for baryonic dark matter in the galactic halo. They expect that there may be many objects, like Jupiter, that are large and compact but without enough density to combust and shine. When such an object passes almost in front of a star, gravitational lensing amplifies the light from the star in a recognizable way. If compact objects make up the galactic halo, then at any given time the predicted number of microlensing events occurring is roughly one per million stars; however, the duration of the events depends on the mass distribution of the objects. To maximize the probability that they will find an event, they are surveying a total of 9 million stars every couple of days, and EROS is measuring a smaller group of about 150,000 stars every ten minutes. Execution of this experiment has been surprisingly fast so far. Proposed only seven years ago, EROS,



MACHO, and OGLE had published 14 candidate events by the time of the conference.

Another speaker, Sanjib Mishra of Harvard University, touched on both astrophysics and particle physics when he reviewed data that suggests that neutrinos have a mass. Data from underground detectors show that fewer than the expected number of muon neutrinos relative to electron neutrinos are produced when cosmic rays hit the earth's atmosphere. Two collaborations, IMB and Kamiokande, now postulate that such a deficit of muon neutrinos could be explained by the oscillation of muon neutrinos into tau neutrinos, which requires that neutrinos have a small mass. The detectors are not sensitive to the tau flavor of neutrino.

This information is not what people who have proposed the tau neutrino as a component of dark matter would hope to find. The

*The Summer Institute provides physics graduate students and postdoctorates a chance to meet and talk with physicists from around the world, as shown above.*

oscillation rate indicated by the atmospheric results requires a tau neutrino mass of 0.1 eV, which is too small compared to the minimum of 20 eV required for the tau neutrino to be a useful dark matter candidate.

A number of the conference speakers speculated about the nature of the dark matter of the universe. All agreed that dark matter exists. The movements of galaxies and superclusters to apparently empty fields of space called great attractors, the rapid creation of galaxies, the ratios of primordial helium, hydrogen and lithium in the universe, and the

*See SSI, page 3*

## **SSI** Continued from page 2

inflationary theory all require the existence of huge amounts of dark matter, but say little about its composition. Primordial nuclear abundances and Big Bang nucleosynthesis plus inflation predict that 90% of the universe is composed of non-baryonic particles. Axions, weakly interacting particles (WIMPS), and the lightest supersymmetry particles (LSPs) are possible candidates, as discussed by Mark Srednicki of UC Santa Barbara.

The field of dark matter opens one of the strongest connections between particle physics and cosmology. While astrophysicists

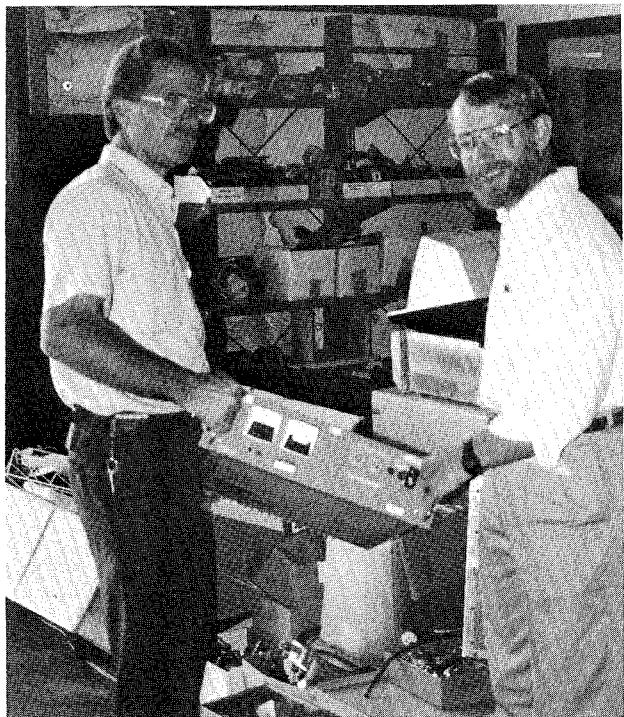
search for baryonic dark matter in the universe with experiments like MACHO and for cosmologically produced dark matter with terrestrial low-noise solid-state detectors, as described by Sadoulet, particle physicists contribute to the search by looking for potential dark matter candidates in their theories and their colliders. "The axions," for example, "were particles invented by particle physicists to solve the strong charge-parity problem in particle physics," said Turner. "When you calculate their relic abundance you find out that they just happen to close the universe." Dark matter may even be

composed of particles that have yet to be discovered.

A strong cross-fertilization between theorists and experimentalists, and between particle physicists, cosmologists, and astrophysicists may help open the door to the true nature of dark matter, and to a host of other questions about the universe and the particles that compose it. The SLAC Summer Institute on Particle Physics turned to astrophysics and cosmology to address the issue of dark matter from multiple perspectives, and to promote essential communication between these widely disparate but interconnected fields of physics.

## Recycled equipment helps local schools

AS PART of the national effort to improve math and science education, SLAC is making donations of surplus equipment to public



P.A. Moore

*Alan Conrad, left, helps JFK High School teacher Bruce Anderson select equipment from the SLAC salvage warehouse.*

schools. According to Helen Quinn, Assistant to the Director for Education and Public Outreach, "This is a wonderful opportunity for SLAC to provide a community service. We are giving teachers the tools they need to do demonstrations and hands-on activities in the classroom."

The first donation took place recently when Bruce Anderson, a high-school physics teacher, collected a power supply to use in his classes at JFK High School in Fremont. Anderson plans to use the power supply to conduct electricity and magnetism demonstrations.

"I'll be able to use these demon-

strations in at least five of my classes, and that means over 150 students a year will have the benefit of this equipment." JFK High School is an urban school with a multiracial student body. Anderson hopes to attract more interest from his female and minority students with the use of the SLAC donated equipment.

Anderson was formerly an electrical engineer and has worked closely with similar equipment. He attended the SLAC workshop on Particles and Interactions, directed by Helen Quinn, in June 1994. He plans to incorporate the information from the workshop and the use of the equipment into his lessons.

SLAC employees who have surplus equipment that they think might be useful to schools can contact Alan Conrad in the warehouse at ext. 2329, or P.A. Moore in the Education Office at ext. 3826.

—P.A. Moore

# Justification for non-competitive procurements

OUR CONTRACT WITH DOE requires SLAC to procure goods and services using competitive procedures to the maximum extent possible. However, on occasion, situations arise that make competition either impossible or not feasible. In such situations, it is the requisitioner's responsibility to document the reasons why a "sole source" is required. For procurements estimated to be below \$10,000, a justification is required on the Purchase Requisition. For procurements estimated to exceed \$10,000, a signed "sole source" memorandum is required. The "sole source" memorandum must include the following information:

- ❖ A succinct description of the required supply/service with sufficient detail to distinguish the item from any similar but non-interchangeable item. This may be accomplished through reference to special features or pertinent specifications.

- ❖ A description of the circumstances necessitating other than full and open competition. This section should make a clear argument in support of the restriction of competition.
- ❖ Reference to a particular requisition or purchase order number to distinguish the immediate requirement from any previous or subsequent purchase of the same item.
- ❖ A statement of attempts to locate competition, including market surveys. Market surveys should include the survey methods (e.g., phone contacts, publication in journals, and/or posting notices) and the date of the survey.
- ❖ Characterization of responses (e.g., "no responses" or "respondents lacked required technical expertise").
- ❖ If other sources offer an item, state clearly the reasons for the unacceptability of that



item. For example, if the item fails to meet certain specifications of the requirement, state why the offered performance is not acceptable.

❖ Plans for future, follow-on acquisitions, and the steps to be taken to locate/develop competitive sources.

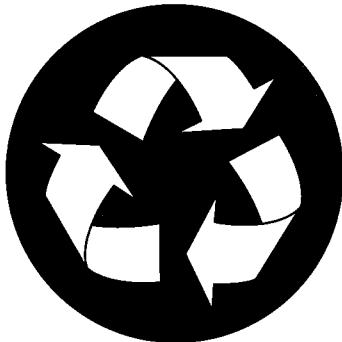
❖ The sole source justification memorandum must be signed by the Requisitioner.

❖ The Buyer and the Purchasing Officer will review the sole source justification memorandum and signify their concurrence by signing the document.

—Alan Saltzberg

## Practicing the 3Rs: Reduce, Reuse, Recycle

KUDOS TO BALBIR GOSAL and the Mechanical Fabrication Department (MFD) for agreeing to reuse approximately 1,500 pounds of metal finishing chemicals supplied by Lawrence Berkeley



Laboratory (LBL). LBL saved money on waste disposal, and SLAC received useful chemicals at no cost. Since the chemicals involved were not very expensive, SLAC's cost saving was small, but the environment was spared an unnecessary setback and LBL saved approximately \$1,000. This is a terrific example of a good environmental practice.

As a result of Gosal's and MFD's accomplishments, at the annual DOE Waste Minimization Conference held last May DOE presented SLAC with a "Certificate of Appreciation" in recognition of

our "dedication and leadership in contributing to the Department's mission to prevent pollution in operations, processes and programs."

As Gosal and MFD have shown, when considering the 3Rs, there is no need to be limited by the immediate locale. It may pay to expand the list of possible areas for reuse to outside of our own organization.

For additional information about SLAC's waste minimization and pollution prevention program, please contact Rich Cellamare at ext. 3401.

—Melinda Saltzberg

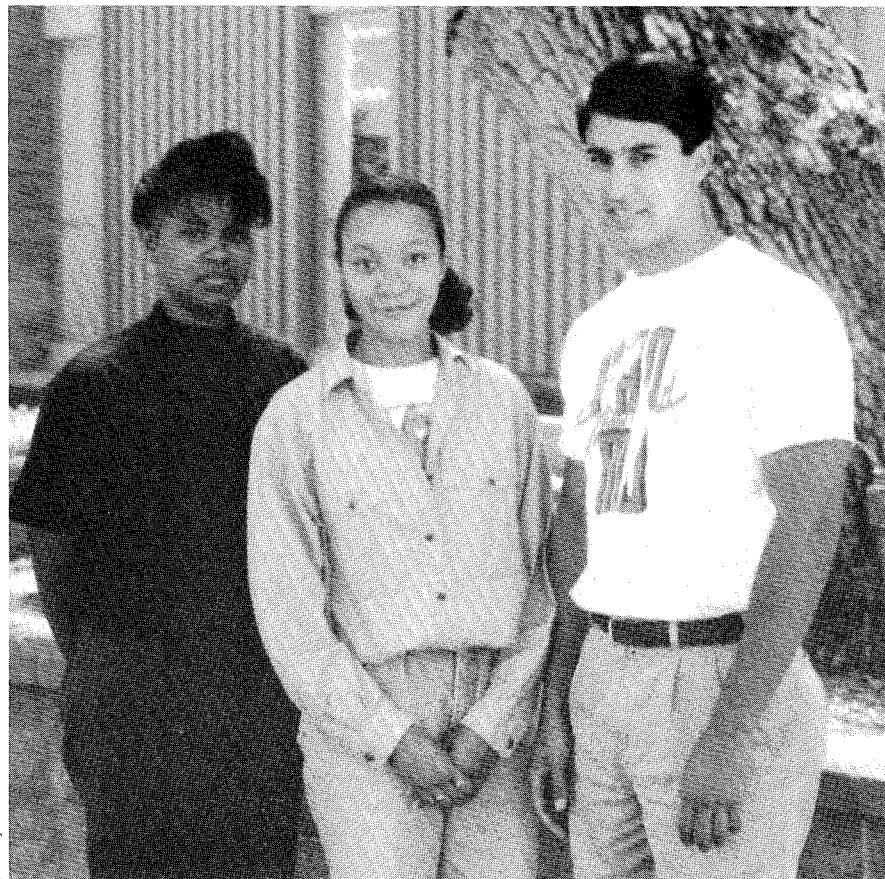
# GEM internships complement fellowships

GRADUATE SCHOOL opens a daunting range of possible careers, so internships have traditionally helped students focus their plans. Four masters students in Engineering—Sharon Meadows, Oscar Madrigal, Vince Sanchez, and Tamara Richardson—came to SLAC this summer to try out the high-energy physics field and get some work experience. They are part of the Graduate Education for Minority students fellowship program (GEM).

Tamara Richardson wrote the computer code for a new board that will transfer information from the accelerator to the control room. She is a first-year masters student in Electrical Engineering from the Georgia Institute of Technology. Advised by Jeff Olson, Dave Nelson, and Diane Yeremain, Tamara had “a pretty good time” around SLAC this summer. Originally hoping to “combine hardware and software design and electronics experience,” she worked with Jeff Olson to “get some exposure to designing hardware” and to complement her programming. She was pleased that her work “will be meaningful when [she leaves],” given that her advisers in the program, “are actually going to implement it.” Not only did she gain valuable work experience, but she provided SLAC with important work.

Tamara and the other GEM students were able to share the Summer Science Program’s (SSP) tours, lectures, and trips to Santa Cruz, San Francisco, and Los Angeles, and they lived along side the SSP students in the Manzanita trailers on Stanford campus. In spite of these close connections to SSP, Tamara and her three GEM counterparts were part of a very different program from SSP.

SSP is a SLAC summer program designed to provide an introduc-



*GEM participants Sharon Meadows, Tamara Richardson, and Vince Sanchez. Not pictured is Oscar Madrigal.*

tion to the real world of physics and engineering to undergraduate students. GEM, on the other hand, is a national fellowship program for graduate students that follows the recipients from the time they receive the award until their graduation. In addition to the paid summer internships, GEM provides a fellowship to fund the student’s graduate school expenses, and to provide an additional annual stipend, said Brent Hendry, the GEM coordinator at SLAC’s Affirmative Action Office.

SLAC and a group of science and engineering companies founded GEM in 1976. Since that time, the program has grown into a collection of 75 universities and 85 industrial companies, said Hendry. While the GEM coalition

provides the fellowships, SLAC and the other individual institutions select the GEM students, and sponsor them through the summer with work internships. At SLAC, GEM director an Affirmative Action Officer SueVon Gee organizes the summer internships in areas in which the students have expressed an interest.

The benefits of the program go both ways. “In exchange for a little work space and some time from a supervisor,” said Hendry, “the departments basically get a full-time summer worker.” While students gain valuable work experience, they provide SLAC with new ideas and fresh energy.

—Jill Mhyre

# SSP offers internships and insights



Shown above are graduates of the 1994 SLAC Summer Science Program. Standing, from left to right, are: James Berry, Clover Huang, Carlos Figueroa, Karen McClenahan, Louis-Gregory Strogler, Jihong Park, José Lorenzo, Charles Nickel, Sarah Mathis, Tehari Finch, Lynford Goddard, Marisela Reyes, Gabriel Velasquez, Evelyn Aviles-Hernandez, and Kera Bell. Sitting, from left to right, are: Gena Poe, Gabriel Perez-Giz, Kelly Yang, Xuandzung Tran, Waukeshia Jackson, Anna Shapiro, Magdalena Garza, and Ebony Waller.

THE 25TH CLASS of students arrived at SLAC for the Summer Science Program (SSP), and according to Carlos Figueroa, the SSP director, the students this year were super. Coming from all over the country, they shared an interest in science and engineering that SLAC worked to promote with the nine-week program which included lectures, tours of Bay Area laboratories and companies, and an individual project at SLAC.

The SSP program was designed to allow students "to compare personal career objectives with the opportunities available in the community." According to a past student, "SLAC SSP exposes students to the everyday experiences of practicing physicists at the time when students might be considering careers in physics." The program targets engineering and physics students from groups that are under-represented in the field, including minorities, women, and people from rural backgrounds.

SSP Director Carlos Figueroa is proud of the program. He was a

participant in 1986, and had a great experience, but says that the program today is of even higher quality. He credits the work of Karen McClenahan, the SSP Coordinator, whose organization gives the program a "more permanent feel." Her efforts were also evident to this year's students. Harvard physics major Tehani Finch was impressed that "the administrators took the time to get such prominent speakers to talk"—speakers from SLAC, Stanford University, and Bay Area industrial companies.

Figueroa also credits SLAC leadership for making the program a priority and funding it generously, doubling the student stipend this year to \$450 per week. The extra funding made the program more competitive. With 187 applications for 20 spots, the selection committee admitted only two alternates, so they "basically got [their] first choice of students," said Figueroa.

But more importantly, the students in the program seemed happy to be at SLAC. Many reported

positive experiences in their independent projects, especially those students who were working in areas closely related to their course of study in school. Evelyn Aviles-Hernandez, a computer engineering major from the University of Puerto Rico, created hypertext programs to link documents for the World Wide Web, which she recognized will be an increasingly important venue for passing information in the future. "It's been a good experience," said Evelyn, "to work with systems such as UNIX and HTML—a hypertext markup language." She anticipated that her skills will be valuable not only in future classes, but also in the workplace.

Hernandez credited her supervisors, Joan Winters and Tony Johnson, for creating such a valuable work experience. "They give me suggestions, but let me work my own way." Several students agreed that a good supervisor is the key to a strong independent project. About thirty-five SLAC

See **SSP**, page 7

## **SSP** Continued from page 6

physicists and engineers supervised the students this year. "They are dedicated to working with young people to challenge them," said Figueroa, who worked with the supervisors to establish the internships.

Burton Richter also recognized the important role that the SLAC faculty play in SSP. "The key to this [program] is the commitment of the scientists and engineers at the Laboratory to generate the kind of work assignments that will benefit the students and to provide the necessary supervision

and mentoring. The full faculty of the Laboratory has committed itself to this effort, and with that commitment, I believe that the Summer Science Program will maintain its effectiveness for a long time."

Morning lectures and Friday tours complemented the independent projects. The group toured LBL, Lawrence Livermore, Hewlett Packard, Highland Technologies—a small company with less than 20 staff members, Lucas Medical Center, and Lick Observatory. They were able to compare large, medium, and small company envi-

ronments to get an idea of the distinct opportunities available in each.

Finch was "glad to see SLAC funding a program like this." He explained that "as an undergrad in science you have a few cases where people will come to you with an opportunity, but most of the time, you are out on your own. It isn't until your third or fourth year of graduate school that you get a clear picture of the field." SSP gave its students a sneak preview of the physics and engineering professions.

—Jill Mhyre

## Keeping track of those sun vibrations

ONE OUT OF EVERY SEVEN Americans will develop skin cancer at some point in their lives. Dermatologists diagnose 1 million new cases each year, making it the most common form of cancer—three times more common than breast or lung cancer.

Dr. Bernard Recht, a practicing dermatologist at Foothill Medical Center, taught people what they need to know about avoiding skin cancer and surviving its harmful effects in a New Options for Wellness presentation on September 9. He emphasized the importance of recognizing cancer early to substantially reduce the rate of severe scarring and death. People should be aware of their skin and regularly look for any changes—darkening, bleeding, itching, hurting, and scabbing. The most common skin cancers include squamous cell carcinoma, basal cell carcinoma, and melanoma.

Fortunately, skin cancer is easy to cure. Today, 95% of skin cancer patients recover following medically approved treatment. Evidence comes from Australia where the rate of skin cancer has actually risen in the past ten years, but the



*Karl Brown's cap protects his skin from harmful sun rays.*

death rate has been dramatically reduced because of an aggressive educational campaign that is teaching people to be aware of their skin, and to have all changes examined by a dermatologist.

Many common growths that are non-cancerous, or benign, remain only on the surface of the skin. Moles are the most common of a wide variety of harmless growths on the skin. While 25% of cancers do grow from pre-existing moles, the other 75% of cancers originate as cancer cells. Moles are

not dangerous unless they have changed, and the removal of all moles would be an unnecessary procedure that would not take away the risks for skin cancer.

Skin cancer is related to genetics and to the number of blistering sunburns the individual had as a child. The best way to prevent sun damage is to use sun block with an SPF of 15, and to apply it every few hours. Higher factors may irritate the skin because of the high concentration of chemicals in the lotion, so 15 applied regularly and liberally appears to be the ideal. Because UVB rays burn, and UVA rays augment the effect of UVB rays, sunscreens are now available to block both kinds of solar rays.

Sunburns definitely indicate skin damage, but a tan is a bad sign as well. No matter how slowly you tanned, if your skin is darker than its normal tone, it is damaged and your body is releasing melanin to prevent further harm. So remember to use your sunscreen, and keep an eye on your skin. Weighing in at about 6 pounds, the skin is the largest organ in your body. Take care of it.

—Jill Mhyre

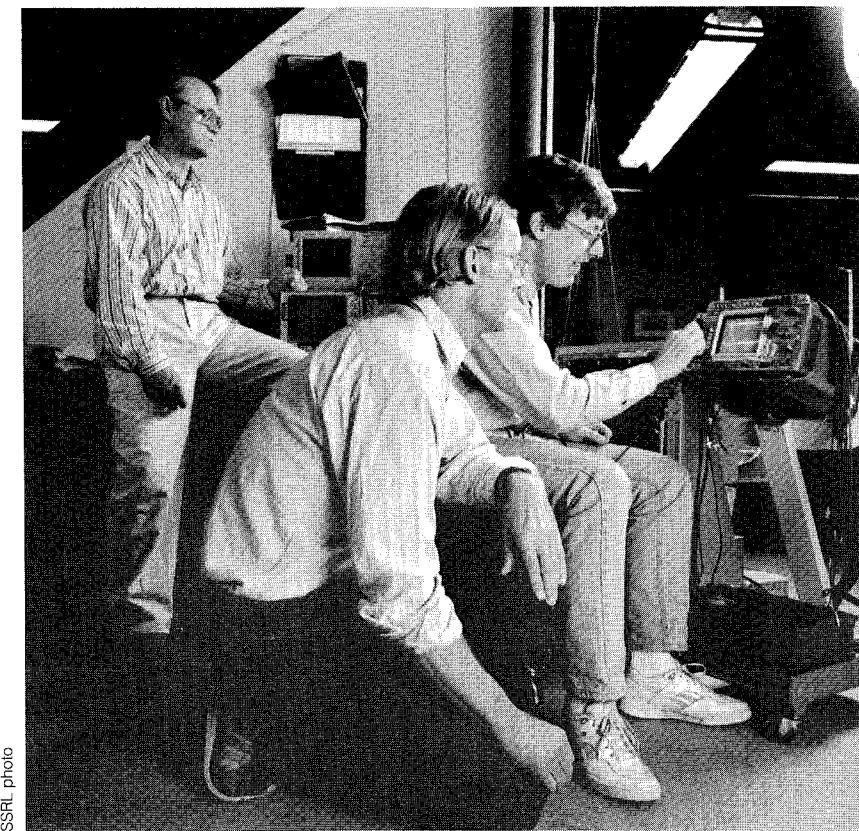
# SSRL completes FY94 SPEAR run

by John Arthur and Ray Isle

THE STANFORD SYNCHROTRON Radiation Laboratory (SSRL) has just completed its operation of the SPEAR synchrotron light source for fiscal year 1994. During seven months of running, over 340 experiments were performed involving more than 560 scientists from around the world. The experiments addressed a wide range of questions in chemistry, biology, materials science, and physics. A description of a particular set of fundamental physics experiments is given below. SPEAR is now going through a busy maintenance period, in preparation for another experimental run starting in December.

During two weeks in August, a multinational collaboration performed several experiments at SPEAR involving x-ray scattering from nuclear resonances. John Arthur, Alfred Baron, and Stanley Ruby from SSRL were joined by Alexander Chumakov from the French ESRF synchrotron facility, Gennadi Smirnov from the Kurchatov Institute in Moscow, Uwe van Buerck from the Technical Institute in Munich, and George Brown from the University of California at Santa Cruz.

In typical x-ray scattering experiments, the x-rays interact with the electron shells of the sample atoms. Interactions with the nuclei are thousands of times weaker, and can be ignored. However, with certain nuclei at particular energies there is a much stronger reaction, a resonance. Tickle a nuclear resonance with an x-ray at the resonant frequency and you'll get a much bigger reaction than normal, much bigger than the electron reaction as well. However, the tricky thing about nuclear resonances is that they are



SSRL photo

Gennadi Smirnov, left, Uwe van Buerck, and Alfred Baron, set up the timing electronics for the Mossbauer experiment.

extremely narrow, less than one microelectron volt wide, so a very particular frequency is required to excite the resonance. In the past radioactive sources have been used to supply these precise frequencies, but recent developments in x-ray optics have made it possible to use the broadband pulse from a synchrotron source to excite the nuclei. Since the synchrotron beam is pulsed, collimated, and polarized, it has distinct advantages as a means of nuclear excitation, though special techniques are still required to separate the nuclear scattered signal from background scattering by atomic electrons.

In the collaboration's first series of experiments, the isotope Fe-57 was used. Fe-57 has become the

workhorse for nuclear scattering studies using both radioactive excitation and synchrotron excitation, because of the key role played by iron in materials science, chemistry, magnetism, and biology. With the Fe-57 isotope, experiments at a number of synchrotron laboratories, including SSRL, have contributed to an understanding of its scattering properties, which are far more complicated than those of standard atomic x-ray scattering. The recent work at SSRL continued the exploration of the fundamental physics of nuclear scattering with three experiments: a study of coherent and incoherent nuclear scattering in thick stainless steel foils; a study of interference effects

See **SSRL**, page 10

# 2nd Cooperative R&D Agreement project

SLAC has entered into a special agreement with two private companies in order to adapt its x-ray mirror technology for commercial and industrial use.

The two companies are Adelphi Technology, Inc. of Palo Alto, California, and Ovonic Synthetic Materials Company, Inc. (OSMC) of Troy, Michigan. They have signed a Cooperative Research and Development Agreement with SLAC to develop a method to reliably design and manufacture state-of-the-art multilayer coatings required for high-efficiency x-ray mirrors.

This agreement is part of a special Department of Energy program designed to encourage the



transfer of technology developed in national laboratories into the private sector. DOE is investing \$230,000 in the project, while Adelphi and OSMC are contributing \$140,000.

High efficiency x-ray optics are expected to play a crucial role in emerging technologies that require precision imaging and analysis in the x-ray range. Examples of such

potential applications include upgrading of the quality of angiograms (x-ray images of blood vessels), improved detection of ultra-low concentrations of impurities on semiconductor wafers, and imaging of astronomical x-ray sources.

SLAC has supported pioneering work in the area of multi-layer x-ray optics in conjunction with Stanford's Vapor Phase Synthesis Laboratory.

This work and the development of x-ray beam lines for specialized research applications are ongoing activities at the Stanford Synchrotron Radiation Laboratory, now a division of SLAC.

*See **Development**, page 10*

## Procurement process better serves customers

LAST JANUARY, the Team On Procurement Systems (TOPS) was formed. Since that time, the committee has met weekly to analyze the current procurement process, and to make recommendations for its improvement. TOPS supplemented its own analysis by conducting focus group meetings with approximately 75 employees. These customers of the procurement process gave TOPS helpful opinions and ideas regarding the procurement process, along with some war stories. Simultaneously, but separately, another group is gathering user requirements to recommend a new procurement software package.

Based on the information TOPS gathered, the group drafted the Requisitioner's Manual to help SLAC employees use the procurement process more effectively, to minimize the number of purchasing delays due to inadequately-

written requisitions and poorly-understood procedures, and to help requesters work their way through the many DOE procedures, rules, and regulations. The final version of the manual will be distributed within two months.

In addition to drafting the Requisitioner's Manual, TOPS is analyzing ways to reduce the time it takes for a completed requisition to reach the Purchasing Department. These recommendations will be given to Jerry Jobe, Associate Director of the Business Services Division, and to the SLAC Directorate.

TOPS hopes that its careful suggestions in the Requisitioner's Manual and recommendations to the Directorate will improve service and reduce delays for all SLAC employees who use the procurement process.

—Jill Mhyre

### TOPS found that:

- ❖ A single purchase takes more than thirty steps, involving the originator, division approvals, budget approvals, Purchasing Department activities, Receiving and Shipping Department activities, and Accounting Department wrap-up.
- ❖ The Purchasing Department took less than six days to place orders for 90% of the 16,167 requisitions processed in 1993.
- ❖ For most requisitions, approximately 75% of this time is spent in division approvals and about 25% of the time is spent in the Purchasing Department.
- ❖ The most common delays are the result of requisitions with poor descriptions and specifications, inadequate paperwork to justify sole-source purchasing, or bad account numbers.

Continued from **SSRL**, page 8

in scattering from fixed and ultrasonically-vibrated foils; and a study of the loss of coherence in diffusing systems. Each of these experiments examined a different mechanism by which the coherence that is initially induced by the synchrotron pulse in a large number of sample nuclei can be lost with time. This work will eventually find applications in the study of magnetic materials, phase transitions, and chemical reactions.

The goal of the final two experiments involved finding resonances that had never been observed before using synchrotron excitation. Two isotopes were used: Kr-83 and Ta-181. In the krypton experiment, a Kr-83 gas sample was used, leading to the first observation of synchrotron-excited nuclear fluorescence in a gas. This

experiment showed the feasibility of using nuclear resonant scattering of synchrotron radiation to study the full range of solid-liquid-gas phase transitions. In the final experiment, the nuclear resonance in Ta-181 was observed for the first time using synchrotron excitation. Because this resonance is extremely narrow, the experimental team can claim the nuclear scattered x-ray beam as the most monochromatic synchrotron light beam ever produced. For this experiment, a special eight-hour period of single-bunch operation of SPEAR (with only one electron bunch in the storage ring) allowed a measurement of the Ta-181 nuclear lifetime to be performed, showing the width of the resonance to be less than one nanoelectron volt, and the corresponding fractional bandwidth of the scattered beam to be

about one part in  $10^{13}$ . By proving that the techniques and capabilities are available to discern these resonances, the SSRL team has paved the way for future, more complicated experiments such as those performed on the Fe-57 isotope.

## Kepler

Comets you say shoot from  
nothing?  
In heaven's name what  
other than matter can be  
matter's mother.

—Lorine Niedecker  
*From the Other Side of the Century:  
A New American Poetry 1960–1990*

## Welcome Guests and New Employees

**Jay Cremer**, SSRL Research;  
**Thomas Galletto**, Accelerator;  
**Patricia Garriz**, Environmental Protection & Waste Management; **Sammy Hanna**, Klystron; **Kathryn Henniss**, Publications; **John Hiller**, Theory; **Victoria Hopkins**, Purchasing; **Georgia Jurickovich**, Library; **Valery Khoze**, Theory; **Romeo Lubrin**, Power Conversion; **Darren Marsh**, Pep-II B Factory; **Thomas Marvin**, Research Division; **Ricardo Principe**, Power Conversion; **Kairong Ye**, Controls ; **Christopher Ziomek**, Klystron.

Continued from **Development**, page 9

Because of the high energy levels involved, highly efficient x-ray optics are more difficult to design and manufacture than those required for visible light beams. An important method for enhancing the effectiveness of x-ray mirrors, for example, involves the deposition of coatings that are only a few atomic layers in thickness on a substrate. These multilayer coatings, in turn, are typically composed of repeated layer-pairs of two different materials. The number, compositions and thicknesses of the layer-pairs must be precisely specified for the energy of the beam with which the mirror will be used.

Under the new agreement the development of multilayer coatings which can be precisely tailored to reflect x-ray beams should be significantly extended.

Adelphi, which has concentrated on the development of x-ray sources and optics for the past 11

years, will assist SLAC researchers in translating theoretical designs of multilayer x-ray optics into fabrication requirements, and in the eventual testing of fabricated optics. Its broad range of expertise in x-ray sources and optics is expected to help define potential commercial applications for multilayer optics.

OSMC, which will fabricate the x-ray devices designed on this joint project, is a pioneer in the field of engineered materials produced by rapid solidification and vacuum deposition processes.

These materials are used in the production of bonded permanent magnets and to reflect x-rays and neutrons in vacuum spectrometers, monochromators, x-ray telescopes, x-ray microscopes, x-ray lithography systems, neutron polarizers, and neutron waveguides.

—Patrick Lui



# ACCESS TO INFORMATION

## Quick help response

YOU KNOW ABOUT calling the SCS Help Desk at 926-HELP (ext. 4357) for computer needs and problems, right? Well, now if your needs, questions, and problems are non-critical and if phoning isn't convenient, you can send an e-mail message to

*help@slac.stanford.edu*

If your problem is critical, continue to call 926-HELP (ext. 4357) and leave an urgent voicemail message if a person doesn't answer.

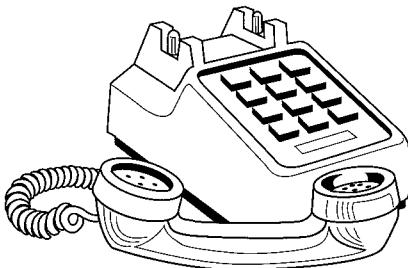
The Help Desk will look for messages addressed to

*help@slac.stanford.edu*

hourly during normal working hours (8 AM to 5 PM, Monday through Friday) and will try to acknowledge receipt of your message within about two hours. The Help Desk staff will get back to you with an answer or solution themselves or route it to a more appropriate expert.

The reason we suggest that you call 926-HELP for critical issues is that the Help Desk can offer a more appropriately quick response. Voicemail left on this number for urgent issues are received and responded to within 20 minutes, 24 hours a day, 7 days a week.

—Billie Bennett and Sandra Crawford



## How to stop a phone phreak and protect your voice messages

SEVERAL VOICEMAIL users at SLAC have missed getting important messages when someone with a similar extension accidentally accessed the wrong mailbox. On a wider scale, toll fraud robs business and government of about \$2.5 billion a year.

SLAC's voicemail system already enforces several rules to help prevent phone fraud:

- ❖ Passwords must be from four to 16 digits in length.
- ❖ A new password may not repeat any of your five most recent passwords.
- ❖ Mailboxes are locked after two consecutive invalid logon attempts.

You can protect your own messages and help protect SLAC's telephone system against would-be phone phreaks by selecting a good voicemail password and changing it regularly. Beginning in November, the system will require users to change their passwords at least once every 90 days. If your password expires, you will not be able to access your messages or any mailbox commands until you change the password.

## Picking a password

A "good" password is one that isn't easy for someone else to guess. It takes an average of 28 minutes to break a four-digit code and six hours to break an eight-digit code. So adding a couple of digits to your password can improve security a lot. Avoid using passwords that match your

mailbox number or that contain strings of the same digit or strings of consecutive digits. Also avoid using passwords containing the current year or information easily connected to you such as a name, street address, or department code.

## Changing a password

To change your password, either when it expires or sooner:

1. Press 84.
2. When prompted, enter the new password, followed by # (pound sign).
3. When prompted, re-enter the new password, followed by #.
4. When prompted, enter your old password, followed by #.

Voice-mail will confirm that your password has been changed.

You can now continue with your other voicemail activities.

If you enter an invalid password, or the new passwords do not match, you will be taken out of the password change procedure and must start the series again.

—Ute Hayes

## Departments pay for own express mail

THE AMOUNT OF SLAC mail sent by Express Mail doubled between October 1992 and April 1994. Although Express Mail does provide next-day delivery to major domestic markets, it is considerably more expensive than first class. For example, the cost to mail a letter-size piece of domestic mail by first class via the US Postal Service is \$.29. That same piece of mail will cost \$9.95 through Express Mail. International mail is more expensive. As of April 25, the cost of Express Mail has been charged back to the department requesting that service.

—Jill Mhyre

# Mary Tropiano—1910–1994



Photo courtesy Tropiano family.

*Mary Tropiano, from a photo taken at her retirement dinner.*

MARY TROPIANO, who managed the SLAC cafeteria under contract with Mannings during the 1970s, died of Alzheimer's disease on Monday, August 15. For those of you who worked with her in the '70s, Mary was the short, snow-white haired lady who always wore a smile and loved everyone.

Mary came to the US from her native Italy at age 10. She lived in the Bay Area for 74 years. She is survived by her daughter Antoinette Mummert of Hayward, her son Nicholas Tropiano of Castro Valley, her sister Emily Nigro of San Leandro, 12 grandchildren, 17 great-grandchildren, and many nieces and nephews.

Mary loved her job at SLAC and liked to cater for special occasions. Always up well before dawn to commute from the East Bay she would arrive at the cafeteria hours before the breakfast crowd and quite often be there after 5 PM.

Mary gave several of her grandchildren a chance to earn some pocket money and experience the job force by bringing them to work with her. In the winter, they just couldn't get over Grandma starting work before the

sun came up and leaving after the sun went down.

Mary was involved with other pursuits outside of cafeteria managing. She was president of the Spanish Ranch Mobile Homes Association for several years and loved to play bingo. She also liked to take weekend trips to Reno, where she always did quite well on the slot machines. But the time that she was really on "cloud nine" was when she won \$12,000 playing Keno.

Mary spent her last months in a nursing home. Her daughter Ann said that Mary, even with her memory failing, continued to remark how badly the kitchen there was run and how she could have run it for less and still had better food.

Mary will be missed by us all! When our paths crossed (several times a year), she always asked these three questions:

"How are things at SLAC?"

"How is the food in the cafeteria?"

"How are all the wonderful people?"

—Vern Smith

All meetings are held in the Orange Room, unless another location is listed. Please notify the Public Affairs Office of any additions or changes by calling ext. 2204 or sending e-mail to [nina@slac.stanford.edu](mailto:nina@slac.stanford.edu)

**October 2, 3 PM**

SLAC/SU Physics Faculty Reception  
Faculty Club

**October 8**

SLAC Family Day  
The Green/Cafe  
Picnic Area

**October 17–21**

SLD Week  
(TBA)

**October 17–18**

SSRL Annual Users Meeting  
Auditorium

**October 19**

SSRL Synchrotron Radiation Workshop Auditorium

**October 19–22**

B Factory Detector Collaboration Meeting Pisa, Italy  
D. Hitlin, A. Pacheco

**October 21**

SU Alumni Association Course Auditorium

**October 23**

SLAC Theory Group Picnic Huddart Park

**October 24, 7 PM**

OS/2 Users Meeting Auditorium

**October 27, 10 AM**

SLUO Executive Committee Meeting

**October 27**

SU Alumni Association Course Auditorium

**October 30–November 5**

IEEE Nuclear Science Symposium Norfolk, VA  
L. Klaisner

**EVENT CALENDAR: October 1994**