



SSRL's Technological Impact on IBM's New Flat Panel Displays

FLAT PANEL DISPLAYS ACCOUNT for more than 30% of the cost of today's laptop computers, and improved methods of producing cheaper displays will lead to their increased use in desktop computers and television sets. In laptop displays, the light transmission from the back to the front of the display is modulated by orientation changes in liquid crystal (LC) molecules. Liquid crystals consist of rod-like molecules, which prefer to align with their long axes parallel to each other. One of the key steps in the manufacture of the displays is the alignment of the liquid crystal molecules in the display. Today this is done by mechanical rubbing of two polymer surfaces and then sandwiching the LC between two such surfaces with orthogonal rubbing directions. The figure below illustrates the relevant parts of a display.

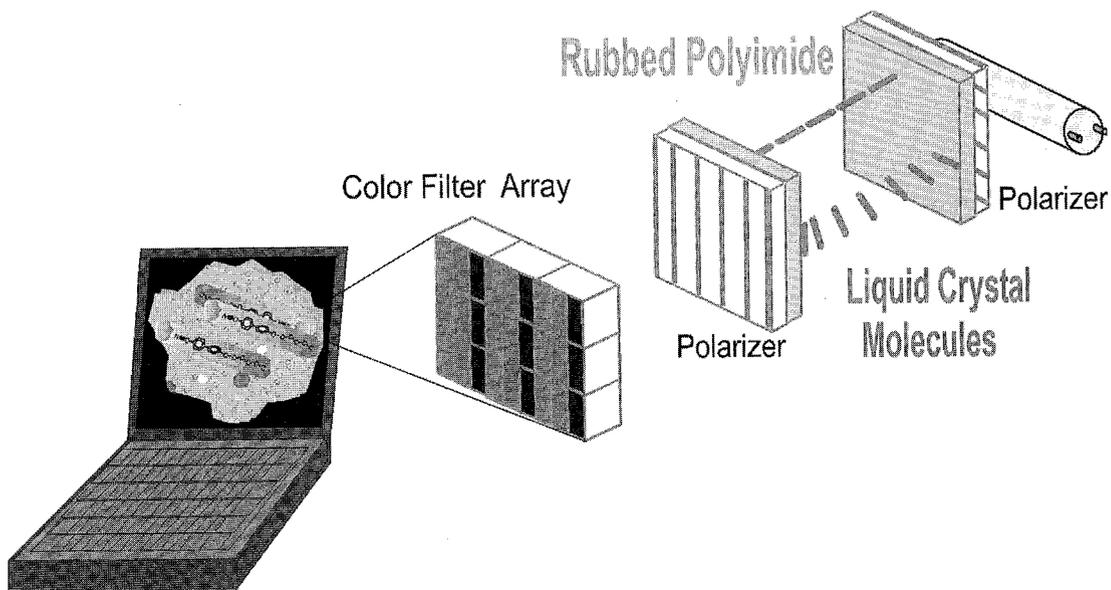
Over the past years a great challenge to this \$20 billion/year industry has been to devise an alternative method of LC alignment. The polymer film used as the alignment template is deposited by a wet process that is incompatible with high-tech manufacturing techniques.

The rubbing process introduces debris and may leave streaks that can affect the quality of the image. In addition, present displays exhibit limited viewing angles and this can only be overcome by producing microscopic alignment areas, so-called multidomains, which cannot be accomplished by rubbing. The development of a new alignment technology, however, has been impeded by the fact that the origin of LC alignment has remained a mystery since its discovery in 1907.

Polarization and surface-sensitive Near Edge X-ray Absorption Fine Structure (NEXAFS) measurements at SSRL have been used to solve this puzzle. The NEXAFS technique, which was developed at SSRL in the '80s, uses polarization-dependent x-ray absorption measurements to determine the direction of chemical bonds near surfaces. In contrast to x-ray diffraction it does not require the presence of crystalline order, that is, materials with periodic atomic positions. NEXAFS offers the capability to determine the preferred orientation of atomic bonds, which can exist even in

(Continued on Page 5)

The light transmission from the back to the front of the display is controlled pixel by pixel by the local arrangement of the LC molecules. The rubbing process aligns the LC molecules in the rubbing direction, nearly parallel to the surface, so that they form a 90° helix from one surface to the other. By application of a small voltage, the LC molecules can be rotated pixel by pixel and the light transmission is changed.



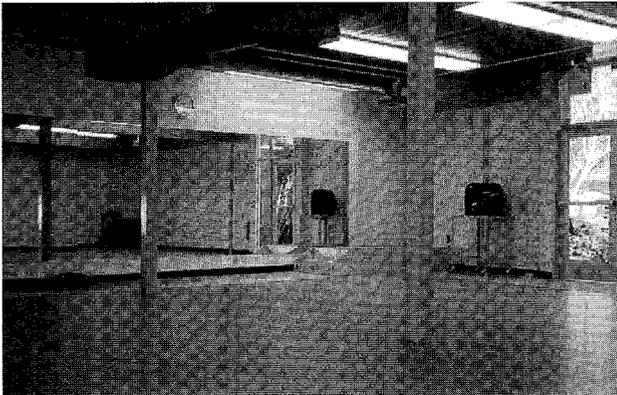
What's Been Going on in "SLAC Space" This Summer?

THE MOST OBVIOUS CHANGE on site this summer was the progress of the Research Office Building (ROB), newly numbered as Building 048. The ROB is scheduled for completion by the end of 2001. The *BABAR* Group will begin moving in at the beginning of 2002.

The new User Lodging has been delayed by approximately six months, due to a relocation recommended by the Stanford Board of Trustees. The new design will have the same number of rooms (110) but a lower profile so it will be almost invisible from Sand Hill Road. It will still require removal of the Training and Conference Center (TCC). The good news is that the TCC will be available at least through the end of October. The new Training Room is located in the Auxiliary Control Building (B003), where the original Accelerator Control Room used to be.

The new Exercise Room (below) was completed in August. It is located in a separate section of the Shops Dining Room Building (B027). You can find out about the exercise programs that use this facility from the Medical Department's monthly calendar.

(Photo T. Peterson)



(Photo T. Peterson)

The SLAC garden (pictured above) was relocated earlier this year further down the hill behind the fence to make room for the User Lodging. We searched for a spot where we could be sure the garden would not be moved again for a *looong* time. Now, even with the User Lodging relocation, the gardens are safe. Finding a new site and working out all the modifications that were required took more time than we had expected, but the work was finally completed just in time for the spring planting. The Garden Club now has a full roster of members (with a waiting list), and their new gardens look great! For more information about the Garden Club, see <http://www-project.slac.stanford.edu/garden/>.

A lot of work has been going on in the Research Yard (RY) to remove trailers and power supply buildings with seismic problems that were identified by the Seismic Review Committee. Other changes in the RY and End Station areas are being investigated to accommodate the Linac Coherent Light Source (LCLS) and other planned research projects.

—Roz Pennacchi

Menlo Park Liaison



Director's Corner

There is no Director's Corner this month due to Jonathan Dorfan's travel schedule.

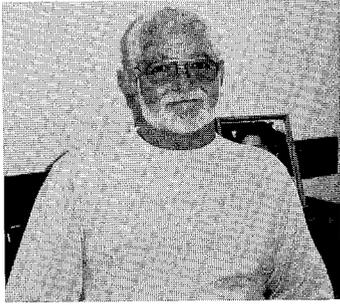
Jean Hubbard, Sr. Buyer in SLAC's Purchasing Dept., was recently named SLAC's representative to the Menlo Park Chamber of Commerce. Hubbard will attend the Chamber's monthly meetings.



(Photo T. Peterson)

Resources from

Barry Webb Named ER Specialist



IF YOU ASK BARRY WEBB what he did during his twelve years as a Heating, Ventilating and Air Conditioning Specialist at SLAC, he'll tell you that he was working "diametrically opposed to God." "If God made it cold, I made it hot; if God made it hot, I made it

cold." In his new job as the Employee Relations Specialist in the Human Resources Department, Webb will be spending his time helping people work cooperatively and productively for their own benefit and for the benefit of SLAC.

Webb brings a wealth of experience to his new Employee Relations role. In addition to knowing the SLAC site and its people, Webb has been an effective problem solver during his five-year tenure as chief steward of the United Stanford Worker's (USW) union. During his years both as a USW steward and chief steward, Webb has seen grievances at Stanford diminish from hundreds ten years ago to just four at SLAC last year.

Webb will also call upon his union experience to carry out new his training responsibilities. As chief steward, Webb was involved in training other stewards in understanding how to effectively implement contract language. In addition, as a member of the Communications Task Force, Webb has first-hand knowledge of the communication goals that need to be achieved at SLAC. He is looking forward to revamping the Employee Orientation program and contributing to other training programs that will be offered at SLAC.

Webb claims that he leads a "very dull life" outside of SLAC—and he likes it that way! He enjoys restoring old cars and taking in some fishing and camping. With a wife, three children, five grandchildren and three dogs, Webb manages to keep pretty busy for someone who claims to lead a dull life.

—Carmella Huser

Employee Referral Award

ANY REGULAR EMPLOYEE WHO refers an applicant who becomes the successful candidate for a SLAC position will receive a minimum of \$200 (net) under the Employee Referral Award program. You, too, can take advantage of the opportunity by referring your friends and family to share in SLAC's scientific endeavors. For details of this program, contact the Employment Department at x2353 or see the SLAC Human Resources website at <http://www-group.slac.stanford.edu/hr/e/referral.htm>. See photos at right for awardees.

—Lee Lyon

Lisa Mongetta Joins SLAC Employment



IF YOU DRIVE TO Boulder Creek in the Santa Cruz mountains, you may find yourself at a 100-year-old house surrounded with rocked-in gardens and rock walls reminiscent of a Thomas Kinkadee painting. That's where you will find SLAC's

new Employment Manager, Lisa Mongetta. When she is not working, Mongetta enjoys restoring her antique-filled home, full of interesting nooks and crannies and a full wine cellar. In addition to old homes, Mongetta loves old movies, such as *Casa Blanca*, and *Gone With the Wind*.

Mongetta brings 15 years of technical recruiting experience to SLAC and four years as a staffing/employment manager. Mongetta was drawn to her new job at SLAC because she was interested in being part of the academic environment at Stanford and liked the stability she found here. In her new job, she intends to build a strong, cohesive employment team that will function as a partner to each of the departments in meeting their hiring needs.

Outside of work, Mongetta's 11-year-old daughter, Natalia, is her first priority. Both love the outdoors, and they find plenty to keep them busy with swimming, hiking, tennis and golf. Living among the redwoods in a small mountain town is the perfect setting for them.

We welcome Mongetta to the Human Resources department and to the SLAC community.

—Carmella Huser



(l-r) Ziba Mahdavi (BSD) received her Employee Referral Award check from Lisa Mongetta for referring

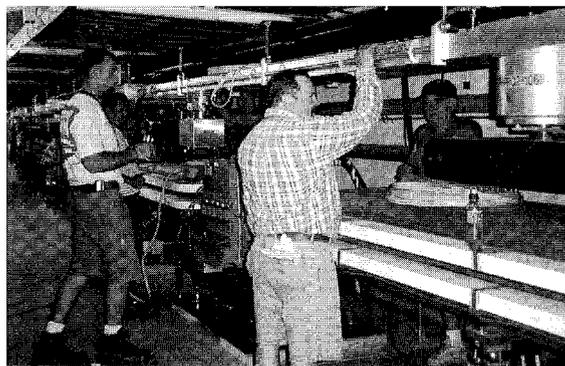
Mike Hogaboom (SCS). (l-r) Thanh Ly (Director's Office) received her Employee Referral Award check from Lee Lyon for referring Tu Ly (Klystron Dept.).

(Photos this page:
T. Peterson)

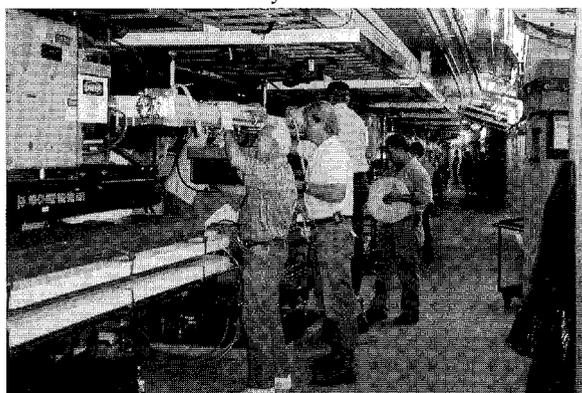
Hard Work Improves *B* Factory Luminosity

THE SLAC *B* FACTORY HAS performed very well and exceeded most people's expectations. Recently, the *BABAR* collaboration published important new physics results. Nonetheless, the *B* Factory was built to make precision measurements and precision measurements require lots of data. There is always room for improvement in the rate at which data is being gathered.

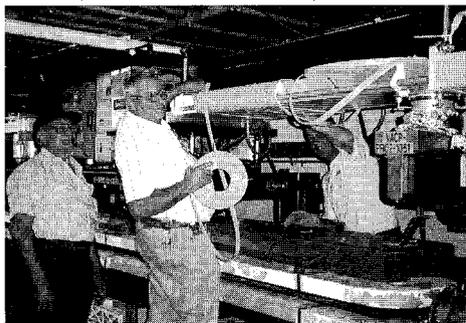
One limitation on that rate (the luminosity) has been an electron cloud instability in the low energy (positron) ring. Electrons emitted from the walls of the vacuum chamber and accelerated by the positive charge of the beam build up in the region of the beam and cause the beam to grow in size. This phenomenon was not anticipated in the original design of the machine and had to be dealt with to continue improving the machine's luminosity.



(l-r) Chris Brown (Precision Assembly), Eamon Lacy (Machine Maintenance), Willie Benitez and George Laxson (Metal Finishing).



(l-r) Leendert Robert (Machine Shop), Mike Zurawel (Precision Assembly), Jesse Gutierrez (Structural Fabrication), and Luis Arroyo (Vacuum Shop).



(l-r) Zoltan Bordan and Harry Walsh (Machine Shop), and Cameron MacKenzie (Vacuum Shop).

The MFD winding crew demonstrated a real team effort with participants from all of MFD's shops. Shown this page are several of the 40 team members.

The solution was to wind a coil around the vacuum chamber, which produces a magnetic field to deflect the errant electrons out of the way. The problem with this solution is that the circumference of the *B* Factory is 2.2 km (1.4 miles)—and that is a lot of vacuum chamber to wind a coil around.

A solenoid was wound around one half of Arc 1 and tested, with promising results. An opportunity presented itself at the beginning of August to mount a major effort to wind solenoids on two and a half more arc sections. Since the machine was going to be shut down for six days to verify the performance of the Personnel Protection System (required every six months), the PEP ring would be available for coil winding during four of those days. The push was on.

On hand was 16,000 feet of wire and an additional 61,000 feet would be needed. Jean Hubbard of Purchasing expedited the purchasing and delivery via truck and train. It arrived on a Sunday, one week before the shutdown. Based on the experience with the trial solenoid, the folks in the Mechanical Fabrication Department (MFD) coil shop invented a way to prepare the wire into pancakes, which minimized the joints and was easy and practical to handle.

The wire was ready and staged when the machine was shut down on July 31st. Forty people from MFD went to work winding, with Leo Giannini (MFD) organizing the effort. When the dust settled, 103 chambers had solenoids wound on them. Each chamber required 750 feet of 4-conductor cable. On Saturday and Sunday, Steve Lowe (ESD) directed people from the cable shop, SSRL and MFD in connecting the coils. By the end of Sunday, everything was ready to go.

The results are still not in on how much improvement this effort will make in the luminosity, since careful machine tuning will be required. However, the operators now have a new tool to make the *B* Factory perform even better.

Accelerator physicist Artem Kulikov (AD) managed the project and was pleased at the way everyone worked hard and efficiently to achieve this goal. Of course, he immediately began planning the winding of the remaining chambers.

Congratulations to everyone who made this effort a success.

—Lowell Klaisner

(Photos this page: T. Peterson)

Yolanda Pilastro Receives DOE Award



(Photo: Courtesy of R. Cellamare)

SLAC SHOULD BE PROUD of Yolanda Pilastro of Waste Management. She received a Runner-up Award from the Department of Energy at a recent DOE Pollution Prevention Conference in Albuquerque, New Mexico. Rich Cellamare, Waste Minimization/Pollution Prevention Coordinator, received the award for Pilastro and presented it to her (pictured above) upon his return to SLAC. The plaque reads in part: *"In recognition of dedication and leadership in contributing to the Department's mission to prevent pollution in operations, processes and programs."* Specifically, the award was for her efforts in the category of Recycling—Implementing Reuse Options for Potential Hazardous Wastes.

Pilastro was instrumental in working with various organizations including other DOE facilities, electric utilities, chemical suppliers, and others to send potential hazardous wastes to parties that could either reuse or reclaim them as useful materials. In turn, the costs to SLAC associated with managing these materials as hazardous waste were avoided. Over the past three years, Pilastro diverted over 60 metric tons of potential hazardous waste and saved the lab thousands of dollars in avoided costs.

Some examples of the implemented reuse activities include:

- Sending used electrical equipment that contained hazardous constituents to electrical companies that were able to service and reuse the equipment
- Developing a program to safely recycle empty chemical containers as scrap metal
- Working with SLAC departments, DOE facilities, and outside organizations to reuse hazardous laboratory chemicals that were no longer needed by the original users

One of Pilastro's more unusual reuse projects was getting gas manufacturers to take back old gas cylinders, called lecture bottles, that contained hazardous gases such as methyl mercaptan, and trimethyl fluorosilane. "Networking in the industry is key to finding a home for potential hazardous wastes," Pilastro explained.

—Vickie Flynn

SSRL (continued from Page 1)

disordered or amorphous materials. First, NEXAFS was used to understand the molecular alignment at rubbed polymer surfaces. The measurements led to a microscopic model for LC alignment that is based on the existence of a statistically significant molecular orientation at the surface of the rubbed polymer. When experiments at IBM's Yorktown Heights Research Center showed that directional irradiation of polymer surfaces with a low energy (less than 500 eV) ion beam also produced LC alignment, the irradiated samples were characterized by NEXAFS at SSRL. These measurements revealed that the LC alignment had nothing to do with the polymer film itself but instead was caused by an ultrathin amorphous carbon layer on the polymer surface that had formed during irradiation. The ion beam had destroyed the polymer network by breaking bonds and, surprisingly, the formed amorphous carbon material showed preferential bond orientation. This was a key discovery and right away led to the suggestion of doing away with the polymer film altogether and replacing it with an amorphous carbon (a-carbon) layer, which could then be orientated by irradiation with a directional ion beam. This idea was experimentally tested and the irradiated a-carbon films were found to reliably align liquid crystals. NEXAFS measurements showed the preferential bond orientation on the a-carbon surfaces, and the orientation in the a-carbon template could be quantitatively correlated with the LC alignment direction on top of the template. A new material and a new process were born.

The final new alignment material is an amorphous carbon film that can conveniently be deposited in a dry deposition process. Hydrogen is added in the deposition process to make it more transparent. Irradiation by a directional ion beam is used to create preferred bond orientation at the surface of the carbon film. The low energy ion beam is produced by a commercially available gun. The understanding of the molecular alignment mechanism and the easy manufacturability of thin amorphous carbon layers by chemical vapor deposition or sputtering methods, convinced IBM to develop this process for manufacturing. The new technology was developed for two years at IBM's Display Business Unit in Japan, and NEXAFS studies were used to help in optimizing the process. The process has now cleared all development checkpoints and full flat panels have been reliably manufactured. The new process has resulted in the highest resolution large displays available today and two-domain LC cells that promise future LC displays with improved viewing angles have already been produced in the laboratory. The work has only recently been cleared for publication by IBM and has been published in the May 3, 2001 issue of *Nature* and the June 22, 2001 issue of *Science*.

—Joachim Stöhr (SSRL), Mahesh G. Samant (IBM)
and Jan Lüning (SSRL)

Neal Adams Completes AIDSride 8



(l-r) Adams poses with Santa Barbara Mayor Harriett Miller, during an unofficial "junk food" pit stop.

(Photos: Courtesy of N. Adams)



Adams is pictured above at the halfway point between Paso Robles and Oceano, where riders pose on top of this rock to have their photos taken.

THIS JUNE 3RD - 9TH, I joined 2700 other bicyclists for California AIDSride 8 (<http://www.aidsride.org>) in riding from San Francisco to Los Angeles. The purpose of California AIDSride 8 was to raise money and awareness for the AIDS-related programs of the San Francisco AIDS Foundation (<http://www.sfaf.org>) and the Los Angeles Gay and Lesbian Center (<http://www.laglc.org>). This year's ride brought in \$11.8 million toward these programs, thanks to the generosity of those who pledged their support for each of the riders and their 350 crewmembers.

This year's ride took us through San Francisco, Santa Cruz, King City, Paso Robles, Oceano, Lompoc, and Ventura, ending at the Los Angeles Coliseum for closing ceremonies. From beautiful city parks to an airport runway, over 3000 people from all walks of life and varying degrees of cycling ability camped out in tent cities each night. I met some amazing people along the route: people who had lost loved ones to AIDS, a man who peddled the entire route using only his arms, as well as many HIV positive riders and crew. The support was great and the sense of community was even greater. It was an incredible experience and one that I will never forget. I plan on doing it again next year.

-Neal Adams

Hutch Retires



(l-r) Jim Craft presents chef's hat to Hutch.

(Photo: J. Ashton)

NO LESS THAN THIRTY-FOUR friends, relatives and co-workers gathered at Capriccios Ristorante Italiano to honor Roosevelt "Hutch" Hutchinson upon his retirement on July 31st. Hutch was a member of what was formerly known as Accelerator Maintenance West (AMW), and is now a part of the Electronics & Software Engineering Department. He worked the swing shift for 26 years, maintaining the modulators, power supplies, and pulse equipment in the Klystron Gallery. Recently, he was one of the first group of individuals to receive an Employee Recognition Award.

During the retirement dinner, Jim Craft, his good friend and supervisory colleague, presented Hutch with a chef's hat (a symbol of prodigious talents in the culinary arts), since he is known for his great cooking skills. Everyone shared stories of Hutch's cooking exploits during those many years on swing shift. A great time was had by all!

-John Beach

New Cafeteria Manager

CARLOS RUIZ IS SLAC'S new Cafeteria manager effective August 2001. He replaced Sigrun Williams, who was here for many years. Ruiz has been with Guckenheimer Enterprises, which runs the cafeteria, for about a year. Before that, he worked 10 years in quick food service and full food service at places like Una Mas and the Monterey Whaling Company. If you are planning an event that will require catering, contact Ruiz at x2615.



(Photo: V. Flynn)

Fant New Department Head for MFD



(Photo: T. Peterson)

EWAN PATERSON AND LOWELL Klaisner (Technical Division) recently announced the appointment, effective August 1st, of Karen Fant as the Department Head of the Mechanical Fabrication Department (MFD). In this capacity, she will report to Klaisner, who is Assistant Director of the

Technical Division for Mechanical Systems. The position had been vacant since Jim Davis left earlier this year.

Fant joined SLAC in 1984 as a mechanical engineer in the Vacuum Group, working under Norm Dean. She left SLAC in 1987 to take a position as a manufacturing engineer supporting chemical vapor deposition machines at the Fremont Division of Varian Associates. She returned to SLAC the following year as an engineer in the Klystron Department.

While Manager of Klystron Window Production and Deputy Group Leader for the Klystron Manufacturing Group, Fant provided mechanical engineering support for x-band klystron development. Her PEP-II work included development of RF microwave windows, cavities, couplers, loads and tuners, and such projects as mechanical design for the vertex and B1 chambers. For NLC, she provided engineering support and system coordination.

With her strong background in SLAC manufacturing processes and experience in engineering and project management, Fant is well prepared for her new assignment. She brings an MFD customer's viewpoint to the position and has ideas for making her department more efficient and more responsive to customer requirements. "One of my primary goals," she states, "is to provide manufacturing engineering services to lab projects in an effort to reduce costs, decrease manufacturing time and increase reliability." Toward this goal, she hopes to utilize the new manufacturing control systems to provide interactive tracking for customers and facilitate the workflow through the shops.

By stepping into this new role, Fant has accepted the challenge of on-going improvement in MFD operations that will lead to improved performance of the laboratory as a whole. We wish her luck as she proceeds with this endeavor!

—Janice Dabney

Whoa, It's Jamie!

ON JULY 19TH, MICHELLE Smith (EFD) was in New York City, and she ran into Jamie Davis (formerly of SLD) at the Pan American Hotel's restaurant. Smith was on her way to meet some relatives for breakfast, and there was Davis sitting near them. "We were both in total shock and happy to see each other in the Big Apple," Smith said. "We chatted for a few minutes and Jamie seems quite happy on the road." All the traveling with the Count Basie Orchestra didn't seem to wear on Davis at all; he looked rested and ready for the next night's show in a nearby state. Smith still can't believe it. She says, "What are your chances of running into Jamie when he's on a world tour?" By the way, Smith said she had a great time in New York City and Ithaca, NY, where her family reunion took place. It was her first visit to both areas.

—Michelle Smith



(Photo: Courtesy of M. Smith)

Tips from TIP

◆ 30th Annual SLAC Run, Walk, 'n Roll will be held at noon on Thursday, November 1, 2001 (weather permitting). The start line will be at Sector 30. For details see: www-project.slac.stanford.edu/slacrace/.

◆ An art exhibit of two Italian artists' works will in the W.K.H. Panofsky Auditorium and the SLAC Computer Center during August and September. It is sponsored by the Abdus Salam International Centre for Theoretical Physics Culture Committee and hosted by the Public Affairs Office and SLAC Computing Services. See <http://www.slac.stanford.edu/grp/pao/art/it01/it01.html> for details.

◆ Menlo Park's Business Expo 2001—Taste of Menlo Park will be held on October 4, 2001 from 4:30-7:30 PM at the Menlo Park Recreation Center. Mark your calendar!

◆ Effective September 1, STAP Funds increased to \$1200. Take advantage of STAP and STRP funds! Check out the website at <http://www-group.slac.stanford.edu/hr/t/> for links to the programs.

High Energy Cosmic Rays Feature Added to the VVC

A NEW SECTION ABOUT high-energy cosmic rays has been added to SLAC's Virtual Visitor Center (VVC). Take a look at www2.slac.stanford.edu/vvc/cosmicrays/ and explore the relationship between cosmic rays and the sun, supernovae and the atmosphere. Examine the components of SLAC's cosmic ray detector and learn how it works. Then, enter the online cosmic ray detector Data Center, where you can extract real cosmic ray detector data for analysis. Take the Guided Tour to find out what this data can tell us about high-energy cosmic rays.

Thanks go to Willy Langeveld (SCS) for the final content development and for scripting the data interface, and to Helen Quinn (Theory), for getting all the people in the same room to make this addition happen. Keep an eye on the VVC for another new interactive addition, about Electron Gamma Shower (EGS) Code, which will be finished soon.

Safety Through Better Listening



I ALWAYS APPRECIATE IDEAS for this column, and the past month I've received a few with a common theme: people transporting themselves by foot, rollerblades, or bicycle while wearing headsets or earplugs covering both ears. Though a Mozart Moment may reduce the

stress you've built up the first half of your workday, please consider the hazard you have created for yourself and others. Volume coming through a full headset can mask out a vehicle engine sound and also negate the intended warning function of horns, bells, sirens or a shout from a co-worker. If you move into traffic lanes without being able to hear, there can be serious consequences. And, depending on the level at which you "zone out" during your exercise, you may not possess the reflexes needed to react to an emergency in a timely fashion.

Article 3.5, Section 27400 of CA DMV Regulations states: "No person operating any motor vehicle or bicycle shall wear any headset covering, or any earplugs in, both ears." Common sense would dictate that if you are walking, jogging, or rollerblading around vehicle zones, you need to be aware of your surroundings. And remember, don't invite danger by exercising in areas on either side of the Klystron Gallery which have posted signs prohibiting these activities.

Keeping yourself fit is an admirable endeavor, and we have a beautiful site in which to accomplish this. But we want you to remain healthy for another day's exercise routine, so keep your ears (or at least one) open!

—Janice Dabney
OSC Chair

Milestones

BIRTHS

Ly, Tu, KLY, gave birth to a daughter, Katelynn Ma, on 7/21/01

RETIRED

Hutchinson, Roosevelt, ESD, on 07/31/01

Winters, Joan, SCS, on 8/1/01

Montgomery, James, ASD Engineering & Tech Services, on 8/27/01

Johnson, Barbara, Human Resources, on 8/24/01

Umemoto, Tad, Mechanical Design, on 8/31/01

DECEASED

Bring, Clyde, 77, retired from EFD on 07/31/87. Died 5/31/01

Renner, Gerald, 81, retired from HR on 12/31/85. Died 8/01/01

Lendin, Bob, 62, retired from SEM on 6/1/96. Died 8/27/01

Do you have a milestone you would like published in TIP? Email to tip@slac.stanford.edu. Look at the TIP website, <http://www.slac.stanford.edu/pubs/tip/tip.html>, for expanded MILESTONE coverage! You may submit items to this website online.

Work Safe, Work Smart

No new injuries involving days away from work have been reported since 6/26/01 according to Sharon Haynes, Workers' Compensation Coordinator. The number of calendar days between then and this update of 8/13/01 is 48 days. SLAC's record number of days between claims involving days away from work remains at 184 days.