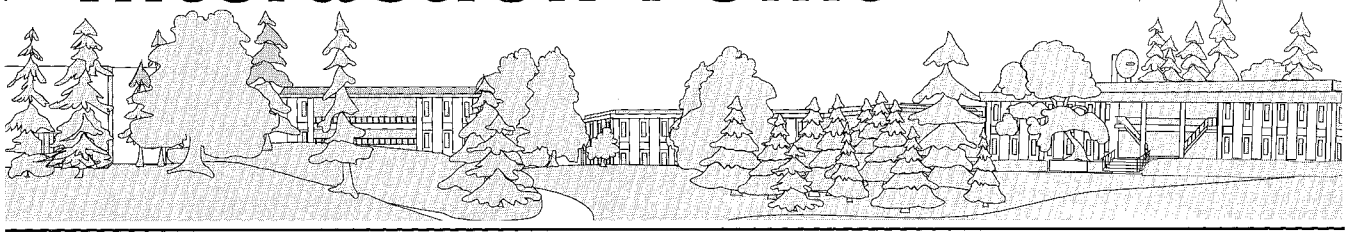
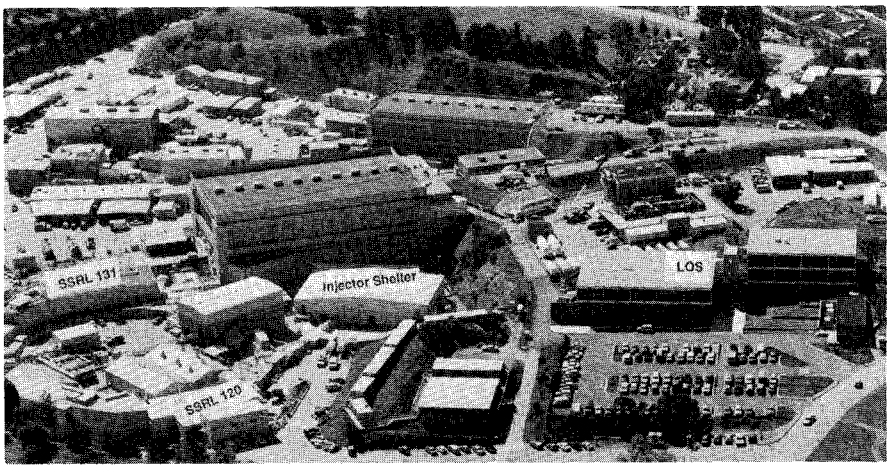
The Interaction Point

Events and Happenings
in the SLAC Community
October 1992, Vol. 3, No. 8



SSRL PERMANENT DIVISION OF SLAC

by Katherine Cantwell



Joe Faust

Aerial view of the SSRL facility. The 26 experimental stations are located in two experimental halls (120 & 131) on either side of the SPEAR storage ring. The injector shelter houses the linac and booster synchrotron which produce electrons for injection into SPEAR. The LOS building houses the SSRL administration, engineering, and scientific staffs.

NINETEEN YEARS AGO, an experiment was performed in a small box attached to the side of the SPEAR wall. From that modest beginning, SSRL has grown to become a national users facility, with 26 experimental stations housed in two large halls on either side of SPEAR.

SSRL's history has been entangled with that of SLAC: SLAC's triumphs have generally led to challenges for SSRL, which SSRL has met in ways that have pushed SSRL forward. The original impetus for the laboratory came from Pief Panofsky and William Spicer of Stanford University. When SPEAR was built, at the suggestion of Ed Garwin and Gerry Fischer, a small port was created for the possibility of extracting synchrotron radiation. Departmental funds from Stanford University contributed $20,000 to start a pilot project in 1971. In April 1973, after a national competition, the National Science Foundation (NSF) committed to starting the Stanford Synchrotron Radiation Project, administered from Hansen Laboratories on campus, as a national users facility. Sebastian Doniach (Applied Physics) was named the first director. Within a year, there were five experimental stations housed in the new hall on the north arc of SPEAR.

In 1976, the project became an independent laboratory and SSRL was born. In 1978, Arthur Bienenstock was named director, and in 1983, the laboratory was transferred from the NSF to the Basic Energy Sciences Division of the DOE.

Synchrotron radiation is the name given to radiation produced as a natural byproduct of circulating or oscillating electrons in a storage ring; it contains a broad range of energies. It is by far the most intense source of photons available in the x-ray and ultraviolet region. In fact, compared to a conventional x-ray generator (such as those used in hospitals and laboratories), synchrotron radiation from bending magnets of a storage ring such as SPEAR can deliver approximately 100,000 times more useful photons per second to a small sample.

This radiation is used by over 600 researchers, from over 80 institutions, to do fundamental studies in three broad areas: the atomic structure of a wide variety of materials, the electronic properties of materials, and the imaging of materials. The science is interdisciplinary, covering the fields of biology, chemistry, electrical engineering, geology, materials science, medicine, and physics. Research covers everything from pioneering work in coronary angiography to the structure of semiconductor surfaces. A wide variety of protein crystals are studied, as well as how radioactive waste products react with the water in the soil surrounding the containers in which they are stored.

In the worldwide synchrotron radiation community, SSRL is perhaps best known for pioneering work in the field of insertion

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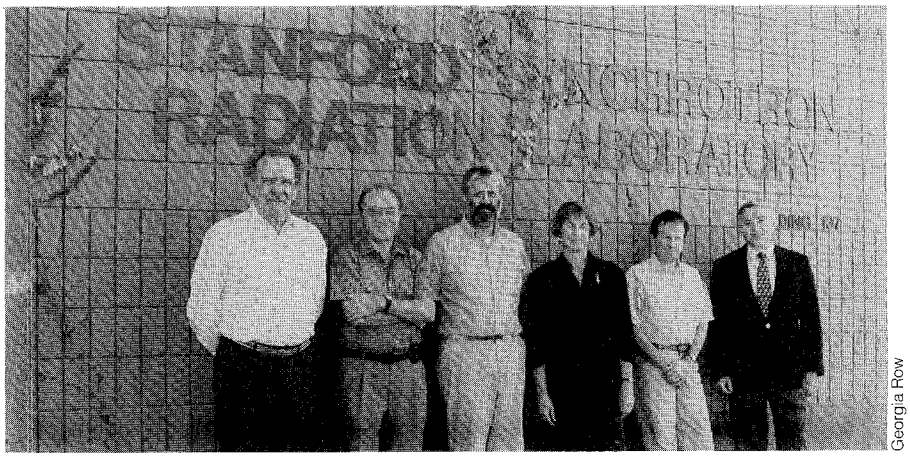


Georgia Row

The leaders of the new division are, left to right: Ron Gould, Asst. Director for Administration; Max Cornacchia, Asst. Director for Accelerator Research & Operations; Piero Pianetta, Asst. Director for Photon Operations; Katherine Cantwell, Asst. to the Associate Director; Keith Hodgson, Asst. Director for Research; Art Bienenstock, Assoc. Director, SSRL Division. Missing from photo is Herman Winick, Deputy Associate Director for SSRL.

(Cont'd. from p. 1)

devices. The interest in and pace of development of these devices was accelerated by the discovery by SLAC high-energy particle physicists of the psi and psi particles. This discovery led toSPEAR being operated at an energy too low for synchrotron radiation experiments. The two types of insertion devices pioneered at SSRL are wigglers and undulators. These devices increase the photon flux of the x-ray beam available on a sample by another order of magnitude by "wiggling" or "undulating" the electrons through the magnet prior to the x-rays being extracted to the synchrotron radiation transport line. Third-generation machines currently under construction around the world are all based on this technology.

The conversion of the linac to run the SLC led SSRL to its greatest challenge: How to get electrons in to SPEAR? While the linac could still deliver electrons, the difference between the 50-GeV energy of the newly converted linac and the 3-GeV storage ring made it extremely difficult and interfered with the SLC project. Thus, SSRL proposed to the Department of Energy that they fund the building of a separate injector for SPEAR. This was completed in the fall of 1991, allowing SPEAR to be converted to a fully independent machine, maintained and operated by SSRL. A month ago SSRL completed its first seven-month user run using this injector. An extremely reliable beam was delivered to 280 different experiments during this period, firmly establishing that SSRL is back in business as a national users facility.

Petty Cash and Hazardous Materials

ALL EMPLOYEES ARE REMINDED that, in accordance with SLAC policy, hazardous materials may not be purchased through the petty cash system. No exceptions are made to this policy.

If you need a hazardous item in a hurry, please take your properly signed requisition directly to the Purchasing Department and request that your requisition be handled on a priority basis.

—Melinda Saltzberg

SSRL MILESTONES

1964 Garwin proposes SR research from SPEAR
1968 Panofsky and Spicer discuss use of SPEAR for SR
1970 SPEAR construction started
1971 Pilot project started
1973 NSF funds SSRP as National Users Facility
Doniach appointed first director
First synchrotron beam from SPEAR
1974 First user running cycle
Five experimental stations
Discovery of psi particle leads to first x-ray drought
1976 Pief commits to 50% SPEAR dedication to SR
SSRP becomes SSRL
1977 Ten experimental stations
1978 Bienenstock appointed director
First wiggler test run
1979 50% dedicated operation begins
1980 First undulator tested
1982 Transferred from NSF to DOE
Fifteen experimental stations
1983 Tenth Anniversary Users Meeting
First tests of 54 pole wiggler
1985 First PEP beam line
1986 Second PEP beam line
Twenty-two experimental stations
First human angiograms
3-GeV injector initiated
1987 SPEAR run 4.5 months for SR
Twelve-day dedicated run on PEP
SSRL users receive eight national awards
1988 SLC leads to the second x-ray drought
1989 SSRL users sent to other facilities
1990 Injector project completed
Full dedication of SPEAR as SR light source
1991 SPEAR commissioned with new injector
1992 SSRL completes a seven-month user run with 87% delivery rate as a dedicated light source

NEW COLLABORATION TACKLES AIDS

THE SPEAR STORAGE RING, best known for its illustrious career in high-energy physics, is entering a new arena: AIDS research. The ring's intense x-rays, called synchrotron radiation, are now being used to examine biochemical molecules spawned by the HIV virus.

A variety of groups are taking advantage of the facilities at the Stanford Synchrotron Radiation Laboratory, now a division of SLAC. Syntex Corporation has entered into collaboration with an SSRL scientist, Henry Bellamy, while another group headed by Earl Rutenbaker comes from the University of California at San Francisco. Both scientists explain that understanding the HIV's biochemical processes will give clues on how to fight the virus.

Bellamy points out that the AIDS virus works differently from normal human cells. "A good way of stopping the virus," he says, "is with chemicals that interrupt biochemical processes unique to the virus, but leave the host cell unharmed."

For example, human cells create their life-sustaining proteins one at a time. HIV, however, makes a long strand of amino acids that is later chopped into individual proteins by an enzyme known as HIV protease. The virus cannot survive without these proteins. Stopping the HIV protease, therefore, would bring the entire AIDS virus to a grinding halt.

Both Syntex and UCSF are now trying to developing effective inhibitors. Ideally, a protease molecule would bind to the inhibitor just as it would to the amino acids. The inhibitor would then lock on like a muzzle on a vicious dog. The protease couldn't bite through anything. No proteins would be made and the HIV would be rendered impotent.

So far, a number of inhibitors have been created that work relatively well in the lab but are not as successful in the body. That's where the synchrotron radiation at SLAC comes in. In a method involving x-ray crystallography, it can be used to examine how an inhibitor binds to the protease and to suggest improvements to the process.

First, crystals are grown from a solution of the inhibitors attached to the protease. Scientists bounce the synchrotron radiation off the crystals onto a detector that records the image like a piece of photographic film.

Synchrotron radiation comes in the form of x-rays, which are nothing more than a type of light with a very short wavelength. This means they can be used to examine very small features. In fact, their wavelength is about the size of an atom, making x-rays the perfect type of radiation to use in examining molecular structures.

The x-rays hit the crystal and rebound on specific paths, making a specific pattern on the detector. A scientist can interpret these patterns to determine the crystal's molecular structure which tells how well the inhibitor has bound to the protease.

X-rays can be produced by machines small enough for a typically sized lab, but synchrotron radiation has several distinct advantages. It is far more intense, points out UCSF's Rutenbaker, and thus gives much better resolution on smaller crystals.

In fact, on particularly small crystals, lab sources are too weak and using synchrotron radiation is the only effective method. Certain proteins are predisposed to form smaller crystals, thus making synchrotron radiation indispensable.

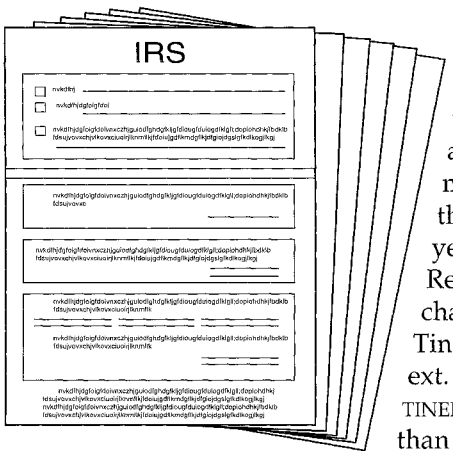
The radiation's intensity also results in much faster data collection. Bellamy says, "On the beam line, we were collecting data in two minutes that once took five hours in the lab." Since many experimental trials are always necessary, this speed brings them just that much closer to finding an effective inhibitor and an AIDS cure.

Rutenbaker agrees. "Since we are working on a number of inhibitors, we are really grateful to be able to use the SLAC facilities to collect data more rapidly. We're excited about possible improvements to SPEAR to speed up data collection still further."

Some scientists think synchrotron radiation can be used to map out all of the HIV's proteins, and perhaps the entire virus itself. The work being done at SSRL may be just the beginning of a major development in AIDS research.

—Karen Fox

THE TAXMAN COMETH



AS TAX reporting time draws near, we'd like to remind anyone who has moved or changed their name in the last year to notify Records. If you have a change to report, call Tineke Graafland at ext. 2366, or e-mail TINEKE@SLACVM no later than November 30.

James Quinn Receives Honor

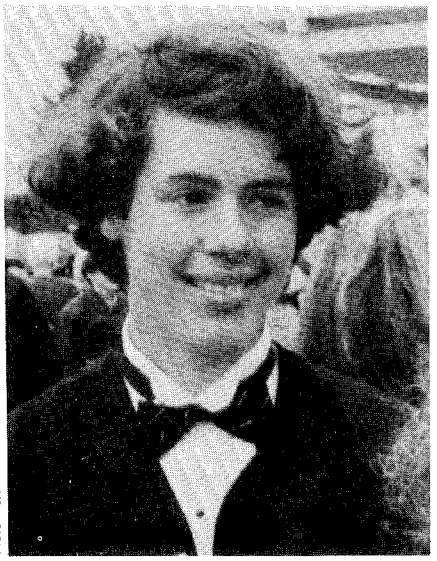
HELEN QUINN HAS REASON to be a proud mother. Not only is her son James a freshman at Harvard University this fall, but on October 26, he received the prestigious National Advanced Placement Scholar Award, based on overall achievement on the advanced placement examinations. There are only 13 other college freshmen in the country who will also receive the award out of the 390,000 students of his age who were eligible.

At Lick Wilmerding High School in San Francisco, James took 13 advanced placement examinations, receiving the highest possible score of five on each (a total of four tests with an average score of four is enough to earn a certificate of distinction). The exams cover college-level work done while in high school. James' tests were over a wide range of topics: two tests each in physics and computer science, and one test each in calculus, chemistry, biology, English literature, English composition, American history, European history, French literature, and music theory. To do this, he took three exams his sophomore year, five his junior year, and five again his senior year.

James' high school career seems even more remarkable considering that he spent most of the three years prior to high school afflicted with an excess of cerebral spinal fluid. This put pressure on his brain giving him terrible headaches.

"He basically could do nothing but lie there, and that was most of sixth, seventh, and eighth grades." Helen remarked. "The only thing he could do during those three years was listen to books on tape; he couldn't even read most of the time."

Fortunately, the pressure was finally alleviated by surgically placing a plastic tube in the base of his spine to drain the excess fluid into his abdomen, and after three years of being isolated from his peers and kept home from school, James was able to live a normal teenager's life: sing in the high school musicals, play on the soccer team, receive 13 fives on the AP exams, and get into Harvard.


Helen Quinn

The Quinns attended the award ceremony at the College Board National Forum luncheon in New York.

—Trevor Payne

THE ANTS COME MARCHING...

THEY'RE BACK! Yes, the ever-popular ants are back. They're looking for the good life—food, water, and shelter. But many folks don't want to share their digs with these uninvited guests. Instead, they want to work in an ant-free zone. And this is why the battle with the ants begins.

If you decide to enter the fray, take preventative measures. Wipe up food spills and dispose of all food scraps, wrappers, and containers in trash receptacles OUTSIDE the building. If the little pests continue to be a problem, arm yourself heavily. A pesticide is available from Stores. Anyone who is going to use it must get a Material Safety Data Sheet (MSDS). Follow the instructions on the MSDS carefully, and make everyone who may be exposed to the pesticide aware of the hazards.

If the above measures are ineffective, you can escalate the efforts from a battle to an all-out war. Contact your Building Manager. The Building Manager may contact the Facilities Department at ext. 2207 to request that the area be sprayed. Spraying is usually done on a Saturday. Afterwards, the building is closed for six hours.

Although the type of ants found here pose no threat to physical health, they may cause you to go a bit bonkers. You may develop an obsession with outwitting the ubiquitous little critters which have brains the size of Z particles. Ants have been known to reduce normally competent people to uncontrollable fits of ant smashing. You may want to invest in a very small white flag to wave at the ants just in case the battle takes a turn for the worse.

—Melinda Saltzberg

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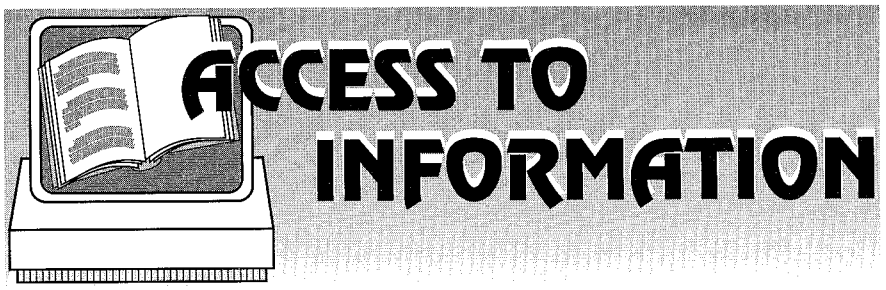


Software Piracy—A Crime of Our Times

ON OCTOBER 8, CONGRESS passed a bill that imposes criminal sanctions in cases of willful violation of software copyright for private financial gain. For instance, a person who makes more than ten copies of one or more copyrighted works with a retail value of more than $2500 during any 180-day period shall be imprisoned not more than 5 years or fined not more than $250,000 or both. This bill is currently waiting for President Bush's signature.

Sometime around 1986 an employee at a DOE lab was rumored to have noticed other staff members freely copying software he had purchased. He reported the situation to the software vendor. As a result, the DOE held a surprise search and found a couple hundred illegal copies on site. The DOE fined the individuals and the lab several thousand dollars per illegal copy.

Sounds severe, you say? This story may or may not be true, but it is a matter of public record that substantial fines have been levied by the courts for software piracy. For example, in 1989 Facts On File, Inc., agreed to pay Ashton-Tate, et al., more than $100,000 for software copyright infringement.

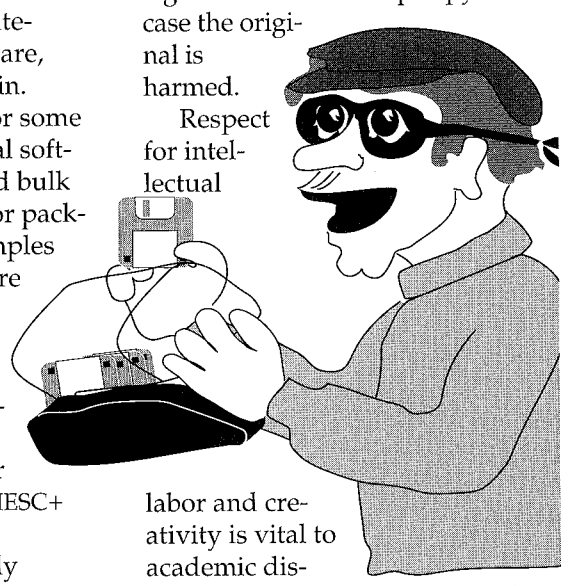
Unless software has been explicitly placed in the public domain, software is protected by copyright law. The owner of a copyright holds exclusive right to the reproduction and distribution of their work. Different owners establish widely varying rules, though software generally falls into one of four different categories: commercial, shareware, freeware, and public domain.

To reduce SLAC's cost for some commonly used commercial software, the lab has negotiated bulk purchases (i.e., *n* licenses for package *x*) or site licenses. Examples of bulk-purchase licenses are PC/TCP to connect PCs to the Ethernet™ and co-Xist to provide the X Window System™ on NeXTs. Examples of site licenses are the Maple interactive computer algebra system and IBM's HESC+ software.

Some authors specifically encourage you to copy and distribute to others their copyrighted packages as shareware or freeware. If you use shareware, the authors, in return, generally request some payment. Examples are DOS's PKZIP for file compression and Stuart, a NeXTSTEP DEC vt100 emulator. Examples of freeware (software usually available over the network for free) are the VM SEARCH4 program and the UNIX® "elm" mail program.

Freeware is contributed by the author to the public domain so it may be shared freely. The copyright rights have been relinquished, though acknowledgment of the authors is usual. Since March 1, 1989, when the United States started adhering to the Berne Convention, software in the public domain must be explicitly noted as such. An example is VM's XCOMPARE.

When you buy software, you acquire a license to use the code from the owner of the copyright. You do not own the code. If your software comes with a license agreement, read it carefully. The license often restricts use of a package to a specific computer. In other cases it may be legal to loan the software you've bought to a friend temporarily, as long as you are not running it during that time. Unless the software is copy-protected, it is legal to make a backup copy in case the original is harmed.



Respect for intellectual labor and creativity is vital to academic discourse and enterprise. The academic community especially does not tolerate plagiarism. Unauthorized copying of software is a form of plagiarism. A Stanford University policy explicitly states: unlawful software copying is not permitted. Sanctions are likely to entail restitution to the copyright owner and may be as severe as termination of employment. If you have any questions about the licensing rules and availability of software you want to use at SLAC, check with the SCS Help Desk (ext. 2406) in the Computation Center first floor lobby.

—*Joan Winters*

Parts of this article are derived with permission from "Using Software: A Guide to the Ethical and Legal Use of Software for Members of the Academic Community," EDUCOM and ITAA (1992). Another source was "Copying of Computer Software," Guide Memo 62 (1987) in the Stanford University Administrative Guide.

RETIRING: Ken Johnson...

PULLING CABLES for a physics experiment is a thankless task, even though the cables are the arteries and nerves of any experiment. The last cables can never be hooked up until the final item of beam-line apparatus is in place. All the delays and schedule slips accumulate until there isn't enough time to finish cable plant installation without working nights and weekends. There is great pressure to finish so the experiment can start and not lose precious running time.

After thirty years of this pressure and thousands of miles of cables pulled (with the help of a talented cast of thousands, of course), Ken Johnson is ready for a change. He accepted the "golden handshake" and retired July 31.

Ken was born and raised in Boston where he absorbed the local accent and the Swedish work ethic from his parents. As a boy, along with his brothers, he was a professional singer—a choir boy in a large church. In those depression years, the money earned by their singing helped pay family expenses. As a teenager, Ken studied piano at the New England Conservatory of Music. As a result, he has had a life-long interest in music. For a time, he led an orchestra, playing in the Boston area. His current interest is in MIDI-created music.

Fred Hall enticed Ken away from Boston to come to SLAC in 1962, where he was assigned to the Beam Switchyard Ad Hoc group and was responsible for the design and installation of the BSY cable plant. After that, he joined Research Group A and was responsible for the spectrometer cable plant. He then moved to RAD (now EFD) to head the Electrical Installation Group.

Ken believes strongly in the closeness of family and in community involvement. He has four sons, four daughters, and a grandson. When his sons joined the Boy Scouts, Ken joined too. He has received several awards in recognition of his contributions to Scouting and is still active in the organization.

After retirement, Ken expects to return occasionally to help complete work he started, and to continue writing articles for a technical magazine. He would like to spend more time playing the piano, which may lead to greater involvement with music. And, of course, he intends to continue with his Boy Scout activities. We wish you continued success, Ken.

—Roger Gearhart and Herb Weidner

...Evaughn Lewis

EVAUGHN LEWIS, A NATIVE of Guthrie, Oklahoma, signed on at SLAC in December 1968 as a scanner, one of that band of talented sharp-eyed people who gazed at thousands of miles of bubble chamber film, trying to spot "significant events." After several years of finding form and patterns where others saw just confusion, Evaughn moved on to the Library.

Georgia Row

As Circulation Specialist, she supervised the checking out and checking in of nearly 10,000 items each year, made sure the shelvers kept the books and reports in apple-pie order, and was responsible for the daily morning sweep through the library to reshelve and tidy up all the journal volumes and books left behind by diligent night visitors. She also checked in the stream of weekly, monthly, and quarterly issues of 700 journal titles, copied tables of contents, and routed journal issues along the way.

For years, the first voice on the library phone was the friendly answer of Evaughn or one of the many student assistants she trained.

Her colleagues all knew that when a signature on a circulation card was illegible or a book seemed to have disappeared, Evaughn's sharp "scanner" eyes would quickly solve the problem.

About 50 colleagues, friends and her three children recently honored Evaughn at a Sector 6 party mourning her retirement. They all agreed that the library won't be the same without her.

Evaughn now lives in North Highland, California. Now that she has retired, she will have more time to spend with her four grandchildren. (Yes, unbelievably, Evaughn is a grandmother!)

—Louise Addis, Arsella Raman, Georgia Row

EVENTS: Nov.–Dec. 1992

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@SLACVM.

November 12, Noon
21st Annual SLAC Run
Klystron Gallery Road
E. Derr

November 10–14
APS Particles & Fields
Batavia

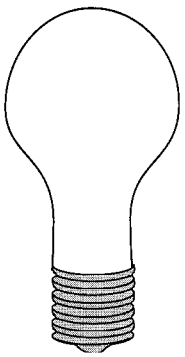
November 15–16
HEPAP Meeting
Batavia

November 17–18
Health Fair
Auditorium/Lobby/Breezeway
M. Arnold

December 1
100th Anniversary
Physics Dept., U of Chicago

December 22, 9 AM–4 PM
SUBB Mobile Blood Drive
Auditorium Lobby

Energy Awareness on the Job



IN LIGHT of the fact that October was Energy Awareness month, we encourage everyone to be energy thrifty: turn off the lights when you leave a room, and turn off computers, printers, and other energy-using devices when they are not being used. Send your suggestions about energy conservation to Bud Simpson, MS 3.

KNIGHTHOOD FLOWERS ON VM

KNIGHTHOOD ISN'T DEAD YET, not even in this country! Recently Chuck Boeheim and Cathie Dager, both of Computing Services, were inducted into the Order of Knights of VM. The occasion was VM's twentieth birthday party at SHARE, an organization of users of large IBM systems, in Atlanta, Georgia.

Cathie was inducted into the Order as Dame Cathie the Symposiarch in recognition for initiating and organizing the REXX Symposium in 1991 in conjunction with Bebo White and Dave Gomberg (see "Symposium Proves REXX Success," *Interaction Point*, August 1991).

Chuck was inducted into the Order as Sir Chuck the Generator of Design APARs. APARs are IBM bug reports, that is, reports of software malfunctions.

Knighted in previous years were JoAnn Malina as Dame JoAnn the Alopecoid and Dick Johnson as Sir Richard the Innovator in 1987, and Ted Johnston as Sir Ted the Assembler in 1982. Dick Johnson left SLAC for IBM several years ago.

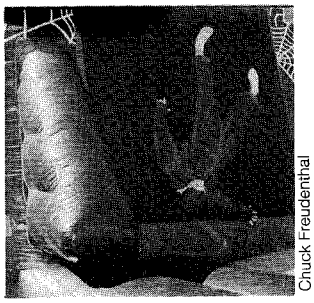
Chuck Boeheim, currently deputy manager of SHARE's VM group, has received three other SHARE awards. He received the Share Book Award in 1988, and the Cardcase Award in 1990 and again in 1992. —*Ilse Vinson*

Welcome Guests and New Employees

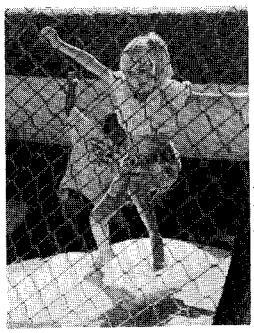
David Atwood, Theory; **William Colocho,** Accelerator Operations; **Evgueni Babenko,** Accelerator Department, SLC; **Michael Boulware,** Theory; **Alexander Kagan,** Theory; **Joseph Kenny,** Environment, Safety & Health, Safety; **Andrew Lee,** Theory; **Patrick Lui,** Business Services Division; **E. Lazarus Marhenke,** Experimental Group I; **Joseph Ormonde,** SSRL, Facilities Plant; **Wai-Keung Tang,** Theory; **Alan Sommerer,** Theory; **Alexei Tolstykh,** Group C; **Dmitri Villevald,** Group C; **Ann Williamson,** SSRL, AROD Management & Planning.

Georgia Row

Georgia Row



Chuck Freudenthal

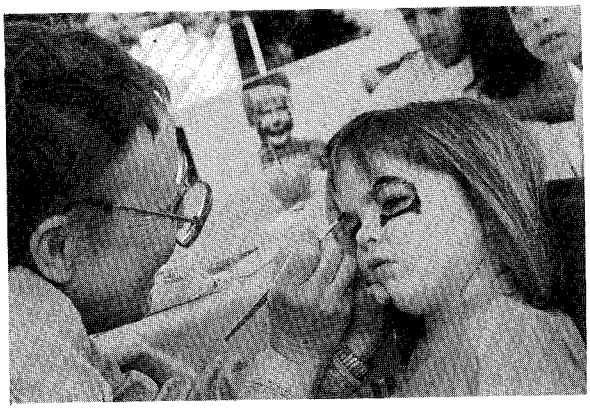


Chuck Freudenthal

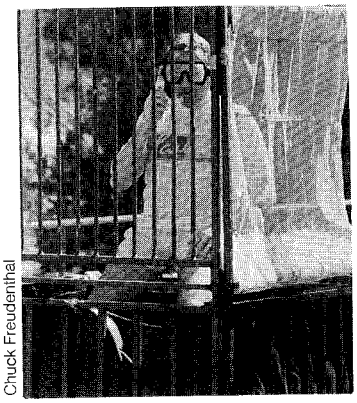
FAMILY DAY 1992

IF YOU DIDN'T MAKE IT ON October 3, here's what you missed: perfect weather, friendly faces, free food, cheap beer, good-looking t-shirts, games of skill, games of chance, watermelon eating, palm readers, cotton candy, balloons, a clown who made the kids laugh, Popsicles, face painting, a dunk tank, a Velcro wall for human flies, bouncing kids, excellent music, and general all-around fun.

Good news for anyone who wants a t-shirt but couldn't be there: the shirts, commemorating our thirty-year history, are available for $6 each from Bernie Lighthouse at ext. 2358.



Chuck Freudenthal



Chuck Freudenthal