The Interaction Point

Events and Happenings
in the SLAC Community
March 1993, Vol. 4, No. 3

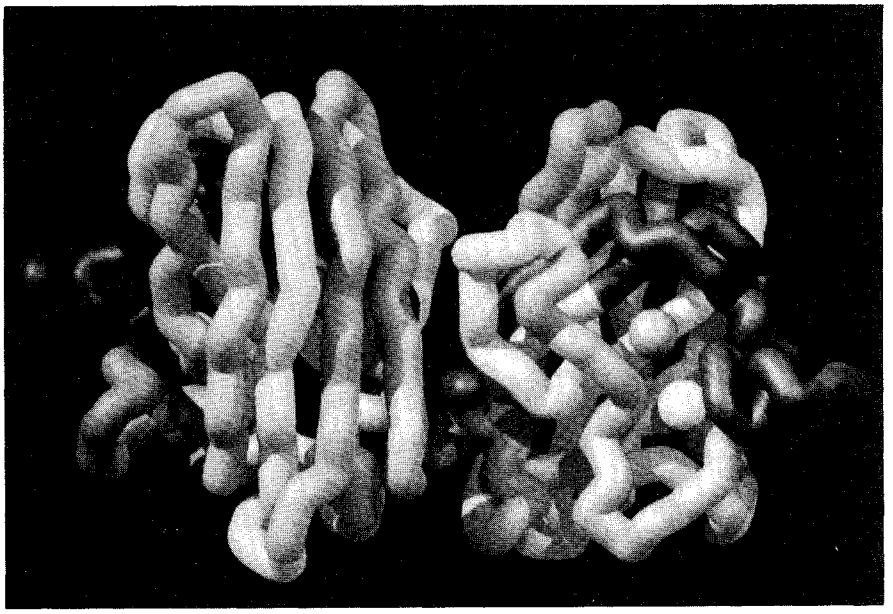
LOU GEHRIG'S DISEASE ENZYME STRUCTURE REVEALED

by Cynthia Mills

X-RAYS PRODUCED BY the Stanford Synchrotron Radiation Laboratory (SSRL) are bringing medicine a shade closer to a cure for Lou Gehrig's disease, and perhaps for cancer as well.

Using synchrotron radiation, researchers have revealed the structure of superoxide dismutase, or SOD, the enzyme recently discovered to be defective in patients with Amyotrophic Lateral Sclerosis, or Lou Gehrig's disease (named after the famous New York Yankee baseball star).

Knowing the structure of SOD may also prove to be important in the treatment of cancer and schistosomiasis, a disease affecting 200 million people in tropical countries every year.



John A. Tainer, Ph.D., Scripps Research Institute

Model of the normal superoxide dismutase (SOD) based on x-ray crystallography studies. The dark spots tell the crystallographers where certain atoms are in the protein, and the researchers deduce the structure from their positions.

"We solved the structures of natural SOD and of several of its mutations," says John Tainer of Scripps Research Institute in San Diego. "Knowing the structure helps to determine how it functions. We got nice results that will help us understand the defects that lead to Lou Gehrig's disease."

This is the same disease that affects physicist Steven Hawking. A defective gene causes the slow death of nerve and muscle cells. Patients gradually lose strength, and usually die within three to seven years.

The discovery that the defective gene responsible for Lou Gehrig's disease was the gene coding for the enzyme SOD excited many scientists, because the enzyme is a familiar one. The result was reported this March in *Nature* by teams led by Robert Horvitz of MIT and Teepu Siddique of Northwestern University.

SOD has long been recognized as the enzyme responsible for cleaning up free radicals, which are molecules with extra electrons that damage the inside of a cell as indiscriminately as a bull does damage in a china shop. In Lou Gehrig's disease, the cells that suffer are the nerve cells that turn on muscles. When the nerve cells die, the muscle cells lose their source of stimulation and also die. The patient becomes weaker and thinner, ultimately losing the ability to breathe.

The same enzyme protects other cells from such damage as well, but this function is more critical in some cells than others. Cancer cells have less ability to repair this damage than normal cells. Radiation and some anticancer drugs work by inducing production of free radicals. Because the cancer

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cells are less efficient at cleaning up the resulting damage, they die sooner than normal cells. "By using drugs to interfere with SOD we can further sensitize the cancer cells to radiation damage," says Tainer. "Right now a patient may get thirty radiation treatments; by inhibiting SOD we hope to increase the effectiveness of these treatments."

Developing a drug that blocks the enzyme depends a lot on finding its structure. Proteins are lumpy blobs with regions that react with their target molecules, in this case, free radicals. The reacting areas look like slots or grooves tucked in the blob. "By altering existing drugs we can make one that best fits the shape of the steep groove (in SOD) and blocks it," says Tainer.

The Scripps researchers hope that diseases caused by microscopic parasites like schiztosomiasis can also be treated by blocking this enzyme. Schiztosomiasis is a one-celled parasite that attacks red blood cells. By finding a drug to block its SOD, the parasite should become more susceptible to other treatments. "Treating this disease is not a priority in this country, but if we can find a drug that blocks a cancer cell's SOD, it might be just a quick side trip to alter it to block the parasite's SOD," says Tainer.

In the case of Lou Gehrig's disease, blocking the enzyme may not be the answer. So far, no one knows what the defective SOD looks like, or how it causes the death of nerve and muscle cells. Just replacing it with healthy SOD will not be easy, because it is a large protein and there is no simple way to get it into the nerve cells. Studying the structure of the SOD produced by the defective gene may reveal why the enzyme doesn't work so well. Knowing this structure may also suggest a way to make it work better without having to replace it.

SSRL is important in this research because of the intensity of its x-ray beams. "What takes us five hours at SSRL would take us five hundred hours using x-rays available here at Scripps," says Tainer.

Tainer, Hans Parge, and Elizabeth Getzoff bring proteins from Scripps twice a year to study at SSRL. Using a method called x-ray crystallography, they study the pattern the beam makes after reflecting off protein crystals. The reflections make a picture on a computer screen that looks like a paper cutout of a snowflake. The dark spots indicate where certain atoms are located in the protein, and the researchers deduce its structure from these positions.

But proteins, being large and irregularly shaped, make lousy crystals. "The difficulty of making good quality crystals out of proteins is one of the barriers in our research," says Tainer. "SSRL x-rays, having brightness a hundred-fold higher than regular x-rays help us get around that barrier. We can do things on smaller crystals, and we don't have to have as many."

Picturing the structure of the normal and abnormal enzyme is just the beginning. Cures for cancer and Lou Gehrig's disease are still a long way off, warns Tainer. Then he adds, "We have an advantage right now in that we already know the structure of human SOD. You can thank SSRL for that."

Welcome Guests and New Employees

Sarah Jones, Purchasing; **John D'Haveloose,** Plant Engineering; **Nancy Hendry,** Research Division; **Yoshihito Iwasaki,** Experimental Group B; **Shigeru Kuroda,** Technical Division; **Huibin Lan,** Experimental Group C; **Chien-Shuo Liu,** Plant Engineering; **Haiming Liu,** Experimental Group C; **Karen McClenahan,** Personnel; **Alexander Mikhailichenko,** Theory and Special Projects/Experimental Group I; **Ester Ruiz-Morales,** Theory; **Angela Seymour,** Technical Division; **Fang Tian,** Accelerator Division; **Shaoqiang Zhang,** Experimental Group C.

1993 UNIVERSITY HOLIDAYS

THE DATES FOR the observance of the designated University holidays in 1993 are as follows:

New Year's Day '93	Friday	January 1
M.L. King Day	Monday	January 18
Presidents' Day	Monday	February 15
Memorial Day	Monday	May 31
Independence Day	Monday	July 5
Labor Day	Monday	September 6
Thanksgiving	Thurs./Fri.	November 25–26
Christmas	Thurs./Fri.	December 23–24
New Year's '94	Friday	December 31, 1993
Birthday Holiday		

The Birthday Holiday may be taken on the employee's birthday or any other work day mutually agreed upon by the supervisor and the staff member which falls within 365 days following the employee's birthday.

Call for Proposals

PERSONNEL EXCHANGES AND SPIN-OFF COLLABORATIONS

THE DEPARTMENT OF Energy's office of Energy Research (ER) recently issued a call for proposals for personnel exchanges and technology collaborations between laboratories and industry or universities. SLAC is eligible for these FY 93–FY 95 funds. To summarize the DOE invitation for proposals:

DOE anticipates it will provide to each program-dedicated laboratory (including SLAC) a total of $500,000 to support small spin-off collaborations and personnel exchanges in FY 93–FY 95. There is no prescribed funding breakout for activities within the funding cap of $500,000.

Small spin-off Cooperative Research and Development Agreements (CRADAs)—particularly with small business—will be supported to develop contacts and collaborations between the ER program-dedicated laboratories and new private sector partners.

Small personnel exchanges bring industry or university scientists into the DOE laboratories and allow DOE scientists to spend time at the company's or university's laboratory. The purpose is to initiate new interactions between DOE laboratories and the US private sector involving technology transfer.

The proposed projects are not subject to an ER peer review process. The laboratory will provide a one-page project summary. DOE headquarters approval or rejection will be returned within five working days.

Of course, things are never quite so simple in reality. But this time it is simpler than usual. Typical evaluation criteria include:

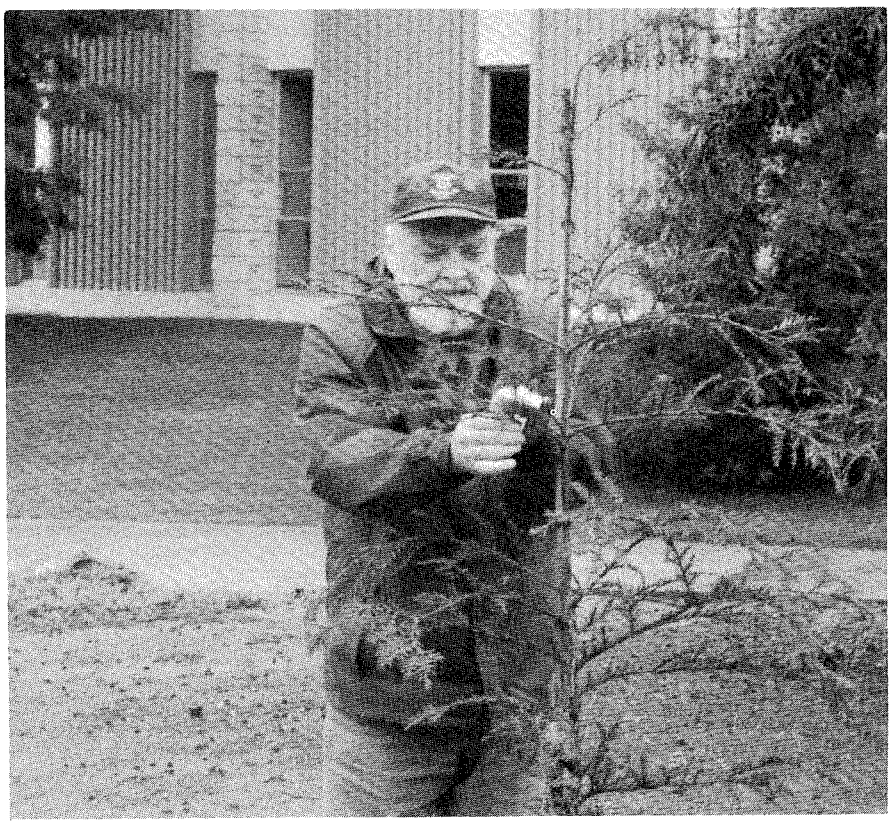
- Scientific merit
- Potential for technology transfer
- Use of unique lab capabilities
- Company's previous work with the lab
- Length of the exchange (preferably six months or longer)
- Level of cost sharing
- Small business
- US location and manufacturing
- One- or two-way exchange

Proposals need to be submitted in March. However, because several years of anticipated funding are involved, future calls for proposal are expected. So consider the funding possibilities for your project—if not for this call, then for the next.

Personnel exchanges and collaborations with industry are only two methods of transferring the results of SLAC research to the public. Consulting by individuals or the laboratory as a whole, cost-shared R&D agreements, use of facilities, and publications are some of the other methods that are all part of the natural and inevitable process of turning knowledge into applications. If you are working on a new device that might be of use outside the lab or is just incredibly novel and slick, have written software that industry or the consumer might find useful, or want to know more about the above opportunity for funding, contact Jim Simpson at ext. 2213 or send e-mail to JSIMPSON@SLACVM.

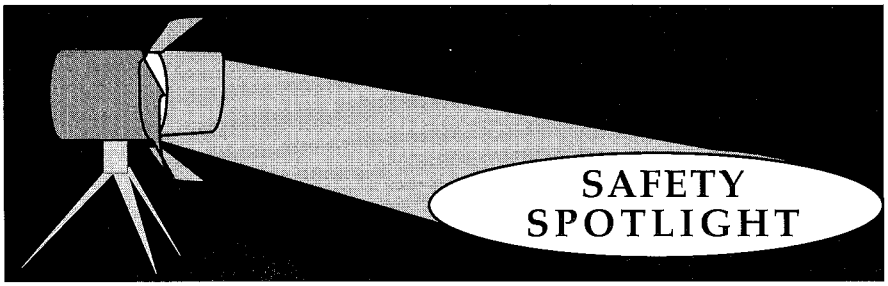
—Jim Simpson

SEMPERVIRENS (var. Bill Kirk)



P.A. Moore

*Bill Kirk adjusts the young coast redwood tree (*Sequoia sempervirens, var. Aptos blue*) planted by his friends to honor his thirty-six years of service to the laboratory on the occasion of his retirement in February. The tree is located near the parking lot between the Central Lab and Central Lab Annex.*



FILMS LIVEN UP TRAINING

MAKE YOUR NEXT SAFETY MEETING more memorable by combining a video with a discussion of how the information presented can be applied at SLAC. Training researchers have found that people are four times as likely to remember something which is presented in a visual format as the same information presented orally. This bit of sound advice gave rise to the old adage "A picture is worth a thousand words."

Sound Advice is easy to find at SLAC; you just need to know where to look. *Sound Advice (Hearing Conservation)* is just one of the dozens of films listed in the ES&H Training Resources Index and Catalog, and are readily available from the ES&H Training Department. This index and catalog is in the TRAINING VM account in the file named ON-SITE VIDEOS. Or you may contact Dennice Renderos of the Safety & Training Department, ext. 2688, to request a hard copy of this list. The list includes a brief description of each film, its length, and target audience. It can help you locate just the right material to enhance a departmental safety meeting.

The list covers a wide range of topics, including chemical hazards, electrical safety, fire safety, disaster preparedness, forklift safety, laser safety, repetitive motion injury, respirator safety, and much more. But if you can't find the right fit from the SLAC collection, the Safety & Training Department will gladly help you look for what you need from alternative sources. One such alternative source is the California Safety Council through which the Safety & Training Department has access to hundreds of additional titles. The only cost for using this service is the cost of shipping (less than $20.00). The list of titles available from the California Safety Council can be found in the TRAINING VM account in the file named RENTAL VIDEOS.

If you need assistance accessing either of these VM accounts, please contact Ruth McDunn, ext. 3054, or Rod Hiemstra, ext. 3662.

—*Melinda Saltzberg*

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EVENT CALENDAR: April–May 1993

All meetings are held in the Orange Room, unless another location is listed. Larger meetings and conferences have a contact listed. Please notify the Public Affairs Office of any additions or changes by calling ext. 2204 or sending e-mail to NINA@SLACVM.

April 1, 9 AM
SLUO Executive Committee
Green Room

April 3, 10 AM
Gerry Fischer Memorial Service
Auditorium

April 6–7
DOE Interlab Business Managers
Buck Estate
E.B. Rickansrud

April 9–10
SPC Meeting

April 12–16
SLD Week

April 12–16
Joint AAPT/APS Meeting
Washington, DC

April 15
APS Executive Board Meeting
Washington, DC

April 16
APS Council Meeting
Washington, DC

April 16
BES Collaboration Meeting

April 24
IEEE Microwave Course
Auditorium

April 26–30
Second International Linear e^+e^- Collider Workshop
Waikoloa, Hawaii
F. Harris
University of Hawaii

ACCESS TO INFORMATION

Introducing the SCS Help Desk

HELP FOR COMPUTER USERS

Georgia Row

Some of the friendly faces you may see lending support to the SCS Help Desk are, left to right, back row: Billie Bennett, Cesar Medel, Sasha Chapman; front row: Naomi Brandt, Sharel Gomez, Dave Marcello.

OVER THE PAST several months the SLAC Computing Services (SCS) Service Desk has undergone a major renovation. Our organizational charter has changed to provide "one-stop shopping," a transparent single point of reference, when enlisting the services of SCS. To more accurately reflect the level of service we provide to the SLAC user community, we have changed our name to the SCS Help Desk.

In order to process your request in a more timely and effective manner, we have installed two phone lines to coordinate and expedite all of your needs.

Extension 4357 (HELP)

Call this number for help with all hardware/network installations and trouble calls, troubleshooting, ordering, and consulting and coordination.

Extension 2406

Use this number to get help with software, product forums, end-user support groups, reel/cartridge media processing and data base support, user accounts, documentation, and user training/consultation.

With the help of voice mail and PacTel pagers, we have expanded our support level to cover both routine and critical laboratory needs 24 hours-a-day, 7 days-a-week, including university holidays. The Help Desk is staffed Monday through Friday from 8 AM to 5 PM. After-hours voice mail will forward your request to our On-Call Coordinator, who will respond to you within 15 minutes.

This year we will continue to enhance and fine-tune the existing support structure to support advances in technology and to meet the growing needs of our user community. We welcome your suggestions and seek your input in helping us expand services to you. To find out more about our organization, please stop by and visit the SCS lobby HELP DESK, just inside Building 50's front-doors, or send e-mail to Sandra@SLACVM.

—Sandra Crawford

VOICE MAIL TIME-SAVER TIP

IF YOU NEED to get a message to someone quickly, yet not actually talk to them, the Express Messaging feature of voice mail could be the answer for you.

Express Messaging lets you send a message to another SLAC voice mail mailbox without logging in to your mailbox to compose and send the message.

Just follow these easy steps:

1. Dial Express Messaging, ext. 4555, and follow the prompts.
2. You will hear "Express Messaging. To mailbox?" Enter the extension number of the person you want to leave a message for, followed by # (pound sign).
3. You will hear "Please leave a message after the tone."
4. After the prompt and record tone, leave your message. Hang up when you are finished.

NOTE: Express Messaging can only be used to send a message to one mailbox at a time and only to those people who have voice mail at SLAC.

—Dona Jones

Another Use for SSRL X-Rays

SEMICONDUCTORS: DESIGNING THE FUTURE

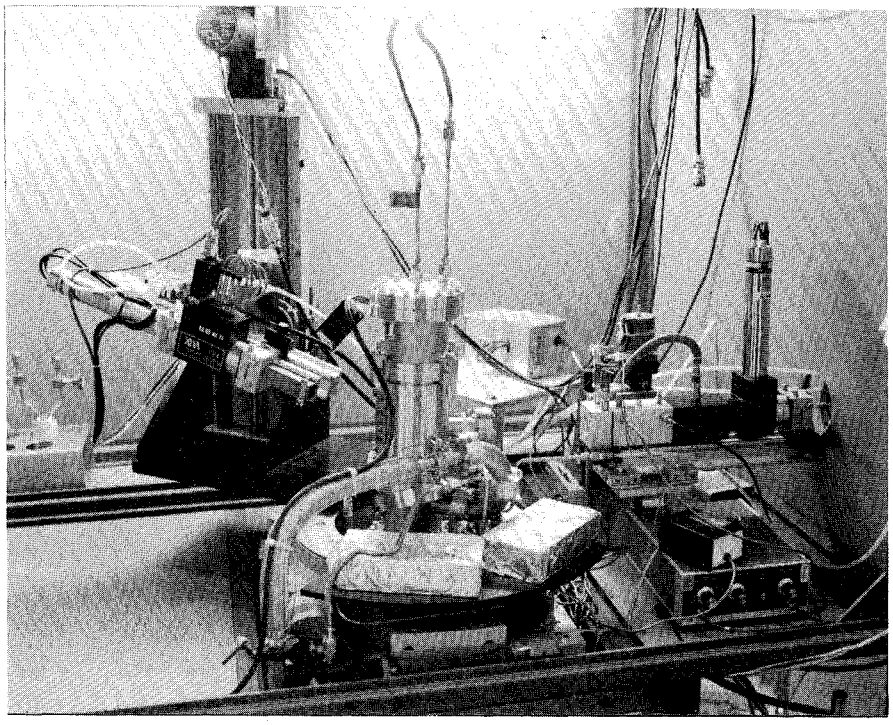
IF YOU'RE LIKE MOST people, one of life's conveniences is also the source of one of life's annoyances. When you find yourself counting the time it takes for your computer to open a file, or the time it takes to put through a call to your grandmother, you are waiting for semiconductors to do their job. These annoyances are due to the limits of today's semiconductor technology. The pressure is on for hardware to become smaller, faster, and more power-efficient.

The ultimate answer will be circuits and wires built molecule-by-molecule. Semiconductors at this scale will have to be nearly flawless.

There's the rub. Almost all that materials science, the field that used to be called solid-state physics, knows about crystal formation is based on theory. Toput it into perspective, we use football as an analogy. We know how big the field is, and we know who the players are, but we don't have an offensive strategy.

The field is the semiconductor chip. The players are the molecules layered onto the chip. Designing an offensive strategy requires knowing a lot more about the players and how they play, so that each plays in its best position.

The intense x-ray beams generated by the Stanford Synchrotron Radiation Laboratory are being used for the play-by-play. Sean Brennan of SSRL, along with David Kisker of IBM Watson Labs, and Paul Fuoss of Bell Labs are bouncing x-rays off gallium arsenide crystals as they are being formed by chemical vapor deposition. The reflected x-rays give them a view of how the atoms and molecules line up in a semiconductor.



Chemical vapor deposition system in use at SSRL. This apparatus was developed by AT&T, IBM and SSRL to study the epitaxial growth of gallium arsenide. X-rays enter from the right, pass through the growth chamber, and are detected by the angled output section on the left.

The semiconductor is usually a crystal, which means the molecules line up in a regularly repeating formation, or lattice. The more ordered the crystal, the faster and more resistance-free is the current that goes through.

Chemical vapor deposition is just one way to make a crystal. The process, says Fuoss, is simply, "Mix two gases, make a thin film." Hydrogen is bubbled through solutions of gallium and arsenic attached to organic molecules, launching the molecules into the hydrogen, like champagne bubbles that tickle your nose. The vaporized molecules mix and react to form gallium arsenide, and then they float over to a target and form a thin crystalline film.

"The real question is, what happens during the growth of a crystal," says Fuoss. "The theories we use to describe crystal growth date back to the 1950s. It is only now that the experimental end has caught up enough to test the theoretical ideas."

This is where the x-rays come in. They can be used to check the molecular line-up as the crystals are formed. Their wavelengths are small enough to get between molecules, and they don't mind working while the molecules are being laid down. This way the scientists can change the conditions while crystals are being formed and see what happens, and perhaps find a way to achieve the smoothest, most orderly structures.

It sounds easy, but it is not. Imagine you are riding in a moving

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(Cont'd. from p. 6)

car and trying to take a photograph of a flying bird using a telephoto lens. That is how hard it is for Brennan and his co-workers to take aim at their target. The x-ray beams are the size of a needle, and the target is a semiconductor chip 1/4-inch square. The beams can shift and the target can rotate in several directions. Lining them all up to get the exact angle of refraction, where all the x-rays reflect off the surface of the crystal, can take hours of beam time. When they finally get it, and the computer graph shows a sharp symmetrical peak, it's breathtaking.

The peaks show where the atoms are in the crystal lattice. Within a certain range, the positions of peaks gives the distance between the atoms. How high and sharp the peaks are gives the number of atoms and the smoothness of the crystal—just like shining a flashlight off the polished side of aluminum foil gives a sharper, brighter reflection than shining it off the rough side.

Surface roughness can make or break a semiconductor crystal; if it is too rough, it won't conduct current efficiently. This roughness can come and go as the surface is forming, and it can be controlled by conditions such as temperature.

Fuoss compares it to water hitting a window. If the water is a fine mist, at first there are a lot of little drops; then, as more water falls the drops get bigger and finally coalesce into a smooth sheet. If the water is cold, as in freezing rain, the drops don't have enough energy to move once they hit the window, and they clump up. Eventually a sheet is formed, but it is bumpy.

The research at SSRL is directed at a growth regime where the little drops form islands and the islands coalesce into a single sheet of atoms before enough atoms have arrived to form a second layer on top of the islands. This regime is known as "layer-by-layer" growth. Determining the size and shape of these islands, and finding out how to make sure they form as a smooth, coordinated team, is the aim of the work at SSRL.

The researchers are still learning the game by watching; they haven't quite gotten to the coaching stage, yet. Fuoss figures they are developing intuition. "Basic science in this case is testing whether ideas are right, and building intuition—so that when we try to push our techniques further, intuition, knowing what to expect, is improved." —*Cynthia Mills*

Let the library do the TeXing for you!

MEET OUR PREPRINT BULLETIN BOARDS

YOU MAY HAVE READ the February 26 article in *Science Magazine* about the great change taking place in physics preprint distribution, i.e., through e-mail bulletin boards. If you haven't, just visit one of the current news bulletin boards (the nonelectronic kind) which the SLAC Library maintains in the Central Lab or the Computer Building and take a look at the posted article.

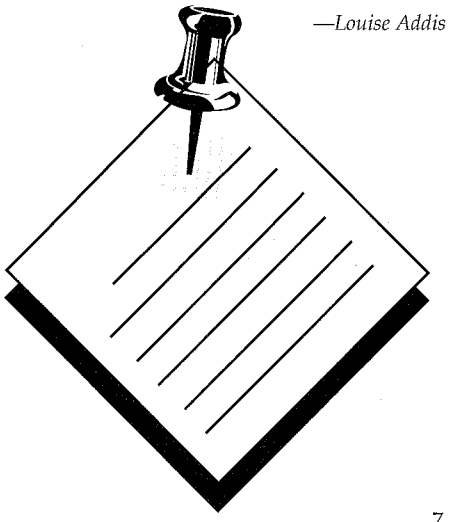
The SLAC Library has been capturing papers from electronic TeX bulletin boards for over a year. In fact, in 1992, over 2200 out of a total of 8188 preprints had a bulletin board source; but last week, 98 out of 160 preprints were from bulletin boards and that shows you where things are heading!

Tina Neubert is our TeX expert who takes the raw TeX and makes it into a readable paper. Since a significant number of bulletin board preprints omit figures, they must often be requested separately via e-mail. Tina does all that and when a preprint appears on the weekly display in the library, you can be sure it has all its figures included.

The library watches HEP-TH (string theory, etc.), HEP-PH (phenomenology), HEP-LAT (lattice), and several others. If you're in a hurry for a preprint you've seen on a bulletin board, just call ext. 2411 or e-mail LIBCIRC@SLACVM, and give us the bulletin board and number. We'll rush it to you. If you're a regular user of the SPIRES-HEP database, you've noticed that the bulletin board numbers are shown with the rest of the bibliographic information. If you issue the command SET FORMAT FULL, you'll be able to see the full abstract.

The library is also sponsoring a pilot program for viewing the full text of these papers online through the World Wide Web. If you'd like to see a demonstration or just learn more about using HEP or the WEB to access bulletin board papers, stop by the library (Central Lab, Y215) and ask for a reference librarian.

—*Louise Addis*



Klaisner Assumes Additional Responsibilities

IN ADDITION to serving as Assistant Director of the Technical Division for Electrical Systems, Lowell Klaisner is now responsible for Mechanical Systems. Since Norm Dean's death last July, Kay Lathrop had shouldered the responsibilities for supervising Mechanical Engineering and Alignment, Mechanical Design, Mechanical Fabrication, Vacuum, and Plant Engineering. With his new assignment, Lowell will be responsible for these departments as well as Klystron/Microwave and Power Conversion.

The Mechanical Engineering shop has been eliminated and the engineers assigned to line organizations. The Machine Operations Support Group has been renamed the Mechanical Support Group and will continue to provide mechanical engineering and project management in support of the ongoing operation of the accelerator. Alex Harvey was the acting head of this group until his departure for the SSC at the beginning of March; a search is underway for a new head for this group.

Lowell graduated from Stanford University in 1961 with an MSEE and promptly started his career in Accelerator Engineering at the ZGS at Argonne National Laboratory in Argonne, IL. From the ZGS, Lowell moved to Fermi National Accelerator Laboratory, Batavia, IL, where he was chief engineer for the Booster Synchrotron. Then he and two associates formed Kinetic Systems Corporation which manufactured control systems based on the CAMAC standard. He moved to the Northwest where he managed engineering groups providing instrumentation for the Space Shuttle and then bar code systems. He joined SLAC in April 1989 as head of the Electronics Department.

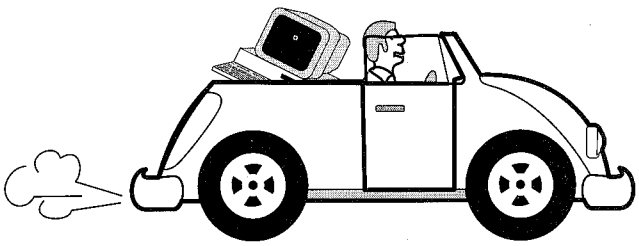
Lowell Klaisner, recently appointed head of Mechanical Systems.

TAKING COMPUTER EQUIPMENT HOME

DO YOU NEED to take a computer and modem home to do your work? Whether for an evening or for a year, taking government property home (or anywhere off SLAC property) requires the following procedure:

Taking the equipment home

1. Complete Form 37026, known as an "off-site use form." You can get a form from your department's secretary or from Property Control, ext. 2231. Several pieces of equipment can be listed on one form. The form must be signed by you and your supervisor or department head.
2. Make two copies of the form.
3. Send the original signed form to Property Control, MS 85A.
4. Give one copy to the guard at the main gate on your way home with the equipment.



5. Keep the other copy in your department's files.

Returning the equipment

When you return the equipment to SLAC, date and sign the "property returned" section of the Form 37026 on file in your department. Mail the signed copy to Property Control, MS 85A.

Keeping the equipment more than a year

If you have not returned the equipment in a year, someone from Property Control will contact you to verify its location and condition. Keeping the equipment longer than a year requires that you and your supervisor or department head sign a new Form 37026. Property Control prepares a new form for you as a courtesy and sends it to you. Please return the form signed by you and your supervisor or department head to Property Control promptly! You do not have to give a copy of the new form to the gate guard.

Questions

If you have questions about the procedure or completing Form 37026, call Property Control, ext. 2231, or send e-mail to MBPACE@SLAC.STANFORD.EDU.

—Sandra Crawford

COMPEN$ATION AND CLASSIFICATIONS

KAREN CAMPBELL, SLAC's Manager of Compensation, provided an overview of SLAC's compensation program in a noontime talk sponsored by the Women's Interchange at SLAC (WIS). Karen has worked at SLAC for almost two years, after 15 years in Central Compensation on campus. The other person in the Compensation section is Carol Bechtel; their offices are in the Personnel Department in the A&E Building.

"Compensation" is the pay we receive regularly for working. The amount of compensation is set based on several criteria: market rates (so SLAC can recruit and retain people), internal equity, legal requirements, and budget constraints.

Karen Campbell and Carol Bechtel staff the Compensation Office at SLAC. Karen Campbell, ext. 2298, and Carol Bechtel, ext. 2365, are always available to discuss a particular situation in a private appointment.

In concert with the campus Compensation staff, SLAC's Compensation staff creates, modifies, and administers pay structures and the job classification system; writes policies, guidelines, and procedures; and carries out analytical studies. They maintain professional relationships with other local employers and the Department of Energy.

The many types of jobs at SLAC are grouped into categories called Job Families, each with associated pay structures. The comprehensive description of all job classifications at Stanford is called The Pay Plan. One copy is kept in the Library for anyone to read. Copies can also be found in Compensation and in other SLAC administrative offices.

A Job Classification Code (JCC) is assigned when a job is created. The following criteria determine the JCC for each job and its relative position in the hierarchy of jobs and pay range: characteristic work, level of responsibility, complexity, scope, impact, independence, technical skills, accountability, and education required.

If you know that your job has changed considerably in one or more of these aspects then you can start the lengthy process called reclassification, the goal of which is to move your job into a different JCC and pay range. Karen described a typical reclassification process that starts with a written request from an employee's supervisor, which is then passed up the management line to the appropriate Associate Director. Compensation reviews the request, interviews the employee and supervisor, and sends a recommendation to the Salary Review Committee. Standing Committees review technical jobs and advise Compensation. The process now takes several months; Compensation is working to make the process proceed faster.

Karen also described the annual cycle of setting employees' pay. In the fall the University's Compensation staff surveys other local employers' average pay and pay ranges for a number of common "benchmark" jobs. They also analyze local and national salary programs. A suggested pay increase budget is submitted to the president and provost of Stanford University. They are advised by SLAC's director, the university deans, and vice-presidents. The president and provost ultimately make the decision on pay raises; they try to keep Stanford's pay "mid-market."

Once the pay-raise budget has been decided, each employee's job performance and pay increase is determined by their manager. Exempt employees and long-term nonexempt employees receive merit increases tied to their job performance over the past year. Bargaining Unit employees and nonexempt non-Bargaining Unit employees on steps get increases specified by their range structures.

Length of service does not automatically move you up the salary range for your JCC. The whole range moves up yearly in response to market pressures. If you started low in your salary range, you may remain there or move very slowly up or down in relation to the salary range. It is important to remember that salaries and the pay ranges normally increase each year.

—Cherrill Spencer

PHYSICS TEACHERS CONVERGE AGAIN

TWENTY-ONE high-school physics teachers converged on SLAC recently for a Saturday seminar lead by staff physicist Helen Quinn. The teachers represented schools from Sacramento, San Francisco, and the Peninsula. The seminar was a follow-up to last summer's workshop on Particles and Interactions where teachers learned about new developments in particle physics and discussed different teaching techniques regarding the Standard Model.

Jonathan Dorfan presented information regarding the need for a B Factory and afterwards teachers toured the mock-up of that facility. There were lively discussions among teachers and SLAC physicists Max Dresden, Willy Langeveld, Steve Shapiro, and Marvin Weinstein.

Three teacher-leaders conducted demonstrations for their colleagues on interactive computer programs and hands-on activities for the classroom. The teacher-leaders were Andria Erzberger from Palo Alto High School, Art Fortgang from Mills High School, and Steve Eiger from San Francisco University High School.

Teachers also had the opportunity to share with their colleagues ways in which they had changed teaching techniques based on what they learned at the summer workshop.

These programs are part of SLAC's precollege education activities designed to improve science teaching and learning at the K-12 level. If you have any questions about SLAC's education programs, or wish to get involved, please contact P.A. Moore, Education Officer, at ext. 3826.

—*P.A. Moore*

P.A. Moore

Helen Quinn leads lively discussion during recent teacher workshop.

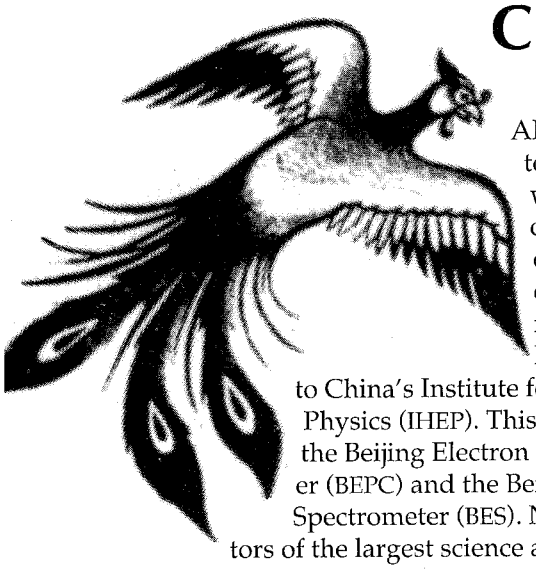
P.A. Moore

Discussion on science teaching techniques continued during the lunch break.

P.A. Moore

Steve Shapiro, Helen Quinn, Max Dresden, Willie Langenveld, Marvin Weinstein and Jonathan Dorfan join teachers for a group photo.

SLAC NETWORKING LINK WITH CHINA NOW OPERATIONAL

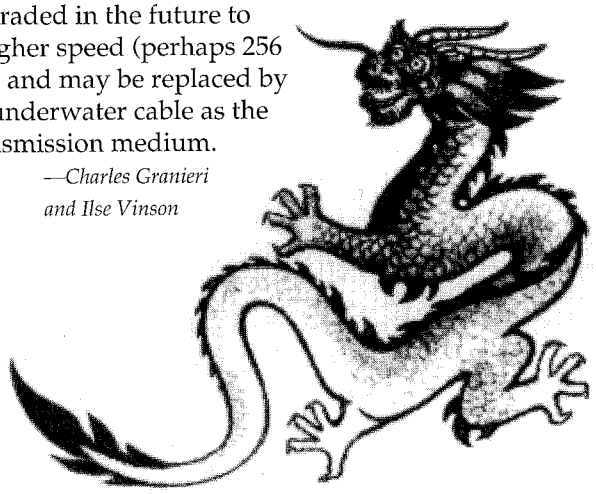


ANOTHER historic milestone was achieved on March 1 by establishing a direct computer networking link from SLAC to China's Institute for High Energy Physics (IHEP). This is the site of the Beijing Electron Positron Collider (BEPC) and the Beijing Electron Spectrometer (BES). Now collaborators of the largest science and technology collaboration between the US and China (see "MARKing History with 1st US/China Physics Collaboration," *Interaction Point*, March 1991) can communicate over a 64 KB satellite link.

Previously collaborators at SLAC and IHEP communicated using the international public X.25 network, a much slower, less reliable, and more expensive means. SCS initiated work on the satellite link through AT&T and the local Chinese telephone company about one-and-a-half years ago. Since this satellite circuit is the first one of this type to go outside of the central Beijing area, several technical problems needed to be solved. Current US government restrictions require that the link be used only for traffic between IHEP and SLAC. SCS is working to eliminate these restrictions as soon as possible.

Depending on use and funding, the link may be upgraded in the future to a higher speed (perhaps 256 KB), and may be replaced by an underwater cable as the transmission medium.

—Charles Granieri and Ilse Vinson



Emergency Relief Association Elects Directors

AT THEIR RECENT MEETING, the SLAC Emergency Relief Association (SERA) membership elected the following directors: Katherine Cantwell, ext. 3191, Pat Jones, ext. 2452, and Al Odian, ext. 3459. Zorb Vassilian, ext. 2464, is now Treasurer and Ben Smith, ext. 2638, is Secretary.

Any SLAC employee in need of SERA's financial aid should contact a SERA director. The directors meet first with the applicant, and then with each other, to decide how best to offer the help SERA has available.

These busy people donate their time to help their fellow employees in need. We, too, can contribute to this effort. Please clip the coupon below, fill in your donation, and drop it in the mail today.

—Shirley Boozer

CONTRIBUTION TO SLAC EMERGENCY RELIEF ASSOCIATION

I want to do my part to help!

❑ My check is enclosed. ❑ I authorize a payroll deduction of $_____ per month for SERA, to continue until further notice.

_____

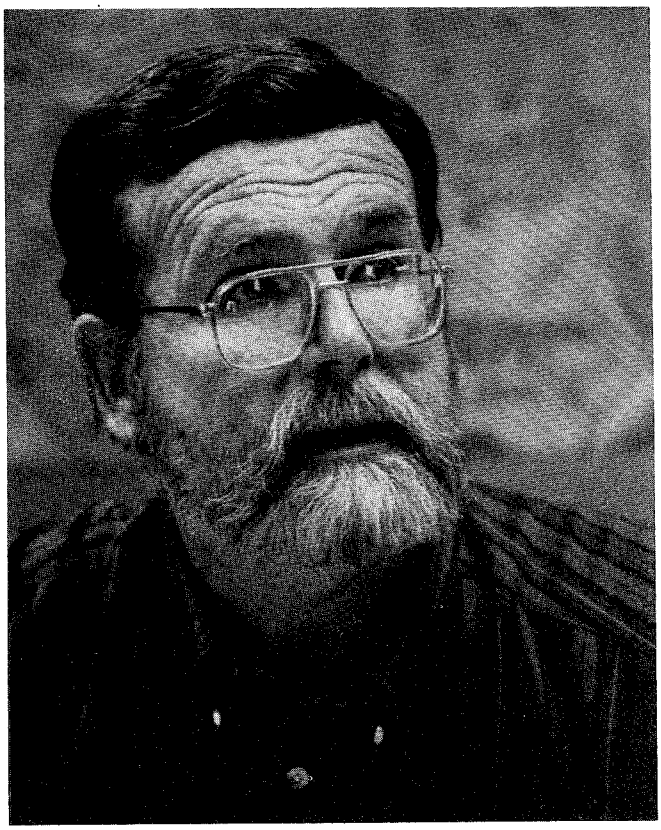
(Signature)

_____

(Please print name) (Date) (Employee number)

Return to SLAC Emergency ReliefAssociation (SERA), c/o Z. Vassilian, MS 12. For more information call or write: B. Smith, Secretary, ext. 2638, MS 91.

GERRY FISCHER 1928–1993



Gerhard Emil Fischer

GERHARD EMIL FISCHER, a senior scientist and one of the leading innovators of SLAC, died Sunday, February 7, of a heart attack. He was 64.

Fischer came to SLAC in 1965 for the design and construction of the SPEAR electron-positron storage ring and had a major role in the development of the Stanford Linear Collider.

Fischer, called "Gerry" by his colleagues, was born in Berlin March 1, 1928, the son of a biochemist and the grandson of Emil Fischer, who won the Nobel Prize in chemistry in 1902. His family fled Nazi Germany in the late 1930s, settling in Canada.

He received his undergraduate degree from the University of Toronto in 1949 and went to the Radiation Laboratory (now the Lawrence Berkeley Laboratory) at the University of California, earning his doctorate in physics in 1954, with a dissertation on proton scattering. At Berkeley he began his lifelong interest in accelerator physics.

Fischer taught at Columbia University for five years and continued his research at Columbia's cyclotrons. In 1959, he moved to the Cambridge Electron Accelerator at Harvard, for a time the highest-energy electron accelerator in the world. Fischer believed the future of high-energy physics was with electron-positron colliders and worked with a group to have one constructed in Cambridge, MA.

When the Atomic Energy Commission (now the Department of Energy) voted to build such a device at Stanford rather than Harvard, Fischer moved west to work on the SPEAR ring with Burton Richter.

Fischer was a key member of the storage ring research and development team, and while the ring was being built, he participated in a notable series of fixed-target experiments. He was responsible for the injection system into the SPEAR ring, and designed the large solenoidal magnet for the MARK I particle detector used to carry out the experiments. He also was among the authors of the papers that announced the discovery of several particles and was a ranking authority on understanding beam motion and instabilities in storage rings.

He was one of the first to recognize the significance of SPEAR as a source of synchrotron radiation, and with his colleague, Ed Garwin, arranged to have a suitable exit port installed on the ring. This was the beginning of what is now the Stanford Synchrotron Radiation Laboratory.

He also was key to the development of Stanford's vastly more powerful PEP (positron-electron) project, a joint program between SLAC and the Lawrence Berkeley Laboratory.

In the 1980s, Fischer moved to the linear collider project, in which electrons and positrons could be accelerated simultaneously, separated and then crashed together, an innovative tool for particle physics. Fischer was project manager for the first damping ring and the magnet system. He designed the unique alternating-gradient magnets that make up the curving arcs of the collider.

He was working on the next generation machine at his death.

Fischer is survived by his wife, Monica, and by the children of his previous marriage to Vera Kistiakowsky, Marc and Karen.

Memorial services at SLAC are scheduled for Saturday, April 3 at 10 AM in the SLAC auditorium. A thirty-minute memorial presentation will be given, followed by the dedication of a live oak tree beside the A&E Building. A plaque reading "In Memory of Gerry Fischer and his many contributions to SLAC, 1993," will be placed at the foot of the tree. Coffee and cake will be served in the Breezeway afterwards.

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