

SLAC BEAM LINE

There is no excellent beauty that hath not some strangeness in the proportion.—Francis Bacon

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Joe Faust's photograph shows most of the members of the PEP magnet group gathered to celebrate the completion of the last bending magnet for the PEP ring. In the back row, right to left, are Roque Hilomen, Zorhab Vassilian, Aldo Rossi, Jim Spencer, Helmut Wiedemann, Bob Adamson, Jan Burlingame, George Mosele, Gerry Fischer, Mary Lou Arnold, James Paterson, Bob Bell, Martin Anderson, Bill Brunk, Bob Roddick and Willie Johnson. In the front row, right to left, are Bob Eisele, John Flynn, Al Nixon, Art Milligan, Mike Zurawell, Brian Luddy, Jon Dunn, Al Montgomery, Bill Shaw, Winston Field, Ramiro Reyna and Chuck Edwards. Among those unable to attend were Larry Didier, Herm Zaiss and Leo Giannini. (Our apologies if we got some of the names wrong.) See page 2 of this issue for a description of the PEP magnet work.

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PEP NOTES

The Three-Thousand-Mile Assembly Line

The line began in a New Jersey factory across the river from Philadelphia, where they make whatever you want out of sheet metal. What was wanted was 700,000 magnet laminations—each an 18-inch-high, C-shaped piece stamped from thin, high-quality steel.

The line ended in the Light Assembly Building at SLAC, where 3500 laminations were taken at a time, stacked together and welded into a core for a PEP bending magnet. It's all in the past tense because early in September a final weld was placed on magnet #193, the last of the series of bending magnets needed for the PEP ring.

A few formalities marked the shutting down of the assembly line. Traditional champagne was poured in untraditional plastic cups. Joe Faust fretted everyone around a completed magnet to obtain the accompanying photograph. When Bob Bell, Chief of PEP mechanical systems, was asked what happens next, he had a ready reply: "Decompress." Although that was precisely what was happening in the long green bottles at the time, Bob was probably referring to the pressures that had been built into the project. Consider the budget, the schedule, and the engineering.

The project budget prepared for PEP in early 1976 set aside \$7.4 million for the magnets, the biggest single item under the technical components for the machine. These dollars were spent in lots of different places, buying raw steel and aluminum, paying for the stamping and machining, and so on. The schedule that went along with that first budget was summarized on a large sheet of paper which listed the months of five consecutive years across the top. Underneath there are rows that indicate the particular kinds of activities to be carried out. At first there are only "D's" to mark the design stage of the work. Then "P's" start to appear to indicate procurement as the money begins to get spent. Next come F, A, T and I, standing for fabrication, assembly, test and installation. Many of these activities have to go on together in order to get the job done within a reasonable time. Thus we find, for example, that last September was a PFATI month. The final stage is marked with a long line of "Z's," which seems a well-deserved rest but in fact stands for check-out. (The letter C gets used in other schedules for construction.)

Then there is the engineering. During a typical shift of eight hours at PEP, a given bunch of electrons or positrons will circulate around the ring about one billion times. So the particles will get to know the path pretty well, and any irregularities will have lots of opportunities to make mischief. This means that the

magnets have to be made very well—and identically well—or the machine just won't work.

So it has been several years of tight budgets, tight schedules and tight engineering for the PEP magnet crew. Now decompression has set in on a different 3000-mile assembly line: plastic champagne glasses must also come from New Jersey, and California makes the wine. All's well that ends well.

—Bill Ash



SLAC AMATEUR RADIO CLUB

The antenna goes up for Field Day, a test of amateur emergency communications. W6PKB (Roger Gearhart) and WA6GYD (Don Farwell) on the ladder get help from WA6JVL (Ron Seefred), K6ANN (Dick Collins) and W6JIC (Jack Hollenbeck). Over 1000 contacts were made with amateurs throughout the world during the 24-hour period.

The SLAC Amateur Radio Club has elected officers for the next year:

President	Roger Gearhart
Vice-President	Howard Rogers
Secretary	Charlie Hoard
Trustee	Warren Struven
Executive Board	Dick Collins
	Norm Crouch
	Jack Hollenbeck

The Club has acquired a new Kenwood TS-520SE. Come down to the Shack and help us set it up. For the time of the next meeting and how to find the Shack, call or page Roger Gearhart or Charlie Hoard. (You don't need a license—we'll help you get that!)

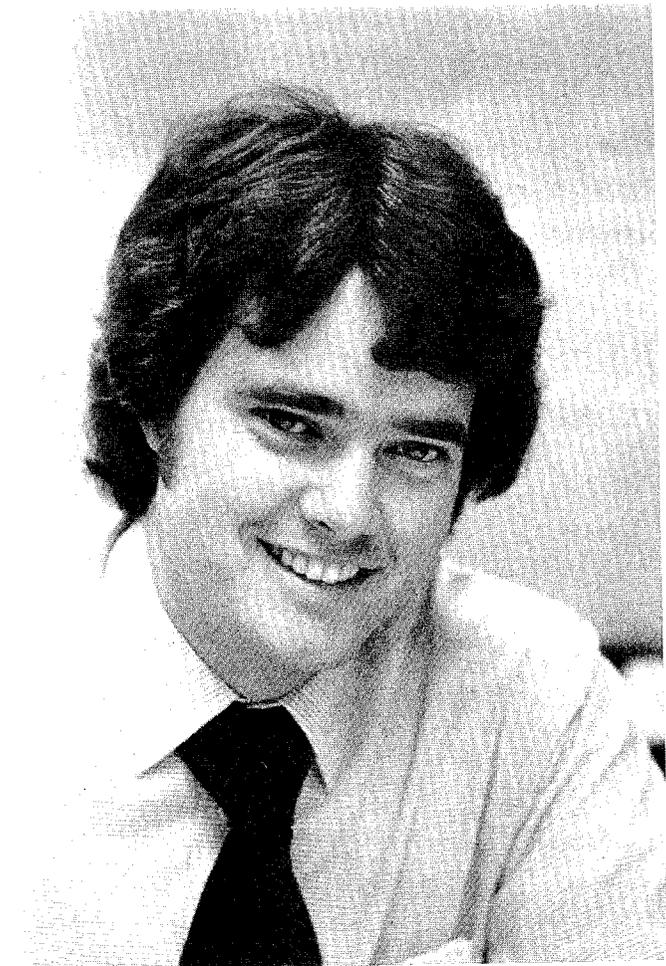
—Charlie Hoard

PURCHASING DEPARTMENT BRAIN DRAIN

The Purchasing Department regrets to announce that two experienced buyers, Cathy Kolb and Vic Mathews, will soon be leaving SLAC. The photos of Cathy and Vic were taken by Joe Faust.



Cathy Kolb started in the Purchasing Dept. as a clerk-typist in 1966. She moved to Expediting in 1968, and in 1974 she assumed supervision of Expediting and Receipt Control. Her buying career began in March 1977 when she was classified as Buyer I, and she later received a well-deserved promotion to Buyer II. After demonstrating her ability to place small-dollar-value telephone orders, Cathy quickly progressed to larger orders placed in response to Requests for Quotations and Requests for Proposals. Her price analyses were excellent. While we regret the loss of this very capable Buyer, we wish her every success in her new position as a Senior Buyer for Coherent Radiation in Palo Alto.



Vic Mathews came to SLAC in May 1977. He had previously worked as a buyer for Peterbilt Trucks. At SLAC, Vic assumed the responsibility for acquiring equipment and materials from Government excess sources. Many is the trip that Vic has taken to climb over piles of Government surplus equipment looking for items on the SLAC Want List. In addition, Vic has been responsible for the procurement of office machines and supplies, electronic test equipment and logic modules, furniture, publications and printing. Through extracurricular study and by taking examinations, Vic has essentially completed all of the work leading to a CPM designation (Certified Purchasing Manager). We are going to miss his energetic approach and his quick smile, but we wish him success in his new position as Purchasing Manager for Dionex in Hayward.

Our thanks to Cathy and Vic for their very important efforts on SLAC's behalf.

—W. S. Curry & R. L. Hashagen



JOURNEYMAN CERTIFICATE AWARDS

Abel De La Cerda (front left) and Tony Barrera (front right) recently received their Journeyman Certificates after completion of a four-year Apprenticeship training program at SLAC, Abel as a maintenance mechanic, and Tony as a maintenance electrician. Both training programs were designed to meet the requirements of the State of California Division of Apprenticeship Standards, and the Certificates were issued by the State of California.

Others shown in this photo by Casey Jano, left to right, are Gerry Renner, Ben Collins (California Apprenticeship Representative), Jean-not Lauer, Art Mainwaring, Fred Hall, Ken Moore and Jim Baskett.

SLAC presently has a total of 15 apprentices in training in various crafts fields. This is a record that very few other employers in the Peninsula area can match.

—Gerry Renner

SLAC BALLPLAYERS FINISH PERFECT SEASON

Organized softball in the City of Palo Alto will never be the same. After a two-year "rest" SLAC has once again shown that it is a formidable force in slow-pitch softball. Playing such classically strong teams as the First Baptist Church, Fred's Dry Cleaners and Harriet's Beauty Parlor, SLAC has emerged with a perfect season. Managed by Paul Regalado, SLAC players shattered their opponents' spirits with such scores as 15-1, 10-0, and a real favorite, 24-3.

Starting out in the "D" League, SLAC quickly showed what it was capable of, and midway through the season was invited to join the prestigious "D" League. Undaunted by the stiffer competition, the "fat-ball" players rose to the challenge and still managed to keep their perfect record intact.

Looking back over the season, there were many outstanding individual performances, but perhaps the most memorable was the lightning swift base-running of George "Wheels" Vertin.

Bored by the slow pace of slow-pitch softball, SLAC is planning to field a team in the Palo Alto winter fast-pitch league. We hope that the competition will be a little stronger.

—Bob Buker



Standing, left to right: Manager Paul Regalado, Bob Buker, George Vertin, Steve Frazier, Bob Adamson, Jesse Cornejo and Dan Wright. Kneeling: Bob Nicholson, Al Pacheco, clean-up batter Bobby Jurgenson, Roberto Garcia and Ted Jenkins.

Already celebrating a perfect season and therefore missing from this photo: Ralph Chavez, Tom Winch, "Cookie" Starks, Mike Resendez and Mike Palrang.

(Photo by Annette Nicholson.)

GOLDEN BRAINS—FEET OF CLAY

SLAC seems to have no dearth of people with brains worth their weight in gold. However, these geniuses, along with the rest of us, have feet of clay—at least when it comes to susceptibility to injury. In many industrial situations, workers are required to wear hard-toed shoes. This precaution has prevented many a bruised, broken and amputated toe. Perhaps we haven't been strict enough about this at SLAC. Nevertheless, when I see someone wearing ordinary oxfords, tennis shoes, or even sandals, working in areas where heavy objects are being lifted, carried or moved about, I shudder.

Another great potential for foot problems occurs in some of our healthiest people—joggers. Because of this, I have asked an inveterate runner, Herb Weidner, to give us his methods of foot protection. Here is what he had to say:

"I have been running regularly for 14 years and have had many painful foot injuries—but none in recent years. I attribute this improvement to the development of specialty running shoes. There are now many excellent shoes on the market, most of them expensive. To the serious runner, the added expense is just a good investment in comfort and health. I hesitate to recommend a particular brand because I recently read a feature article in the *Chronicle*, reporting the results of an engineering study of running shoes, which upset all previous surveys. The top brands still look good, but the order is somewhat scrambled. Good running shoes come in all sizes, so you should be able to get a good fit, which is important. I wear heavy wool socks for extra cushioning, but some runners find them too hot.

"Warming-up exercises are useful for runners. Stretching the Achilles tendon is almost a necessity. When I go for a long hike in the mountains, I usually wear this silk socks inside my heavy socks; I haven't had a blister in many years. Some runners recommend spreading petroleum jelly on any spot where you might get a blister, before you start your exercise; others say rub it on the outside of your socks.

"With proper equipment and warm-ups, you should be able to run on pavement, as we do, without pain or injury. If you are just starting an exercise program, better take it easy at first."

—Dr. Beal

Reminder: The open meetings sponsored by Alcoholics Anonymous are held every Thursday, from noon to 12:30, in the Conference Room of the Electronics Bldg. (Room 126). Anyone interested in the recognition and treatment of alcoholism is cordially invited to attend.

SLAC PHYSICIST SEES FORMIDABLE CHALLENGE TO U.S. LEADERSHIP

[Reprinted from *Campus Report*, October 10, 1979]

The U.S. faces formidable challenges to its leadership in high energy physics, says a Stanford expert.

"At the moment we have a national program with adequate funding for the construction of new facilities to explore still higher energies in the 1980s, but our funding for operating them is marginal," declares Prof. Sidney Drell, deputy director of Stanford's Linear Accelerator Center (SLAC). He is also chairman of the U.S. High Energy Physics Advisory Panel.

The \$78 million Positron-Electron Project (PEP) machine at SLAC, funded by the U.S. Department of Energy and operated on a cooperative basis with the University of California's Lawrence Berkeley Laboratory is expected to become operational [within the next month or two]....

Drell recently returned from a sabbatical trip to Europe. There he was able to gauge the relative positions of Europe and the U.S. in the exciting search for new fundamental discoveries.

"If the present funding is our ceiling for the years ahead, then it will not be enough for the tasks we face," he said. "Europe will surge ahead."

(Prof. Burton Richter, who won the Nobel Prize in 1976 for his work in high-energy particle physics, was quoted in the July issue of the SLAC house organ *Beam Line* as saying "Europe will become the senior partner.")

A new rival to PEP is the laboratory at Hamburg, West Germany, where this summer a subatomic particle called the gluon was discovered. This tiny object is believed to be directly responsible for the force that binds quarks, the basic blocks of matter.

PEP is about the same size and has about the same energy as PETRA, the German machine, which whips electrons [and positrons] around at 15 billion electron volts.

The two-mile-long accelerator at Stanford will inject electrons and positrons into the storage ring. This appears to make injection easier than at PETRA, which has to inject them from a lower energy machine.

"We hope that we shall have a simple task in building up the interaction rate" said Drell in a campus interview.... "Maybe we shall be able to do better than the German machine in rapidly building up to a high interaction rate."

Research plans

"What comes next in the program? Steps planned by America include superconducting proton machines. The Europeans plan to go ahead with an extremely large electron-positron col-

liding beam [machine called LEP] at CERN near Geneva.

"The U.S. has four national centers for this work; three are supported by the Department of Energy. Besides the work being done here in California, there is the Fermi lab near Chicago and Brookhaven on Long Island. There is also an electron storage ring at Cornell, which is supported by the National Science Foundation.

"We have a diverse and well-planned national program, even though the funding is painfully marginal."

Do you say this in reference to what Europe is doing?

"It is difficult to make a direct comparison, for methods vary, and monetary values fluctuate.

"I would say that we are at a marginal level in supporting the exciting research opportunities offered by our facilities, and also in keeping up the morale of our younger physicists in terms of opportunities in the field and support for their research."

If Europe is outspending the U.S. by 2 to 1, as reported, there seems to be a sure bet that we shall fall behind in the race?

"Personally, I don't calculate their edge at such a lopsided margin. One reason for this is that in a multinational effort like CERN there has to be a considerable amount of international bureaucracy imposed on it.

"However, CERN is a marvelous success. I was extremely impressed by the quality of the experimental equipment and the overall intellectual effort.

"Some of our people feel more threatened than I do about the comparative levels of potential in terms of the respective fundings of the U.S. and Europe.

"I think that most of us agree that at the moment the U.S. has an excellent national plan, including new construction."

Is the national panel which you chair worried about the American position vis-a-vis Europe?

"In the long run, yes, if we stay at this level of funding as our operating ceiling. I am not talking about needing large amounts of new money.

"There is a large leverage factor when we are marginally funded, so that a small percentage increase would translate into a considerable strengthening of the research program.

"We could do a great deal more with a comparatively modest increase in funding."

(Continued)

Where do the Russians stand in the international race of the physicists?

"They are excellent theoretical physicists, but the machines they have built for experimental work have not been very productive.

"At Novosibirsk they have a laboratory which excels in advanced accelerator work, but it has not produced very much by way of new physics results. The Russians have plans for a very large machine."

Yet the Russians are well advanced in the race to secure controlled nuclear fusion, which may be the prime energy source of the 21st century?

"Perhaps, but not in our field of high-energy experiments. They are very innovative in ideas, both theoretical and for accelerators, but in actual experimental results they are not among the leaders. They have tried to match CERN but have failed.

"China is entering the field now. They have begun to construct a large facility outside Beijing called BPS—the Beijing Proton Synchrotron. Some of their top scientists are in the U.S. now, learning the technology.

"High-energy physics is given high priority by the Chinese. They take the view that it will be a stimulus to their whole economy, if only by spinoff from the advanced technology. They also emphasize the cultural value of the work."

Does America share its research with all other nations, including the Soviets?

"Yes, research in high energy physics is international, and there is a constant interflow between all the participants.

"We do have certain restrictions on exporting some advanced technology, such as some computers which may have military potential.

"We are benefitting in our own work from ideas about the storage rings which came from the Russian work at Novosibirsk."

What you are all doing is pure research into the unknown? There is no immediate practical objective?

"None whatever. But the lesson of history is that inevitably new developments of great use to mankind follow major new discoveries in pure research.

"It was fundamental research into the nature of electricity and magnetism in the late 19th century that led to today's comforts and communications—lights, telephones and TV, for example.

"It is also true that fundamental scientific progress can and often does lead to great new challenges for society to face."

In view of the energy crisis, some laymen might ask why all the effort is not going into securing cheap, safe, and abundant energy from fusion power.

"That branch of research is also important. The high-energy effort does in fact help fusion, via new technology such as superconducting magnets and neutral beam heaters and via skilled people.

"So far as high-energy physics is concerned we are doing basic fundamental science. We are hopefully getting close to some of the answers to basic questions about the nature of matter and the universe.

"Every major nation on earth is pressing forward in this search, which is fundamental to our understanding of our very existence.

"It is important to do both fields well—to advance our understanding of nature and to cope with our long-range problems. If history is an accurate guide, today's progress in fundamental research will provide the basis for future technologies and benefits."

Is there any overlap in the international research?

"All high-energy physicists recognize the importance of international communications and coordination as we plan ahead for our next major, expensive facilities.

"We want to avoid simply duplicating each other's very large machines or programs in the future, and we want to enhance international cooperation in research. That way we shall be able to share much wider areas of discovery.

"The day will surely come when we shall want to build a large 'world machine,' but the difficulty of developing such facilities and such a program means it will take a long time before that happens."

In effect, there will be a sort of unofficial worldwide collaboration, cutting across political and ideological boundaries?

"Yes, the international band of physicists does not hide anything. We all share.

"Far from hiding data, we proudly share—sometimes to the point of boring each other by talking so much about the data!"

Summing up, are you happy about the prospects as far as the U.S. is concerned?

"An excellent national program has been drawn up, and has been implemented since 1977.... The construction program has been good. Our worry is our rate of progress toward our goals as limited by our funding levels."

—Donald Stokes

U.S./JAPANESE RESEARCH AGREEMENT

On November 11, an agreement for cooperation in high-energy physics research between the U.S. and Japan was signed at SLAC. This new accord falls under the more general U.S./Japanese Agreement on Cooperation in Research and Development in Energy and Related Fields, which the two nations executed last May in Washington. Other energy-related fields in which similar cooperative work is underway or expected include fusion, coal conversion, photosynthesis and geothermal energy.

The agreement was signed for the U.S. Department of Energy by Dr. James Leiss, who is the Associate Director of DOE's Office of Energy Research, High Energy and Nuclear Physics. Signing for Japan was Dr. Kohei Shinozawa, who is the Director-General, Bureau of Scientific and International Affairs of the Japanese Ministry of Education, Science and Culture.

Plans are being made for cooperative experiments and associated research at the Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley Laboratory, and SLAC. There will be provisions for exchange of scientists and of data, for joint research and development in accelerator and detector instrumentation, and for new experimental projects.

DEMETRIA RHODES LEAVES SLAC

Demetria Rhodes has left SLAC Purchasing to assume a position as Expediter for Dionex in Sunnyvale. She joined our staff as Office Assistant in 1974. In addition to her many duties in Purchasing, Demetria broadened her experience by working on special assignments in Stores, Shipping/Receiving and Expediting. On many occasions we counted on Demetria to carry maximum workloads in pressure situations, which she did efficiently and willingly, and in her own special style.

During her five years at SLAC, Demetria was enrolled in school part-time in a business administration program. She received her A.A. degree from Foothill Junior College in 1978, and

ANNUAL CHRISTMAS PARTY

The annual SLAC Christmas Party will be held this year on Thursday, December 20, from 11:30 to 1:30 in the Auditorium/Cafeteria area. The tree-trimming event will be held on December 12, Wednesday, at noon.

DECEMBER 14 RED CROSS BLOOD DRIVE

The morning of Friday, December 14, is the time to remember for the next visit of the Red Cross Blood unit to SLAC. As before, blood donations will be taken in the lobby of the SLAC Auditorium. Please phone ext. 3113 for an appointment to donate blood.

SLAC TENNIS TEAM

On November 1, a hastily organized tennis team from SLAC was narrowly defeated by a strong group from the Hoover Institution on campus in the second annual meeting. The score of the match was 6 to 3. The members of the SLAC team were the following:

Singles: Ken Crook, Randy Fowkes, Jeff Cruz, Bill Cruz, Earl Hoyt, Ken Witthaus.

Doubles: Harry Changnon & Lew Keller, Jon Dorfman & Dave Fryberger, Bob Bell & Tom Donlan.

As noted in a recent issue of *Science & Government Report*:

The index of recently published hearings of the House Armed Services Committee contains the following witness entry: "Drell, Sidney D., deputy director and executive head of Theological Physics, Stanford University."

is continuing her studies at San Jose State College to complete a Bachelor's degree.

We wish her every success in her new position and in her challenging career plans.

--Kay Russell
Purchasing

<p>SLAC Beam Line (Bin 80) Stanford Linear Accelerator Center Stanford University Stanford, California 94305</p>						<p>Joe Faust, Bin 62, x2882 <i>Photography</i> Crystal Washington, Bin 68, x2502 <i>Production</i> Dorothy Edminster, Bin 20, x2723 <i>Articles</i> Herb Weidner, Bin 20, x2521 <i>Associate Editor</i> Bill Kirk, Bin 80, x2605 <i>Editor</i></p>						
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