The Interaction Point

Events and Happenings
in the SLAC Community
April–May 1992, Vol. 3, No. 4

May Day brings success to SLC

WE DID IT: POLARIZED Zs CREATED!

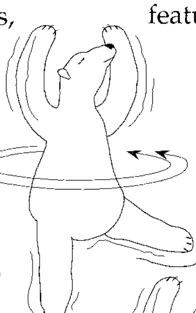
by Lowell Klaisner

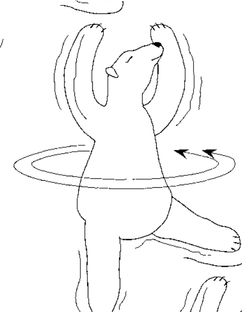
ON MAY DAY, THE FIRST Zs were created from collisions of polarized electrons with positrons, a fitting event to mark SLAC's 30th birthday. The polarized electron source was commissioned on Sunday, April 19. This initial operation is a major milestone in a program that began over a decade ago. Virtually everyone contributed to making the Polarized Electron Source Project a success and to SLAC's leadership in electron physics. This success highlights the resourcefulness and tenacity of many people in the face of unanticipated challenges (see box, p. 2).

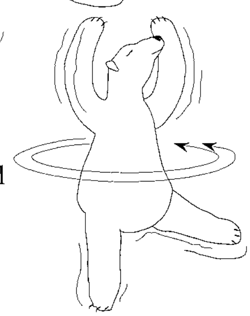
The week and a half of verifying polarization at SLC went very smoothly, a tribute to the planning and testing that had gone before. First, the beam was taken straight to the end of the linac and the polarization measured. Then the beam was taken through the north damping ring and the polarization was measured again. When the SLD was ready, the beam was taken around the north arc to the final focus, and polarization measured just after the detector. These measurements went well and the results were close to our predictions. The addition of polarized electrons makes the SLC competitive in measuring asymmetries in the Z system.

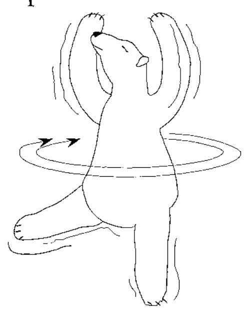
Preparing the Big Escape

The Polarized Electron Source Project was begun because certain features of Zs can only be studied with polarization. When we say a polarized electron source, we are talking about the electron gun and the laser system. The semiconductor cathode in the electron gun is very sensitive to contaminants. A layer less than one atom thick on the surface will reduce the number of electrons produced. Because of this sensitivity, the electron gun construction requires particular care. All of the parts are baked in a vacuum prior to assembly. The gun itself is assembled in a clean room, then the entire unit is baked again. The gun is isolated from the machine vacuum by an isolation volume. All of these efforts to keep the gun and its environment super clean have had the desired results: the vacuum performance of the gun has met all expectations.









To achieve the desired effect, cesium is added to the surface of the cathode, allowing the electrons to escape. During the run, this cesium becomes contaminated and the number of electrons that escape decreases. Some cesium is added to the surface about every three days to restore the electron current. About every three weeks the contamination becomes bad enough that the cathode needs to be heat cleaned. In the cleaning process, the cathode is heated to greater than 600° C to drive off the contaminants.

The laser that illuminates the cathode produces a short, high-power, infra-red pulse of light. The atoms of the lasing material, a dye suspended in methanol, are excited by flash lamps. Each cycle the light pulse from the dye is chopped to produce the two pulses required by the SLC: one pulse for the final focus and the other pulse to produce positrons. The light pulses are only two feet

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long. Polarized light from the laser strikes the cathode and produces polarized electrons.

Spinning the Tale

Electrons have spin and a magnetic field analogous to the earth's rotation and its magnetic poles. Until now, the SLC used a gun that produces electrons from a heated metal surface. The heat gives them enough energy to escape from the metal, and then they are accelerated through the two mile linac and sent on to the experiment. Using our earth analogy, these electrons leave the metal with their north poles in random directions, and are called unpolarized. Until May Day, all the electrons produced for the SLC were unpolarized. Now, with the new system, we are producing polarized electrons.

At the polarized electron source, the electrons escape from a semiconductor surface. Light from a laser excites electrons into the conduction band of the semiconductor. Special treatment of the surface allows these electrons to escape. The semiconductor used, gallium arsenide (GaAs), produces electrons that are excited with their spin oriented perpendicular to the surface.

These polarized electrons are accelerated in the same way as the unpolarized electrons, but now the spin direction must be taken into account so that the electrons arrive at the interaction point with the same polarization. Three spin rotator magnets have been added to the machine to manipulate the spin to assure these results.

The Results

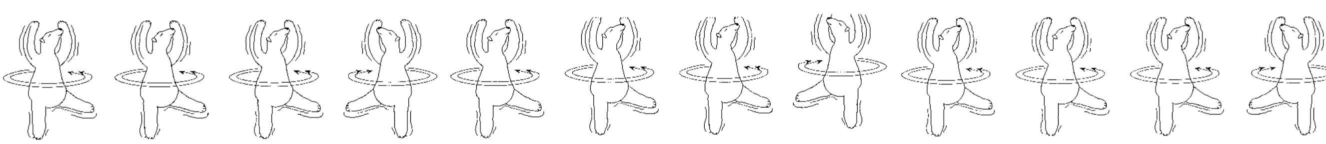
The best we could expect from the gallium arsenide cathode was three electrons spinning one way for every one electron spinning the other way. In reality, the gallium arsenide cathode produces twice as many electrons in one direction as in the other.

The ratio of the number of electrons with their orientation north pole forward to those with south pole forward is measured by a polarimeter at two locations. The Möller polarimeter measures electrons scattered by a magnetized foil at the end of the linac and the Compton polarimeter measures electrons scattered by a laser beam just after the detector.

Future Developments

A new system is currently being developed and will be installed in the fall downtime. The new system will include a new laser and lasing medium, a lock-load system, and new cathode materials. These new developments will provide better stability, higher polarization, and improved availability of the system. This will bring us closer to having all of the spins pointing in the same direction, greatly increasing polarization, and decreasing experiment time.

Production of polarized electrons in substantial numbers will allow physicists to study Zs from a new perspective, giving us a better understanding of the Standard Model and, ultimately, the nature of our universe.

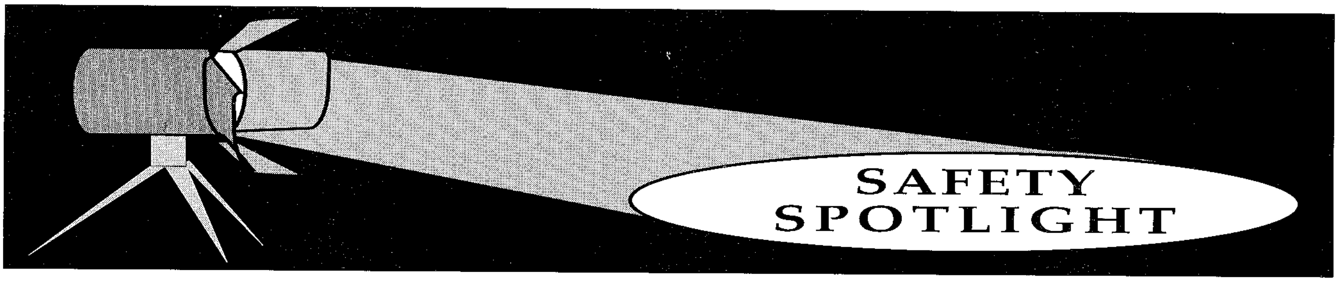


Sylvia MacBride

GRATEFULLY ACKNOWLEDGED

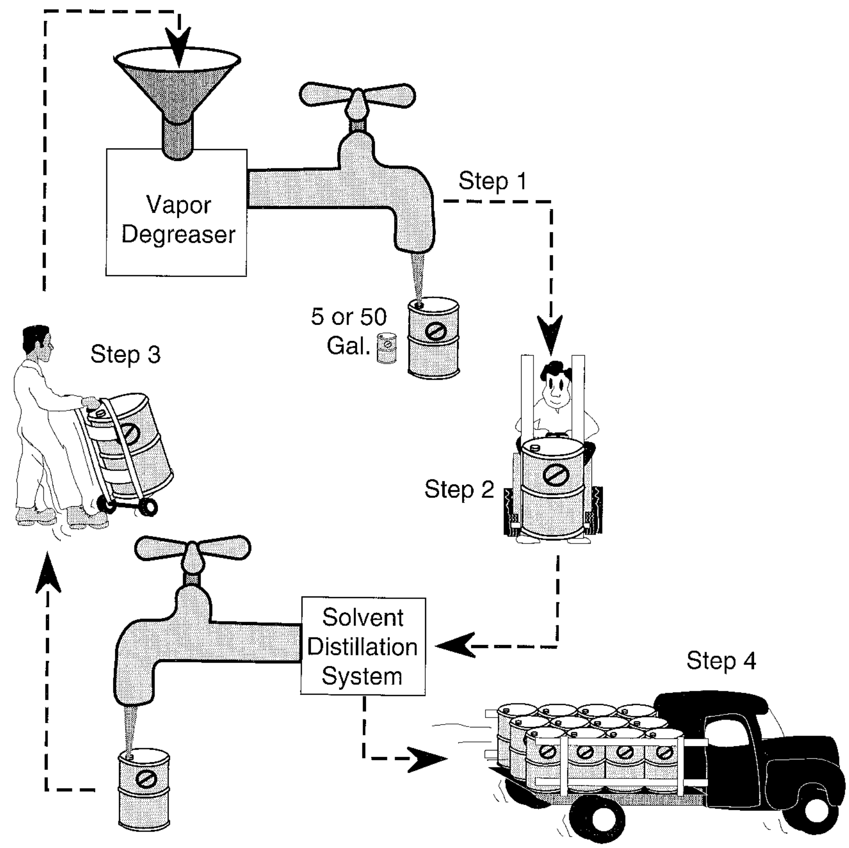
The real heroes of this story, of course, are the behind-the-scenes people who supported the project. Everyone involved shares in the honor of this accomplishment and in our praise. The SLC Polarized Electron Source Project has drawn technical resources from throughout the laboratory. Following is a list of the major contributors:

Executive Committee: S. Drell, L. Klaisner, G. Caryotakis, C. Prescott; **SLC:** R. Alley, J. Clendenin, J. Frisch, C. Garden, A. Kulikov, P. Saez, D. Schultz, J. Turner, M. Wicks, M. Woods, D. Yeremian, M. Zolotorev; **Accelerator Theory and Special Projects (TSP):** K. Eppley; **Mechanical Fabrication (MFD):** W. Roome, G. Tunis; **Vacuum (VD):** T. Galetto, R. Gutierrez, K. Ratcliffe; **Controls (CD):** D. Brown, M. Browne, E. Hamner, W. Pierce, W. Roster, D. Nelson; **Power Conversion (PCD):** M. Artusy, J. de Lamare, K. Harris, J. Krzaszczak, JJ Lapari, D. Williams; **Research Division:** M. Breidenbach, J. Collet, T. Fieguth, E. Garwin, T. Himel, E. Hoyt, R. Kirby, T. Maruyama, J. McDonald, K. Moffeit, A. Odian, M. Petradza, R. Schindler; M. Swartz, J. Venuti; **Technical Division:** J. Chan, F. Decker, N. Dean, W. Herrmannsfeldt, M. Hoyt, K. Jobe, H. Kobbeman, T. Lavine, E. McKeen, R. Miller, N. Phinney, M. Ross, J. Sheppard, K. Skarpaas, J. Sodja, M.Talbert, J. Weiler, D. Wright; **SSRL:** P. Pianetta; **U. of Wisconsin:** R. Prepost, G. Zapalac.



Successful Waste Minimization Strategies

Sylvia MacBride



Solvent Recovery by Distillation

Step 1: *Used solvent is transferred from the degreaser to a 5- or 55-gallon container.* **Step 2:** *Containers are moved and contents are poured into the distillation system. to separate solvent from residues.* **Step 3:** *Reusable distilled solvent is returned to the degreaser.* **Step 4:** *Solvent residues are poured into a separate container and transported to offsite recycle facility for further processing as hazardous waste.*

THREE METHODS are commonly used to reduce hazardous waste. First, eliminate the source of waste by changing the materials you use or the way you use them. Second, recycle materials by reusing them in the same or another operation. Third, treat the waste chemically or physically to change the volume or toxicity. (Treatment is a less preferred method and is usually difficult to implement because of hazardous waste permit requirements.) Each strategy attempts to influence the level of hazardous waste we put in our landfills (see *Interaction Point* article, March 1992, p. 4). Technical and economic factors also influence the selection of these waste minimization strategies.

Many departments already practice waste minimization techniques. For example, Mechanical Fabrication (MFD) is improving the performance of its rinse water treatment system and segregating its waste streams; it is considering reusing certain chemicals; and it has eliminated hazardous waste sources such as cold solvent cleaners. The Test Lab (KLY) processes and recycles its degreasing solvent with the aid of an existing distillation unit. MFD is planning to use a similar unit to recycle its degreasing solvent. Plant Engineering reduces the disposal of ion exchange resins by using offsite treatment and recycling. Other groups reduce waste generation and prevent pollution by using secondary containment to prevent spills or releases into the environment.

There are many ways we can minimize waste in our work and personal lives. I would like to hear about your efforts in this area: successes, semisuccesses, and yet-to-succeed efforts. If we work together we can benefit from each other's efforts. In my next article I will present more specific ways we can each practice waste minimization.

—Rich Cellamare

LIBRARIAN LOUISE ADDIS WINS

IT CERTAINLY IS NO SECRET that SLAC has visionary, hard-working, enthusiastic librarians supported by a dedicated, knowledgeable staff. But it always comes as a pleasant surprise when somebody else recognizes it. By bestowing one of the six Amy awards on Louise Addis, our senior Librarian for Automation and Systems, Stanford University has acknowledged the excellence of SLAC's world-class high-energy physics library as well as a person distinguished for the qualities sought by the award committee.

The Amy J. Blue Award was established in memory of Amy J. Blue, a Stanford University employee who died of brain cancer in 1988, to honor staff who are dedicated to accomplishment ("venturesome, takes responsibility and gets things done"), committed to people ("involves, challenges and supports others"), and enthusiastic ("energetic and positive").

Any member of the Stanford University community may nominate an individual for the award, first given last year. This year the selection committee chose to give the award with the $1000 stipend to Peter Tuttle, a computer systems specialist on campus. However, because their choice was such a difficult one, the selection committee also decided to honor six others with "mini-Amys." And, while we at SLAC know that Louise deserves a "maxi-Amy," we are certainly pleased that she has been singled out for this important award.

Louise came to SLAC in the year of its official founding (1962) as part of the team of George Owens, Louise Addis, Bob Gex and later, preprint librarian Rita Taylor, to help create a high-energy physics library from scratch, a library that has since become a model for other such libraries around the world. The part of the library enterprise with which Louise is most closely identified is the array of high-energy-physics-related database services that are known to the world community of particle physicists as SPIRES (inaccurately, since it's actually a cluster of databases managed under the SPIRES system).

Louise remembers first being excited by the possibilities of automated information-handling systems when she spotted a card-punch facility on the the Stanford campus. The year was 1963, when computers were an expensive novelty but clearly the wave of the future. By 1969, Louise found herself collaborating with Professor Ed Parker of the Stanford Communications Department and providing a test site at SLAC for the continuing development of the now classic database management system called SPIRES that evolved into a mainstay of the SL

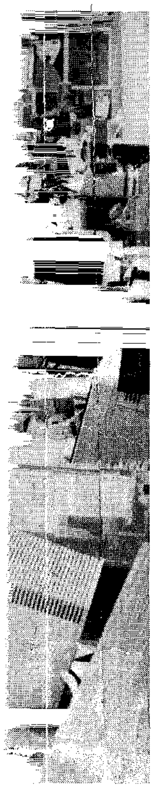
information systems.

The SLAC librarians recognize that the most important mode of communication among particle p the preprint, a prepublication ve scientific paper. In those early da found it necessary to type and fil card (sometimes hundreds) for e every preprint. So the first test d SPIRES was called "Preprints," ar ultimately to that red-letter day i the SLAC library became the first to trash its card catalog.

Louise also remembers believ Preprints database might never e entries, but as shown in the acco illustration in the upper right, its HEP (High-Energy Physics) now 240,000 entries with 20,000 more each year. As the drawing also s

Louise Addis, standing center foreground, and Carol Chatfield, Systems Librarian, watch Sally Assistant, check in a preprint with the barcode wand. Busy working, as usual, are from left to rig Acquisitions Specialist (standing under potted tree); Bob Gex, Chief Librarian (standing in Neubert, Library Assistant; and Sharon Ivanhoe, Circulation Specialist.

AMY AWARD



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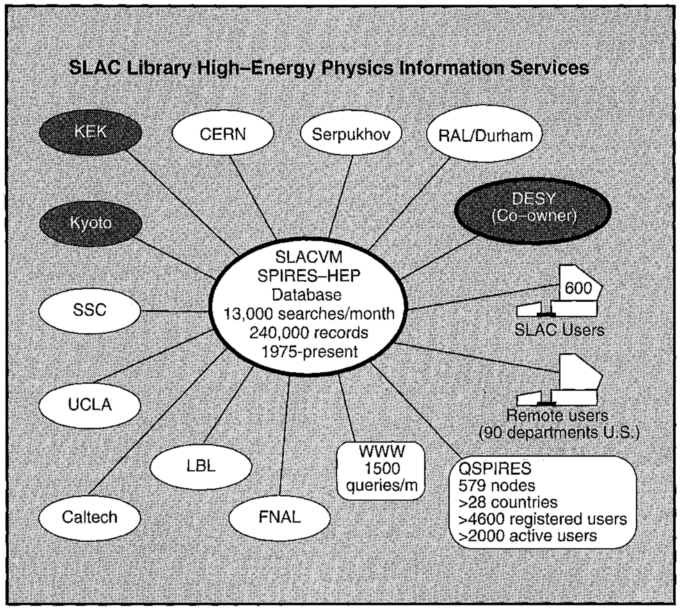
and DESY are co-owners of and major contributors to the HEP database, with added input from KEK, Yukawa Institute at Kyoto, CERN, Serpukhov, Fermilab, and the SSC Laboratory. Clone copies of HEP run under SPIRES at DESY, KEK, and Kyoto and are kept up-to-date over the network. Users of HEP and other related databases number in the thousands via remote SPIRES or QSPIRES and represent at least 28 countries.

Perhaps the thing that Louise has most enjoyed about her work at SLAC has been the challenge of developing the library databases and then working with many people in laboratories nationwide and other countries to put together what is today a voluntary world-wide network of high-energy physics information sources and services. Her current enthusiasm is for a CERN-developed scheme called WWW (World-Wide-Web) that looks promising for better networking of HEP to the UNIX world.



Shaded institutes run SPIRES with clone copies of HEP (automatically updated nightly); unshaded sites contribute and use HEP in some way to manage their own preprint operations.

Along the way, Louise has always found time to help others with their information and/or database problems, and it was this helpfulness that was emphasized by those who nominated her for the Amy J. Blue Award, citing her willingness to help "throughout the day, late at night, and on weekends," "whether to assist a physicist searching for research data, an engineer seeking to understand new computer technology, a visiting scientist trying to make sense of a new environment or non-technical personnel in need of information." She just laughs at this praise and says "So many people have helped me over the years that I really enjoy passing it along whenever I can!"

Louise is also quick to point out that "the SLAC Library staff has always been wonderful to work with. At a time when many people were frightened by automation and change, our group always welcomed it and saw it as a way to do more for our patrons. But, of course, the real secret is that we have pretty good information in our databases thanks to our chief, Bob Gex, who runs a very tight ship on promptness and accuracy as do the folks at DESY."

In addition to this central activity of automation and systems development, Louise has also been interested in opportunities for women at SLAC. During the 1970s, she, Marie LaBelle, and Frankie McLaughlin collaborated on some comparative salary studies that were important to the founding of the first SLAC Women's Association.

She's had several committee assigments, but one that Louise remembers with some satisfaction occurred in 1981, when then Director Panofsky asked her to chair a committee on text processing. The choice the committee faced was (in much simplified terms) between a large investment in many small new word-processing machines vs. use of TeX and Imagen printers off the main frame (this was, gasp, before the personal computer arrived). The consensus decision was TeX and Imagens for technical text, which in retrospect looks pretty good since they're both still going strong, while stand-alone word processors are history.

More recently, Louise spent some months at the SSC Laboratory in Texas, helping with their library startup, and last summer she teamed up with SLAC Archivist Robin Chandler and "some really wonderful people over in ES&H" to collect the documents required by the DOE Tiger Team inspectors. The SPIRES database was, of course, called *Tigerlib*.

Louise and the other winners will receive their 'Amys' on May 22 in a small private ceremony at the Hoover House on Campus. SLAC Director, Burton Richter will make the presentation to Louise. When first notified of the award, Richter commented "Louise has made a difference not only for us but for the entire high-energy physics community."

Apparently there are many folks who agree.

—Rene Donaldson

Tax-Deferred Annuity Eligibility

THE STAFF EARLY RETIREMENT Incentive Program has created a lot of interest and questions regarding some of the retirement benefits available to SLAC employees. One of the benefits available to all regular employees at SLAC is the ability to put some of your regular salary into a tax-deferred annuity program. When you elect to do this, the amount that you put into the program is deducted from your regular salary so that you do not pay taxes on the deferred money at this time. You pay taxes on that money only when you withdraw it sometime in the future. The money that you place into the tax-deferred annuity can be put into numerous investment options. If you have any interest in a tax-deferred annuity or want more details about this financial option, please call the Benefits Department at ext. 2357.

—*Lee Lyons*

Welcome Guests and New Employees

Luda Cantor, Facilities; **Miguel Chacon**, Purchasing; **Oscar Guerra**, Mechanical Fabrication Department; **Ze-Kai Hsiau**, Computing Services; **Tao Hu**, Experimental Group C; **Blake Irwin**, Theory; **Valerie Khoze**, Theory; **Debra Klobuchar**, Controls; **Mike Lewandowski**, Radiation Physics; **Donghong Ma**, Experimental Group C; **Mihoko Nojiri**, Theory; **Marlene Ritenour**, Environmental Safety & Health; **Nading Qi**, Experimental Group C.

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RECOMMENDATIONS CONTROVERSIAL

A GREAT DEAL OF CONTROVERSY HAS BEEN GENERATED recently with the publicizing of the results of the Witherell Subpanel's high energy physics budget recommendations. The Witherell Subpanel was created by HEPAP (High Energy Physics Advisory Panel) to recommend to the Department of Energy long-term high energy physics programs based on three possible budget scenarios: a high budget estimating real budget growth of about 2.5% per year; a medium budget with a constant purchasing power; and a low budget of a constant dollar amount, consequently subject to a loss of purchasing power by the amount of inflation each year. This is naturally a subject in which we can all take an intense personal interest.

The worst of the three scenarios was sensationalized with attention-getting headlines depicting the imminent demise of SLAC; this dramatization began right after the release of the Witherell report. On netnews, the American Physical Society newsbrief of April 17 headlined an item, "Witherell Subpanel makes tough choices in high energy physics," mentioning that "Under the low budget scenario, SLAC ... would cease accelerator operations by 1995." The *Stanford Daily*'s April 21 issue proclaimed, "SLAC to close if drastic budget cuts needed," leading off with, "Research at the Stanford Linear Accelerator Center will end by 1995 if the worst of three possible budget scenarios is enacted by Congress." *The San Jose Mercury News*' April 22 issue pronounced, "Stanford Linear Accelerator staff fears cuts." While less dramatic than the *Daily*, the *Mercury News* again highlighted the "most severe" worst-case scenario with such tidbits as its lead-off, "A federal advisory panel has recommended that many of the experiments at [SLAC] be stopped ..." and "... about half of the linear accelerator's 1300 employees could be looking for jobs." *Science*'s April 24 issue informed us that "SLAC Sees Writing on the Wall," amplifying in a teaser its viewpoint that SLAC "bet its future on a single, ambitious facility—and lost."

Nevertheless, *Science* is the only journal to hint at the potentially negative consequences of these prospective reduced physics budgets to the American and worldwide physics communities, and to the American and worldwide general publics. No information is given to assist readers if they should want to help change this negative potential. The general implication is that the future is already set and the only role left to the reader is to accept it as it is depicted.

The truth is that the Witherell Subpanel only makes recommendations and that any final decision on the SLAC budget remains uncertain, at present, and unknown until President Bush submits his FY1994 budget to Congress in January 1993. Although Richter's April 14 memo cautions "against undue optimism ... because the probability is low of the high scenario actually occurring," Richter also vows that, "with the rest of the SLAC leadership, I will work very hard during the coming months and years" to seek a favorable budgetary outcome.

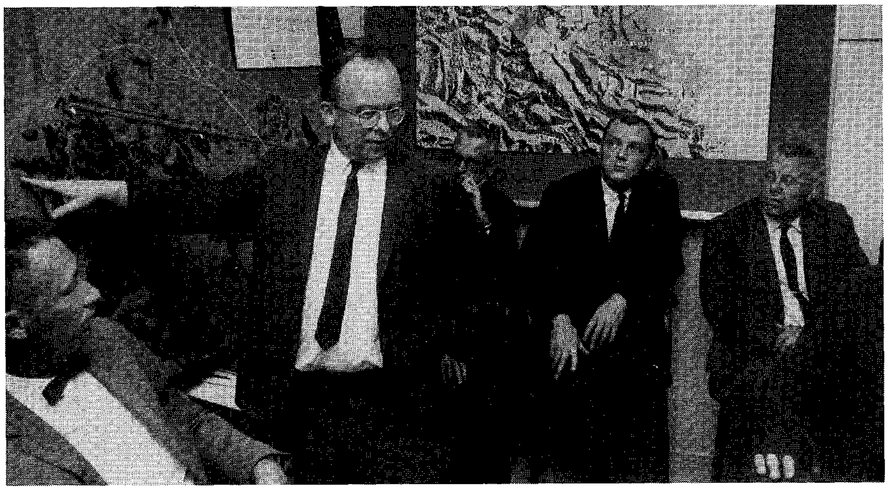
If you are interested in letting your opinion as a voter and a member of America's scientific and technological community be known, write to your Congressional representative.

The Interaction Point will keep the SLAC community informed of developments promptly as they occur.

—*The Editors*

Third in series

History of Particle Physics Conference



Pief Panofsky, director of SLAC, is shown pointing to a model of the proposed SLAC site. This photo was taken around 1960. Two of the people recognized in the background are Bill Kirk, center, and Bob Gould, far right.

IN LATE JUNE, SLAC WILL HOST the Third International Symposium on the History of Particle Physics, which it will sponsor jointly with Fermilab. At this gathering, a group of eminent physicists will meet with historians, philosophers and sociologists of science to explore the major scientific, technological, and social developments that gave rise to the currently dominant Standard Model of elementary particles and forces.

This symposium will be the third in a series that began at Fermilab in 1980. The previous gatherings covered events through the early 1960s, before SLAC was completed. Titled "The Rise of the Standard Model," the June symposium will survey the period from 1964 through 1979, during which SLAC played a leading role in the field of high-energy physics. This is the time when quarks were discovered in the famous MIT-SLAC experiments in End Station A, followed by the discovery of the psi, tau and charmed particles at SPEAR. All of these topics will be featured in the symposium, along with experimental breakthroughs that occurred at other laboratories around the world. Major theoretical advances and developments in the technologies of particle acceleration and detection—such as the flowering of colliding-beam techniques during this period—are also included on the program.

There are 32 speakers and 14 panelists participating in this four-day event—including 10 Nobel prize winners and 12 foreign scientists. Among them are SLAC physicists James Bjorken, Martin Perl, Charles Prescott, and Burt Richter, while Pief Panofsky chairs a session and serves on a panel discussing "Science Policy and the Sociology of Big Labs."

The symposium begins on Wednesday evening, June 24, and continues through Saturday afternoon, June 27. All sessions will occur in the Auditorium, with a possible video feed to the Orange Room. Members of the SLAC community are cordially invited to attend. For registration forms and further information, contact Nina Adelman Stolar at M/S 70, ext. 2282, or NINA@SLACVM.

—*Michael Riordan*

EVENT CALENDAR: MAY–JULY 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.

May 20, Noon
Employee Fitness Day
E. Derr
A&E Bldg Parking Lot

May 27
Admiral Watkins Visit to SLAC (TBA)

May 30
Theory vs. Experiment Softball Game
The Green

May 13
SU Commencement Tours
Mem Aud, Campus/Bus Route

June 15–19
SLD Week (TBA)

June 15–29
Particle Accelerator School
H. Wiedemann, W. Harrison, R. Siemann
Stanford Campus

June 18, 9–4
SUBB Mobile Blood Drive
Auditorium/ Lobby

June 18–19
Mekometer Calibration Workshop (TBA)
R. Ruland, B. Bell
Note: Date Change

June 19
US Tau-Charm Collaboration R&D Meeting
Group I Conference Room

June 19, 2:30–6 p.m.
3rd Annual Juneteenth
Cafe Picnic Area
Jean Hubbard/BASE

June 20, Noon
SLAC Day at the Stick
Busses to Candlestick

June 22–July 3rd
Physics Teachers Workshop
H. Quinn, A. Erzberger

June 24–27
3rd History of Particle Physics Conference
M. Riordan, L. Hoddeson, M. Dresden, N. Stolar
Auditorium

July 13–24
SLAC Summer Institute (SSI)
Auditorium/ Lobby/Breezeway/ or Rooms
TOPIC: The 3rd Family and the Physics of Flavor (20th)
D. Leith, L. Dixon, D. Burke, J. Hawthorne)

PROFILING WOMEN ON THE LINAC

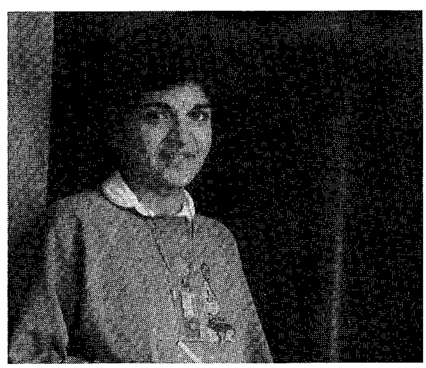
WOMEN WORKING in physics or engineering are still rare, even in our changing culture. On March 24, the Women's Interchange at SLAC (WIS) sponsored the panel discussion, "Women on the Linac," featuring Kathy Burrows, Helen Jarvis, Michele Talbert, and Dian Yeremian, moderated by Cherrill Spencer. (Check out the video from the library.) Each panelist performs a job critical to the lab: designing and building components

for the linac, installing and maintaining those components, or operating the linac. They described their varied career paths, what they would change if they were to do it over, and gave advice for anyone wishing to emulate them.

Dian Yeremian, area physicist for the linac injector since mid-1990, is responsible for the electron guns and for helping to produce the first GeV electron beam. She uses computer modeling to set the parameters, decides if new components are needed, and fine-tunes the beam. Born in the former Soviet Union, Dian wanted to be a physicist since the sixth grade. She encourages people to work hard towards their goals, but to take time off. Dian says that work at SLAC is fun at times, frustrating at times, and always exciting.

Michele Talbert, born in Hollywood, has been at SLAC for nine months. Realizing that teaching sailing and flying weren't paying the bills, she pursued a degree as a mechanical engineer. Michele's advice is to love whatever you choose as a profession. When Dian decides in a theoretical way what is needed, Michele documents the

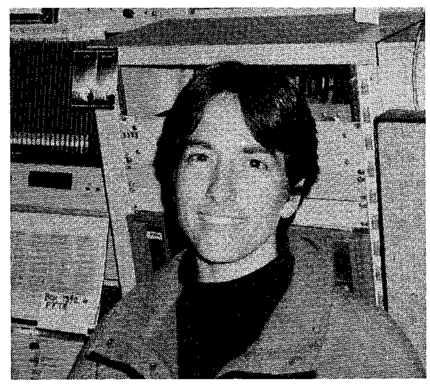
Clockwise from top: Kathy Burrows, mechanical technician; Helen Jarvis, Engineering Operator in Charge; Dian Yeremian, area physicist for the linac injector; and Michele Talbert , mechanical engineer.



process, writes work orders, and translates Dian's ideas into reality. Michele's previous work includes satellite electronics, and helping design a space station exercise machine, and a nuclear warhead interceptor.

Helen Jarvis, of Atherton, is Engineering Operator in Charge in the Main Control Center (MCC). She became interested in science and math in high school and went on to college in Virginia. Four years ago, Helen was hired as an accelerator operator. She was excited to be part of making the accelerator run. She now supervises three operators and coordinates all the activities necessary for the most efficient running of the linac. She also works with Dian sometimes to optimize the beam parameters. She likes her odd schedule and her job very much.

Kathy Burrows got a job in the Vacuum Group in summer 1982, while attending the University of Hawaii; in 1983, she transferred to the Klystron Group, there acquiring more technical experience. In 1984, she defected to Los Angeles, but returned to SLAC in 1985 as a



mechanical technician, and was on the team that installed the SLC Final Focus beam lines. She then became assistant to Roz Pennacchi, linac Area Manager. She feels that she and Roz complement each other at work because of their backgrounds: Roz comes from electronics/operations and Kathy, from mechanics. During beam downtime, Kathy inspects linac components, makes sure the linac is still straight, looks for water leaks, and checks the black widow population. She is proud of her nine years of experience at SLAC.

Panel members' diverse backgrounds and achievements demonstrate the variety of opportunities for women at SLAC. Moderator Cherrill is pleased to report continuing, positive e-mail response from the panel's audience.

—Cherrill Spencer