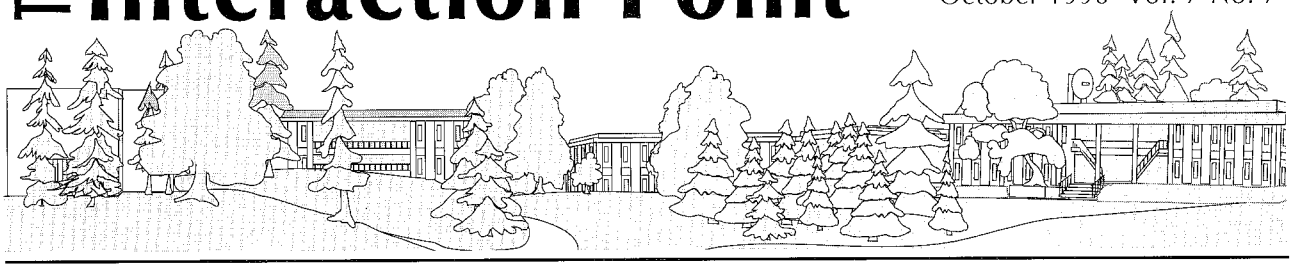
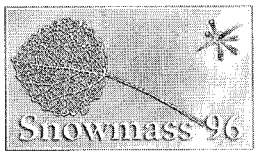
The Interaction Point

Events and Happenings
in the SLAC Community
October 1996 Vol. 7 No. 7





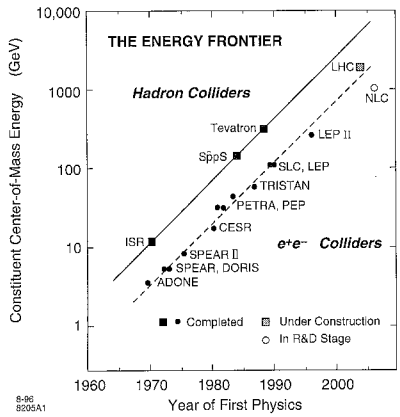
A Look to the Future at Snowmass '96

by David Burke

THE U.S. HIGH-ENERGY physics community gathered for three weeks at Snowmass, Colorado this summer to contemplate the future of accelerator-based physics in the U.S. as we enter into the next century. The wheels driving such grave consideration were set in motion nearly three years ago when the skyrocketing costs of the Superconducting Super Collider (SSC) led to its cancellation by the U.S. Congress. The SSC itself had been born over a decade earlier at a similar gathering of physicists at Snowmass in 1982. The meeting this year marked a turning point of sorts in the collective recovery from the loss of the SSC as people began to look forward, generate creative ideas, and rekindle the spirit of adventure in exploration of new science at the highest energies.

A partial step had been taken when a panel chaired by SLAC's Deputy Director, Sidney Drell, recommended U.S. participation in the construction and use of the Large Hadron Collider (LHC) at CERN. Though not the overpowering collider that the SSC was destined to be, the LHC provides an entry for U.S. scientists to do physics at energies ten times that now being studied at SLAC and Fermilab.

It is also significant that for the first time, the U.S. is planning direct support of a scientific "megaproject" overseas. An open-door policy has long allowed scientists from any nation access to experimental facilities built anywhere, but it has not been U.S. policy to contribute to construction of facilities abroad. We must form reliable partnerships in international science projects if we are to seek answers to questions at ever higher energies, and the LHC will be a first step in this direction.



But the LHC by itself will not do the job on the Energy Frontier (see the figure above). History clearly demonstrates the critical role played by electron-positron colliders in the investigation of physics at the highest energies, and study of scientific opportunities offered by the Next Linear Collider (NLC) became quite vigorous in the U.S. even preceding Snowmass '96. Nearly 500 physicists participated in one or more of several workshops organized at Fermilab, SLAC, and Brookhaven over the past year to investigate the physics potential of the NLC. Work continued at Snowmass, and new results broadened and deepened interest in the NLC. Successful use of the SLC to make precise studies of the Z has put the linear collider concept on the map, and advances in the accelerator physics and technology of the NLC has firmly established its feasibility.

A highlight at Snowmass was the unveiling of the new "Periodic Permanent Magnet" klystron developed here at SLAC. This advanced generation klystron, expected to be the microwave power source for the NLC, delivered as promised on its first round of tests, and its success has marked a major milestone toward the NLC. An extensive "Zeroth-Order Design Report for the Next Linear Collider," completed over the past year by a collaboration of a dozen institutions in the U.S. and abroad led by SLAC, also met with broad accreditation. Snowmass '96 confirmed that the NLC is the natural companion of the LHC on the Energy Frontier.

We are not alone in pursuit of an electron-positron flagship, as there is great interest and extensive effort around the world

(cont'd on page 2)

Thanks to PEP-II for Waste Reduction Effort

by Richard Cellamare

WHEN PEP-II STAFF members do things, they go all out. This is shown not only with their major effort in constructing the PEP-II facility, but also with their recent success in waste minimization. Through herculean efforts, Sandy Pierson, ES&H Coordinator for PEP-II, and Plant Engineering Dept.'s (PED) Phil Cutino, Rich Torres, and Harry Shin found a home for approximately 200 non-radioactive concrete rafts that had once been used to support the older PEP magnets. The rafts were 3 feet wide, 2 feet thick and ranged in length from 10 to 18 feet. At 3 to 7 tons each, the total weight came to approximately one thousand tons. Plant Engineering cleverly reused about 80 of the rafts in the reconstruction of the Interaction Region halls for PEP-II. Others were used around the site as retaining walls to prevent soil erosion.

Sandy Pierson investigated the potential for reusing the remaining rafts off site. One option was to have the rafts crushed and ground into material that could be used for roadbeds. This was not possible since the rafts were too big for nearby crushing facilities, and the process would be too costly. Another option was sending the rafts off in whole pieces to other organizations that could reuse them in construction projects, such as for jetties in U.S. Army Corps of Engineer projects or for retaining structures in U.S. Department of Interior projects. While interest was expressed, these options were not readily implementable due to timing, funding for transportation, or other concerns.


R. Cellamare

Phil Cutino, SLACer and volunteer with MPFPD, devised the winning solution of reusing excess concrete rafts.

Phil Cutino came up with the promising option of sending the remaining rafts to the Menlo Park Fire Protection District's (MPFPD) training center. Phil is a volunteer with MPFPD, which is one of the 26 National Urban Search and Rescue Task Forces, and he had assisted in rescue operations last year at Oklahoma City.

The MPFPD indicated interest in using the rafts at its Baylands Structural Collapse Training Center where they train their 200 member Task Force, as well as hundreds of firefighters and civilians throughout the West Coast. This training includes structural collapse rescue techniques, necessary to prepare for disasters such as the Oklahoma City bombing and earthquakes.

The relocation effort was coordinated between our PED, CalTrans, DOE, and MPFPD. PED loaned a large 15-ton forklift and a flat bed trailer to MPFPD to use at the team's Training Center. The blocks were loaded by the SLAC Rigging Group and transported by CalTrans and MPFPD. This process was conducted over several months until all the rafts had been transported. Eventually, some of the rafts will be sent to other rescue teams in California, including the Sacramento team and the State Office of Emergency Services training site near San Luis Obispo.

Our thanks to PEP-II and PED staff and to DOE for their support in an outstanding waste minimization effort.

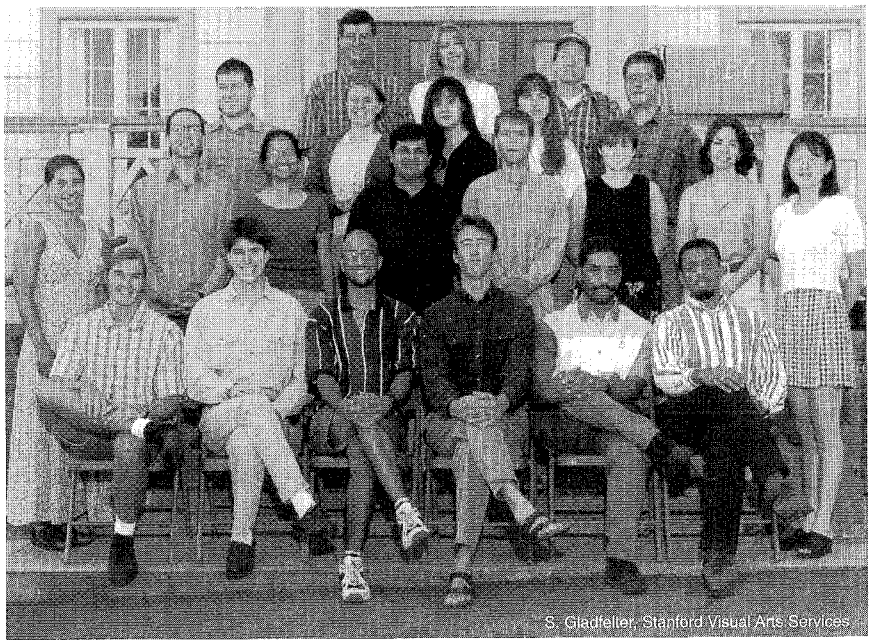
Snowmass 1996 looks to the future in physics

(cont'd from page 1)

aimed at development of such a facility, as seen in strong presentations made at Snowmass by scientists from Europe and Japan. The universities and laboratories involved in development of linear colliders have coordinated their research efforts, and in doing so have laid a solid foundation for future international cooperation as we move to final design and construction. The FFTB and NLCTA experiments here at SLAC are major parts of this R&D. Our task now is to build on this cooperative start, and put into place working structures that allow this rather intriguing combination of collaboration and competition to most efficiently reach its conclusion. It is a competition that we are not guaranteed to win, but we will bring our best to the job, and it is a collaboration of which we must be a part.

Snowmass '96 marked the beginning of U.S. High Energy Physics for the new century. It should prove to be an exciting time with great challenges in science and technology, that will require us to do business in new ways. We will be expected to clearly define the significance of what we do. The U.S. scientific community has begun to look forward to this era, and we will be ready with the NLC as it does.

Summer Internships attract students

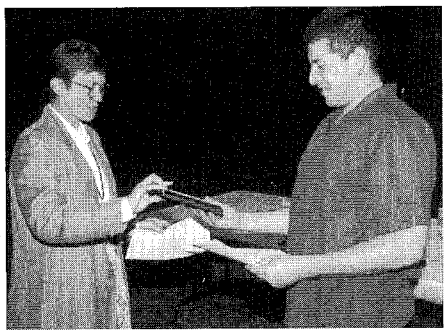


by Karen McClenahan

SLAC's 1996 Summer Internships in Science & Engineering (SISE) marked its 27th summer of employing and educating twenty college undergraduates. This year, the 2nd annual Ernest Coleman Award for Scholarship & Citizenship was awarded to Santa Clara University engineering physics major, Isaias Job. Isaias was supervised by Roberto Aiello of PEP-II—he was Roberto's second award-winning intern!

SISE program Director, Carlos Figueroa remarked, "Each year, the students get better and better. This year's group really kept me on my toes and impressed me with their insightful questions and excellent group dynamics." The students for the 1996 SISE program were from many different universities; see if you can find your alma mater:

Carrie Andre, The Cooper Union; Balarama Bernal, UC Santa Cruz; Julio da Graca, MIT; Maria Flor Durol, Cal Poly; Ronni Fantini, Smith; Corey Gray, Humboldt State; Atul Gupta, City College of New York; Tunde Gyurics, CSU-Sacramento; Justin Hernandez, Arizona State; Isaias Job, Santa Clara; John MacMahon, UC Santa Cruz; Hugh Manini, UC Berkeley; Keith Marshall, Univ. of Virginia; Alexander Morgan, Brandeis; Miranda Pearce, Reed; Mark Polsen, Cal Poly Pomona; Anamaria Reyna, Florida State; Bryan St. George, Univ. of Maryland-College Park; Nhu-An Vo, Santa Clara; Michelle Waziri, Santa Clara.



Helen Quinn, SISE Program Administrator, presents the Coleman Award to Isaias Job, a Santa Clara University engineering physics major.

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Workshops on Conference Poster Production

THE FIRST IN a three-part workshop series presented by the Technical Publications Dep. on preparing conference posters will be held on October 11 at 2:00 PM in the Orange Room. Advance sign-up is not required. This workshop is geared towards researchers or their support staff who need to prepare posters for conferences.

Focusing on production methods which do not require special software or hardware, this workshop will concentrate on basic poster layout and design, fonts and font sizes. It will discuss the process of achieving an appropriate balance of text to graphics, recommended materials and simple methods for using them to assemble attractive and effective posters.

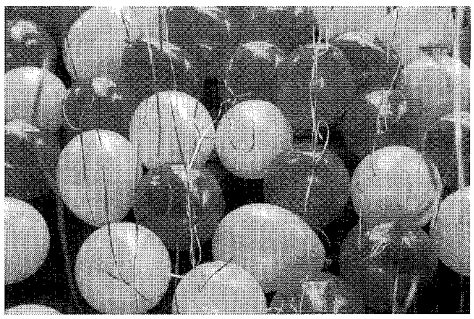
The second and third workshops, which will be held in November and December, will focus on posters made by generating large-scale printouts from various graphics and presentation software applications.

The workshops will be led by Terry Anderson (Computer Graphics) and Maria Breaux (Information and Document Technology).

1st in Physics, 3rd in Golf

SLAC took 3rd place in the 7th annual DOE-OAK sponsored golf tournament, held August 23rd at Skywest Golf Course in Hayward. Ben Smith of PEP-II coordinated this event; 20 SLAC'ers participated. Sandia National Lab, who had an average aggregate score of 75, won the perpetual trophy SLAC handed over the trophy they had won last year in SF. Participants were from Sandia, Bechtel, SLAC, LLNL, and LBL, and DOE-OAK.

Burton Richter and Helen Quinn prepare to cut the ribbon for the official opening of the SLAC Visitor's Center



The Too Much Fun Club employees prepare for their busy day

SLAC Celebrates Family Day

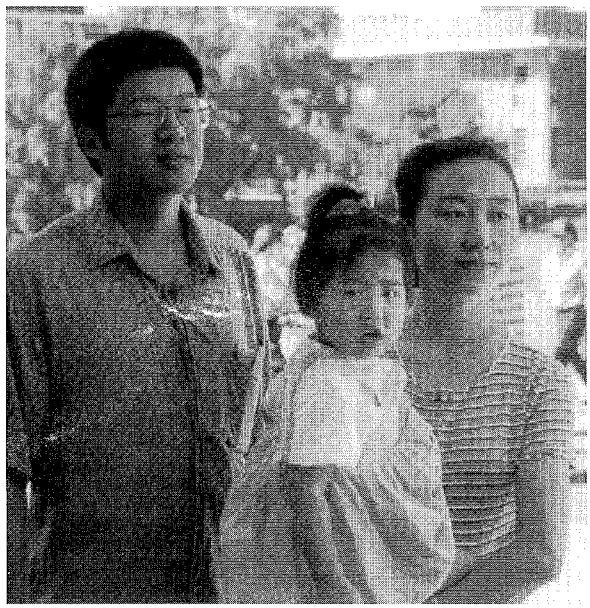
by K. McClenahan

"A GOOD TIME was had by all" on Family Day – held Saturday, September 7th. Approximately 1600 employees, their friends, and families, attended this day in the sun. The day was made possible through the combined efforts of Craig Russell and his employees at the Too Much Fun Club, the Family Day Committee, the Public Affairs Department, and many more.

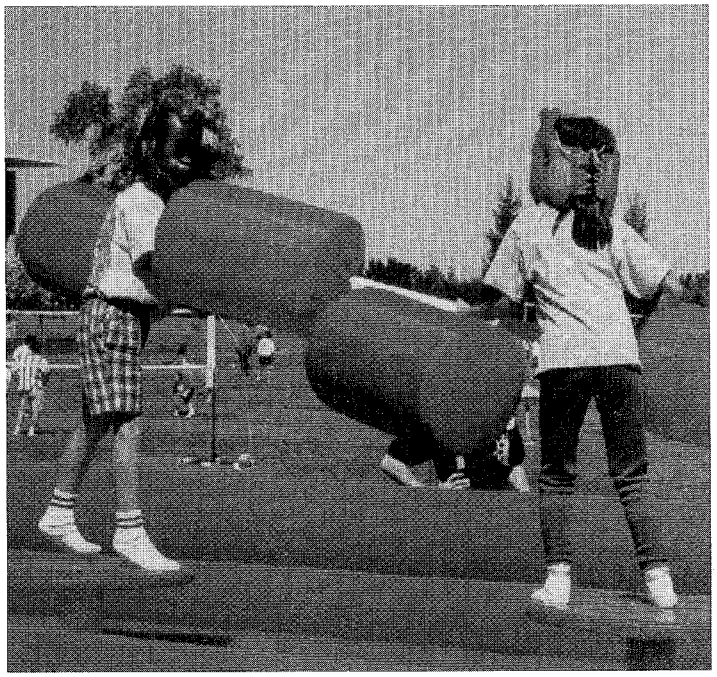
The younger children activities included arts and crafts in Fun City, a train ride, creative face painting, and climbing aboard the Palo Alto Fire Department's fire engines and rescue vehicles. Older children worked to conquer the 28′ inflatable mountain or knock rivals off their pedestals in the joust game, or catching a movie. Adults relaxed by listening to music or sitting back in the Sports Club.

Adults and children alike packed the beautiful Visitor's Center and participated in tours all over the site. Everyone enjoyed the delicious lunch and the fantastic acrobat and contortionist show. Throughout it all, t-shirts featuring a design by SLAC employee Joe Kenny were available for purchase. The final moment of Family Day was a winning one for Lorenzo Soria of the Power Conversion Department and his "EPA" volleyball team members as they were awarded champion ribbons for the volleyball tournament. They will have the perpetual trophy to display...until next year.

All Photos were taken by P. A. Moore

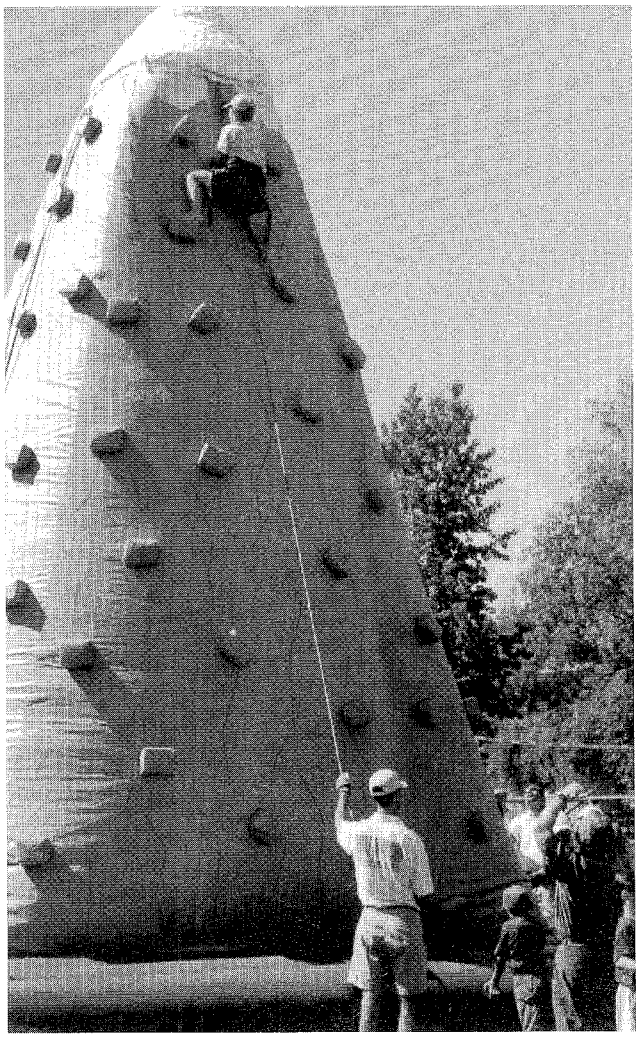


Visiting Electrical Engineer, Ziaoxi Xu and his family enjoy the party.



Battle of the siblings?

A "crafty kid"?



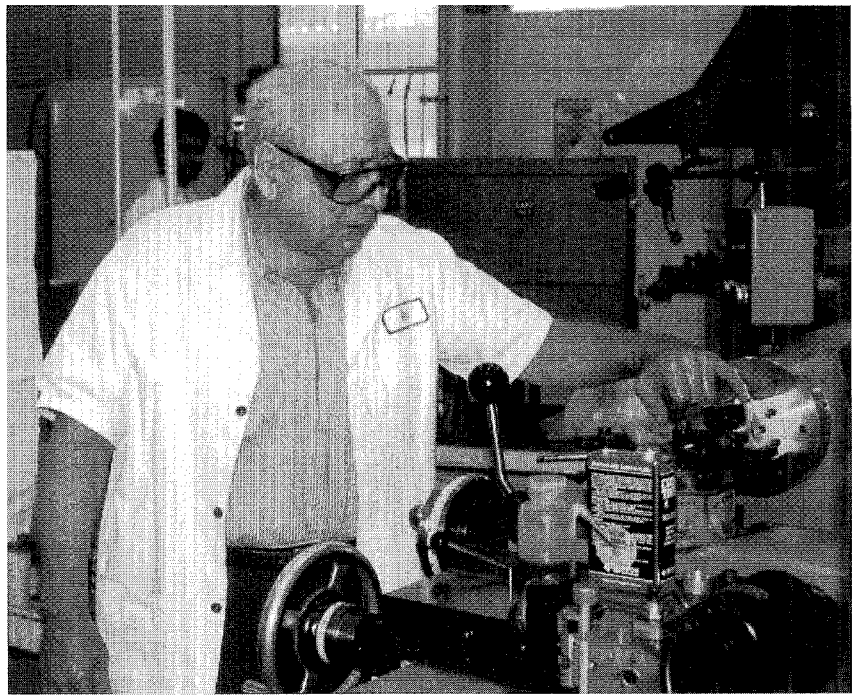
A brave young man conquers the Matterhorn.

Face painting was a very popular activity.

Toddlers relax in a comfortable spot.

Laser-Wire Lights up SLC Final Focus

by Steve Wagner



P. A. Moore

Art Hernandez, of MFD, points to the laser-wire final optics box he machined. When Art was finished, the lenses and mirrors necessary to focus the laser beam down to sub-micron spots were installed and the optics box was welded to the beam pipe, then installed inside the SLD detector prior to the start of the SLD run.

IF YOU NEED a wire to measure the size of the beam at the SLC interaction point (IP), but it turns out that the beam intensities are so high that any wire made of matter (atoms) will break from thermal shock, what do you do? At SLAC during this year's SLC run, we made a wire out of light.

The smallest fibers you can imagine making a wire scanner from are 4 micron carbon fibers, and there's only one person at SLAC (Yung-Yung Sung of Group I) with hands steady enough to make these. But even these wires are bigger than the nominal beam size at the SLC IP (which is about 1 micron, or one thousandth of a millimeter, vertically). When the beams are focused, we end up measuring the wire size rather than the beam size. That is, when we don't break them!

It's so hard to get in to replace these wires that we're only allowed to use them when the beam current is much lower than is needed to produce luminosity for the SLD. And at low current the properties of the beam change.

Unlike the wire scanners up and down the linac (where beam sizes are much larger), which have become the workhorses of beam diagnostics over the past few years, the wire scanners at the SLC IP have fallen into disuse as the accelerator currents have risen.

Driven by advances in lasers and by the need for wire scanners in the Next Linear Collider (NLC), where long "trains" of beam bunches will chew up wires in much the same way as at the SLC IP, a SLAC group lead by Marc Ross built a novel substitute for a wire scanner, appropriately named the "laser-wire." The installation of the new SLD vertex detector provided the opportunity to place one of these 29 cm away from the SLC IP.

The simple idea behind the laser-wire is to focus a high-powered laser beam down to the smallest spot possible. The "diffraction-limited" size of the near-ultraviolet laser we used is less than 1 micron; better than the carbon fibers.

A laser focused down to its diffraction-limited spot doesn't form a "wire," it forms a waist which quickly diverges away from the waist, just like the SLC beams at the IP. In many ways it's easier to think of the laser-wire as an accelerator like the SLC that produces a beam of particles (photons), which is then focused and collides with one of the SLC beams. The laser corresponds to the electron gun; the transport line from the laser clean room on the CEH pit floor to the SLC IP corresponds to the arcs; and the lenses and mirrors which focus the laser down to its waist corresponds to the SLC final focus.

All that's missing is the linac (since you can't "accelerate" light) and the damping rings, since the laser we built already produced the coolest beam of photons possible. Then the problem of finding the laser-wire waist becomes the same as focusing the two SLC beams at their IP, except that the laser and the electron beam cross at right angles, rather than meeting head-on like the two SLC beams.

The laser-wire was ready for commissioning in July; however, it took about four shifts of accelerator time to bring the electron beam

(cont'd on page 7)

Single Micron-Thin Laser-wire for SLC

(cont'd from page 6)

into collision with the laser-wire. It was like finding a needle-in-a-haystack with another needle, except that both "needles" exist for only a small fraction of time at the same place (about 5 and 150 trillionth of a second for the electron beam and the laser-wire, respectively). Even if the electron beam and the laser-wire are right on top of each other, if the timing is not exactly right, nothing happens.

So we persevered and, shortly after midnight on July 12th, we saw the first feeble signal of the electron beam colliding with the laser-wire. We grabbed this signal and tuned everything we had control of until the electron beam and laser-wire were exactly on top of each other at the right time.

Within three hours of first collisions, we had large signals and were making laser-wire scans as small as any on the IP carbon-fiber wires, at full accelerator current.

The laser-wire project was truly a collaborative effort, with dozens of SLAC people contributing anywhere from an hour or two to several years of specialized knowledge to make it work. Marc Ross organized the effort and contributed to all phases. Joe Frisch designed the laser, and Ray Alley and Theo Kotseroglou made it work after Joe left SLAC for industry. Eric Bong, Don Arnett, and Mark Scheeff were responsible for the mechanical design. The precision optics box, which holds the final mirrors and lenses welded to the beam pipe, was manufactured in the SLAC shops.

Keith Jobe, Doug McCormick, and Sandy Horton-Smith provided the instrumentation to make sure the laser beam got to the SLC IP in good shape and at the right time. Steve Wagner and Mike Woods from the SLD experiment provided optics testing, physics support, and detectors for the downgraded electrons and upgraded photons produced when the beams intercept the laser-wire. Many of the accelerator operators spent the 1995 summer down-time working on laser-wire projects.

The SLC software group provided the code necessary to scan the beams and process the data, and the SLC accelerator physicists pitched in to help bring everything together, and provided the electron beam.

To the many others at SLAC who helped make the laser-wire project a success, we thank you.

Sixty Years of Stanford Klystrons

VISIT THE LOBBY of the Test Lab and see the display, "60 years of Stanford Klystrons." George Caryotakis conceived the idea for this exhibit and conducted a search for early klystrons to display.

The earliest tube on display dates from 1937 and is a copy of a Model B klystron constructed at Stanford by Russell Varian, Sigurd Varian, and William Hansen. The original is located at the Smithsonian Institute.

Also on exhibit is a 1949 klystron designed by Edward Ginston and Marvin Chodorow, with decals of the old Stanford Indians football team - which places the klystron in a period of Stanford history.

Others who contributed to the design and construction of the klystron display are Jim Stanfield, Mike Copeland and Cole Carter.

SSRL 23rd Annual User Conference

THE SYNCHROTRON DIVISION will host its annual users' conference on Oct 24-25. The program will highlight recent achievements and advances made possible by SSRL. Plans for near-term development and new directions in the future will be part of the discussions.

A preliminary agenda is posted on the Web as well as registration forms. This year a $200 cash prize will be given to the best graduate student poster. The posters will be judged by the SSRL Users' Executive Committee. For additional information, contact Michelle Steger at ext. 3011.

Welcome Guests and New Employees

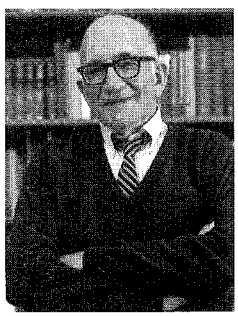
The following people joined SLAC in August and early September: **Toshinori Abe**, Group A; **F. Curtis Belser**, PEP; **Dominic Case**, Power Conversion; **Yuval Grossman**, THP; **Paul Harrison**, EC; **James Lewandowski**, Accelerator Ops.; **John Luhman**, SSRL Eng; **John MacMahon**, Accelerator Dept.; **Tracey Marsh**, Accelerator Ops.; **Apurva Mehta**, SSRL; **Anatoly Krasnykh**, Klystron Testing; **Chris Pappas**, PCD; **Johan Rathsman**, THP; **Peter Rowson**, SLD; **Gerald Yocky**, Accelerator Ops.; **Xiaoxi Xu**, ARDB.

Wedding Belles of BSD

Sharon Bolton, BSD, married Ed West on August 11th in a ceremony at a private estate in Waimanola, Oahu, Hawaii

Cheryl Kreuzer, BSD, married David Niermeyer on May 4 at their ranch.

Meet Sidney Drell



DRELL WAS RECENTLY acknowledged for his 40 years of service to Stanford University and his 70th birthday. Also born in 1926 were Queen Elizabeth and Marilyn Monroe, both of whom sent gifts: a corgi and a kiss. Drell sits on the President's Foreign Intelligence Advisory Board and is active in arms control debates around the world. At SLAC he is best known for his many contributions to the Annual Theory-Experimental Softball game.

FactinOs

Photo portraits of physicists are on display in Central Lab, 2nd floor, by photographer Bob Palmer. Photos will be departing soon, so try to see them before they go.

During Rekeying of the Central Lab, there is still 24 hour access to the Library if you have an outdoor key to the Central Lab. If you don't have a Central Lab key and plan to use the Library during off-hours, ask Lana Smith, ext. 2207, for assistance.

The lab will close from Sunday, Dec. 22 to Jan. 1 except as noted in the All Hands memo of Sept. 12.

Car Stickers will be required as part of the new traffic safety procedures. Get one now and avoid the rush. Go to the Security Trailers #205 near the Sector 30 gate. We are still looking for the oldest sticker — do you have it?

It's time to start training for the 25th annual SLAC run to be held on Nov. 7. Neither bodies nor Rome were built in a day. Besides, it is a well known theorem that an exercise plan before the holidays will prevent weight gain during the holidays. We need some volunteer experimentalists to test the theory.

Opportunities abound! Check out the Stanford Report's Fall 1996 guide for Educational &Training Opportunities and the Sept. —Dec. Training Opportunities at SLAC. Contact your office administrator or Personnel at ext. 2265 if you need a copy of either of these pubs.

Bloopers! Did you receive an Interaction Point that was misprinted? Please let us know so we can give you a correct copy!

The photo credit for Bye-Bye Bitnet in the September Interaction Point should have been given to Teresa Downey.