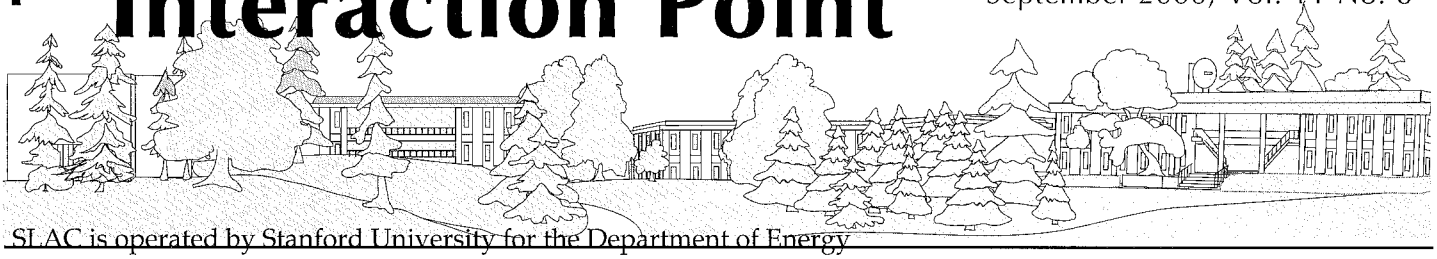
The Interaction Point

Events and Happenings
in the SLAC Community
September 2000, Vol. 11 No. 8



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First Results from the B Factory Presented in Osaka

THE PEP-II ASYMMETRIC *B* Factory continues to exceed expectations, having nearly reached design performance after only a year of operations. Designed and built by SLAC in cooperation with the Lawrence Berkeley and Lawrence Livermore National Laboratories and funded by $177 million from the U.S. Department of Energy, this innovative electron-positron collider has been creating millions of B meson pairs. The collaboration of more than 500 physicists who designed and built the 1200-ton *BaBar* detector is eagerly sifting through this burgeoning mountain of data. Coming to Stanford from Canada, China, France, Great Britain, Germany, Italy, Norway, Russia and all across the United States, they are searching for evidence of CP violation, an asymmetry between matter and antimatter, in B meson decays.

As reported at the International Conference on High Energy Physics in Osaka, Japan, the SLAC *B* Factory hit a peak luminosity (the standard measure of the collision rate) of 76 percent of its goal of 3.0×10^{33}. *(Editor's Note: Since the report at Osaka, this record has been surpassed.)* When combined with better-than-expected operating efficiencies on both the collider and the *BaBar* detector, this facility has exceeded its expected daily output of *B* meson events on several different occasions. Having already created over 10 million *B* meson pairs, or more than has been recorded on all previous accelerators, it is indeed operating like a factory. Thanks to the untiring efforts of the commissioning team led by John Seeman, SLAC has now gained the world's records for peak luminosity and for the total luminosity integrated over a shift, a day and a week.

A distinctive feature of the *B* Factory, and why it is called "asymmetric" is that the electrons and positrons circulate at different energies. When an electron and a positron meet and annihilate, the *B* meson and its antiparticle that are often produced lurch forward in the direction of the more energetic electron beam. This feature makes it much easier to isolate the daughter particles that arose from each of the two individual *B* decays and to determine the time that elapsed between them. Knowing this time difference is essential for physicists trying to measure any CP-violating asymmetries among *B* mesons.

Normally a new particle collider with such innovative features must be coaxed through a long tuning period, often taking several years, before it performs at its full potential. The particle detector surrounding the collision point is another complex, sensitive device that must be painstakingly adjusted to work as designed. But the entire *B* Factory, both collider and detector, has come on line smoothly and in record time, to the delight of the hundreds of *BaBar* scientists now trying to cope with the flood of data. One observer likens it to "drinking from a fire hose."

On July 31 in Osaka, *BaBar* spokesman David Hitlin of Caltech presented results based on over nine million *B* meson pairs. In addition to precise measurements of *B* meson lifetimes and mixing parameters as good as any made by Cornell's CLEO collaboration, he revealed a surprisingly large tendency for *B* mesons to decay into pion pairs, more than twice what CLEO observes. This preliminary result augurs well for further measurements of a possible CP asymmetry in these decays, but it must be confirmed by further measurements on *BaBar* and KEK's Belle experiment.

By far, the most anticipated number Hitlin presented was the collaboration's preliminary result for the CP-violation parameter sine-two-beta which is extracted from decays of neutral *B* and anti-*B* mesons into a j/psi particle and a K-short. Any significant difference between these two decay rates corresponds to a non-zero value of sine-two-beta and gives solid evidence for CP violation. The preliminary value Hitlin announced at Osaka, based on 120 such "golden events," was $0.12 \pm 0.37(\text{stat}) \pm 0.09$ (syst) consistent with no CP violation at all.

In an intriguing twist, the *BaBar* data analysis that generated this result was done completely "blind." Even the physicists doing the analysis did not know the answer until two weeks before the Osaka presentation. Such a blinded analysis helped to eliminate experimenter bias about what the value of sine-two-beta should be, and to allow studies of detector resolutions and efficiencies to be done while keeping this value hidden. In a SLAC colloquium a

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Director's Corner

by Jonathan Dorfan

The Year in Review

It was pointed out to me recently that I have been in my new position as Director for a year. I must admit that I was surprised; somehow it doesn't seem nearly that long! The past year has been a busy and successful one for all elements of the Laboratory. The staff should feel proud of their many accomplishments, some of which I will highlight below. I am most appreciative of the support that I have received this past year from all corners of the Laboratory.

The *B* Factory program, PEP-II and *BaBar*, had a spectacular first year of operation. The machine achieved world record peak performance levels in a very short time. Perhaps even more significant has been the total amount of data delivered, which reflects the very high up-time of the machine. The *BaBar* detector has performed equally well. The data are rapidly provided to over 500 experimenters worldwide for analysis. PEP-II will continue to run until the end of October. Then we will be down for three months to allow the machine and detector groups time to improve the hardware in preparation for next year's run. We can expect a rash of publications by the end of the calendar year.

Not to be outdone, the SPEAR run was equally impressive. SPEAR delivered beam to its users a record 97% of the scheduled time. More than 750 independent experiments got data, and the user population grew beyond 1600 researchers, over 300 of whom are new this year to SSRL. The SPEAR science program continues to produce frontier research in the areas of material science, chemistry, environmental science, and structural molecular biology. The upgrade of SPEAR, called SPEAR3, is proceeding well. The SPEAR3 team received very high praise at the recent DOE technical, cost, schedule and management review.

Looking towards the future, we completed the first year of the multi-laboratory Linear Coherent Light Source (LCLS) R&D program. This facility, which would use the back one-third of the linac as the source for an extremely bright light source, has the potential to revolutionize X-ray science in much the same way that the SPEAR-like machines did. In addition to the machine R&D, detailed studies aimed at making a persuasive scientific case for the facility were launched. Construction of such a machine could begin as early as 2003.

The next horizon for the high-energy physics frontier is the NLC, a 500 GeV center of mass energy electron-positron linear collider. This machine was spawned by the pioneering effort of the SLC. Much progress has been achieved in the past year. A memorandum of understanding was signed with our sister laboratory Fermilab which has now joined us in NLC R&D. We have continued our very successful R&D collaboration with our colleagues at KEK in Japan. The major focus of the past year has been to look at strategies for reducing the cost of the machine, and several new ideas have led to a potential cost reduction of 30%. Physics studies have sharpened the scientific case for the machine. Significant progress has also been made on the design for a so-called two-beam machine, which provides a very promising approach to increasing the energy beyond the initial 500 GeV.

We received good news in our non-accelerator program when NASA selected the Gamma-ray Large Area Space Telescope (GLAST) proposal for its 2005 launch. GLAST is a large telescope that will record a detailed map of the gamma-ray sources in our universe. About 100 times as sensitive as the best instrument flown to date, GLAST is a collaboration of high energy and astrophysics researchers from five nations. The $120M detector project is based at SLAC.

The SLD experiment that concluded two years ago continues to analyze its data and produce results that are, in many cases, the best measurements of their kind in the world. Preparation for the next fixed target experiment, E158, in End Station A, is proceeding. This experiment will be run in two 10-week phases, one each in FY2001 and FY2002.

On the unsuccessful side, I am sorry to report that I have had no success with recruiting a Deputy Director from outside the Laboratory ranks. The three outside candidates who were approached have all turned us down. We will have to rethink how to deal with this critical need.

Other positive news for the Lab was the merger of Facilities and Plant Engineering into the new Site Engineering and Maintenance Department (SE&M). SE&M's responsiveness and performance has been uniformly praised by its customers. We now have a dedicated Space Manager, who should greatly improve the traditional difficulties with the assignment of offices and research space. Our new Research Office Building, which will house 150 people and is sited next to the A&E building, is in the final design phase. Construction begins this fall and should be complete by the end of 2001.

The Communications Task Force has completed its in-depth look at all aspects of communication at the Laboratory. They have made many

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ORION: A New Facility for Advanced Accelerator Research

BREAKTHROUGHS IN HIGH-ENERGY physics come from new theories, experimental discoveries, and new accelerator science and technologies. At one time or another, all of these have been critical to SLAC. The September 16 celebration for James Bjorken (bj), for example, shows an interplay of all three. bj interpreted the deep inelastic electron scattering experiments in End Station A as showing that neutrons and protons are made of quarks. The experiments were possible thanks to a great accelerator achievement, the two-mile linac.

Now, as high-energy accelerators become bigger and more expensive, it is important to explore new ways to accelerate particles. There are many ideas for that based on such things as plasmas, lasers and high-gradient radiofrequency. Most of the ideas are still embryonic, but a few could become crucial for the future of high-energy physics. They cover such a breadth of physics and engineering that we at SLAC cannot explore them alone.

So, how can SLAC help develop these concepts? The answer is to follow SLAC's usual mode of operation, that of providing outstanding facilities for a broad range of users from universities and other national laboratories. That brings us to ORION, a facility for researchers with a passion for developing new accelerator technologies. ORION will support user activities by providing beams, instrumentation, and facilities for their research.

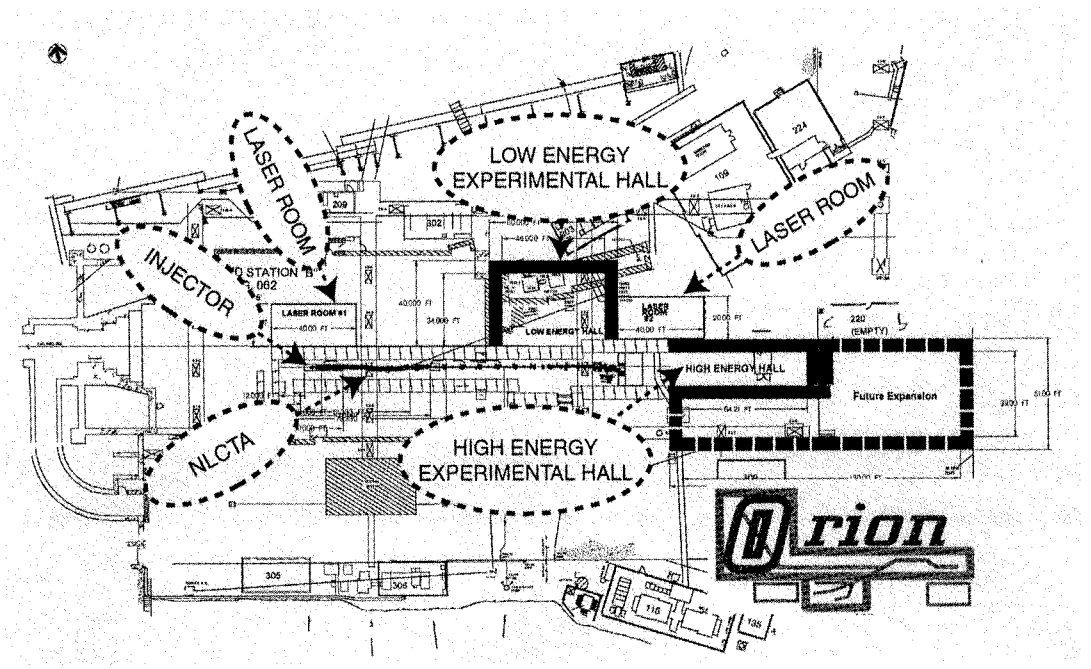
The ORION Advanced Accelerator Research Facility will be based on the NLC Test Accelerator (NLCTA) located in End Station B in the Research Yard. New experimental halls will be constructed for performing experiments with 50 MeV and 300 MeV beams from the NLCTA, and there will be two laser rooms to house the lasers that will be a major part of the ORION research program. Finally, a new injector will be needed and will operate in parallel with the present NLCTA injector.

The picture has evolved over the past year. A major preliminary step was a workshop held in February where the experimental program was discussed and user interest in ORION clearly demonstrated. Experiments conducted at the ORION facility will study all aspects of advanced accelerator science and technology. Laser driven accelerators, plasma accelerators, high-brightness particle sources, and understanding the limitations of radiofrequency accelerators are all expected to become significant parts of the program. The workshop report provides further details describing the possible experimental program and may be seen online at the following url: `http://www-project.slac.stanford.edu/orion/conf/orionsummary.pdf`

The decision to build ORION was announced by Jonathan Dorfan, SLAC Director, in a memo in mid-July. The Director's memo stated key principles for the facility. ORION will be a user-driven facility, experiments will be proposed and peer reviewed in much the same manner as those at other SLAC facilities. Funding for building ORION will have to come from outside the present SLAC budget. I will be in charge of building the ORION facility as a project under the auspices of the Technical Division; Dieter Walz will be the project engineer.

The challenge of raising funds and designing and building ORION is a substantial one, but I look forward to it. ORION will be an important facility for SLAC, the high-energy physics community, and for the development of new accelerator concepts. My dream is that ORION will become a focus for a diverse and large community interested in advanced accelerator concepts. It is a great opportunity for SLAC to build and provide this advanced accelerator research facility and for the user community to have the resources that will be offered by ORION.

–Bob Siemann



The ORION Advanced Accelerator Research Facility will be based on the NLCTA and located in the research yard near End Station B.

Changes for Training Funds

BEGINNING SEPTEMBER 1, 2000, THE Stanford University Staff Training Assistance Program (STAP) funds policy allows immediate use of $800 per year by all full-time, regular employees of SLAC (no faculty or students). Historically, STAP benefits have been restricted to $200 per quarter. Now, SLAC employees may choose to use the $800 in one of several ways: all the $800 for one class; incrementally for several classes; or selectively for classes such as those offered by the University (i.e., Stanford Continuing Education or HIP courses) that may not be covered by department funds.

Employees can use STAP funds to help defray costs of training, conferences, workshops or seminars. If the cost of the activity is more than $800, the remaining expense would need approval to be covered by department funds, or the employee would bear the expense.

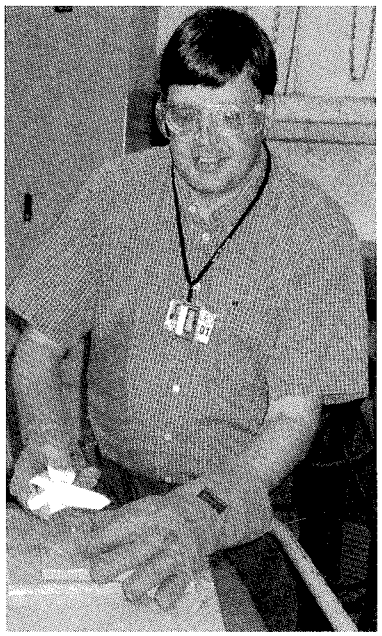
A new online version of the STAP training request form is now available at `http://www-bis.slac.stanford.edu` under the "Forms" tab in either "Human Resources" or "Accounting-Special Payment Forms." All employees are asked to make use of this online version of the form, which allows tracking of the data against the amount of STAP funds allocated to each employee. After filling out the information requested, the employee prints the form and obtains the necessary approvals before submitting it to the Training Coordinator at M/S 11.

A SLAC Registration Payment Form (located at `http://www-bis.slac.stanford.edu` under the "Accounting-Special Payment Forms") should always accompany the STAP form, along with the cost and description of the training, whether it's a workshop, conference or seminar. This insures that the request for the training will be paid for by department funds if the employee's STAP funds are exhausted.

If you have any difficulty in finding these forms online, or have questions concerning the information requested, please contact either Lynn Thanash (x2265, lthana@slac.stanford.edu) or Teri Peterson (x3245, terip@slac.stanford.edu).

–Teri Peterson

SLAC Family Day: Fun, Food, and Physics Saturday, September 23

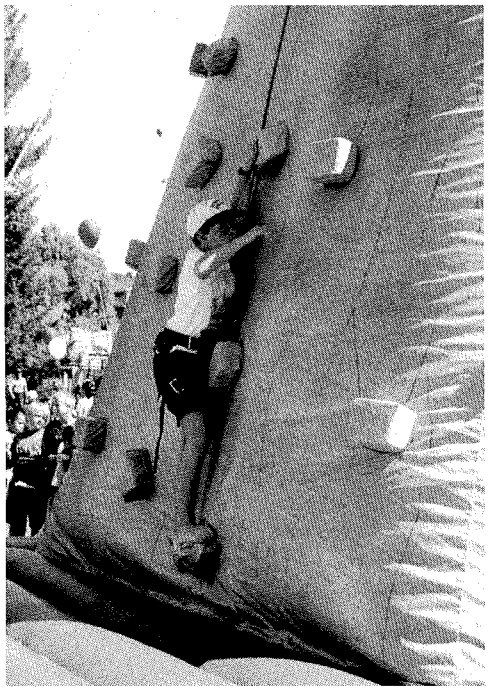


IF YOU NEED TO pound in a nail and don't happen to have a hammer handy, maybe a banana will do. That is, once you freeze it to a cryogenic temperature of -315° F. Come see this and other feats of physics at the SLAC Family Day. John Weisend, of EFD Cryogenics, won't make coins disappear, but he will perform a different kind of "magic" at his show, featuring not only the banana-hammer, but also levitating magnets and brittle flowers.

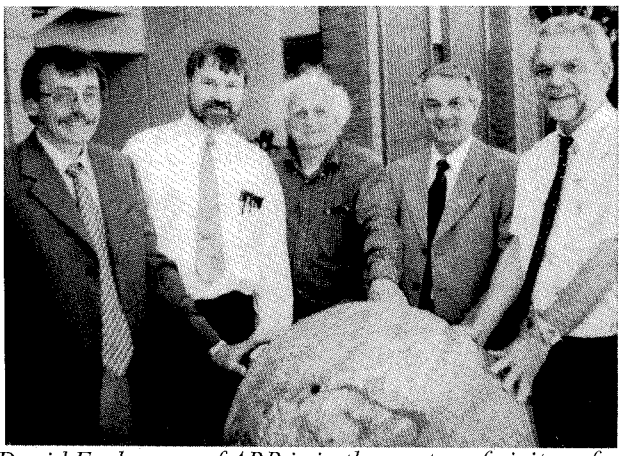
Other exciting demonstrations will be presented by Dave Bostic on Vacuum Science and Jim Allan on Radiation.

This is one of the attractions at the SLAC Family Day that you won't want to miss. Mark your calendar and check out the web page at `http://www-project.slac.stanford.edu/familyday/2000/fd2000.html`. We're still planning; so send your ideas, feedback, and suggestions to Brenda Warren, x2355, bwarren@slac.stanford.edu or Jonathan Dunn, x2145, jdunn@slac.stanford.edu.

Activities in previous years have included face painting, crafts tables, and rock climbing.



Ball Lightning Explorers



David Fryberger of ARB is in the center of visitors from Norway. They are in the US looking for financial support for a Earth Light Center to be set up in Hessdalen, Norway. Erling Strand (2nd from left) published the Hessdalen Report, clearly establishing earth lights as a physical phenomenon. Fryberger delivered an invited paper on Ball Lightning at the Earth Lights Workshop at Hessdalen in March of 1994.

First Results from the B Factory

(Continued from Page 1)

week before Osaka, Hitlin still kept the true result blanked out, although by then most of the BaBar collaboration knew the answer.

The errors in sine-two-beta are still large at this early stage; they will come down steadily as millions more *B* mesons are produced and recorded over the next few months. "The rapid launch of the *B* Factory has given us our first glimpse into the new domain of CP violation measurements in the *B* meson system," observed Hitlin. "We hope to double our data by the end of October and to begin to make truly definitive tests of the Standard Model mechanism for this intriguing phenomenon."

–Michael Riordan

Director's Corner

(Continued from Page 2)

recommendations and it will take time to understand them and produce an implementation plan. But be assured that a wide-ranging plan will be forthcoming.

In my inaugural speech, I urged us to seek new research opportunities within the larger Stanford research base. I am happy to report that the University Administration responded well to this idea and we are already seeing new and wider opportunities emerging. You can expect to see some of these efforts take hold in the next year.

We have a bright scientific future here at SLAC. Thanks to all of you for your contributions to the Lab.

Safety During Emergencies Depends on Team Work and Cooperation

HAVE YOU EVER WONDERED what your responsibilities are during an emergency? This notice will help you clarify what to do during emergencies at SLAC.

During a fire alarm or other 9-911 emergency at SLAC, local emergency responders (such as the Fire Department), SLAC Safeguards and Security staff, and SLAC Main Control Center (MCC) personnel will respond. The individual who is in charge at the scene (generally the Senior Fire Officer or Security Officer present) is the Incident Commander. During the incident, the Incident Commander may use Fire, MCC or Security staff to help with evacuation or other emergency scene duties. Their help will allow the Incident Commander to focus on the emergency.

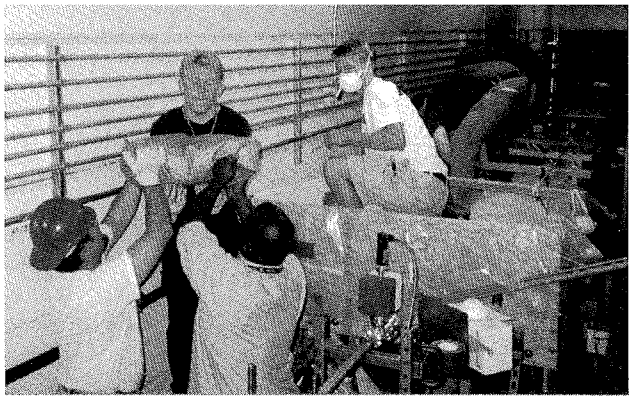
During an emergency, if either Fire, Security, or MCC personnel ask you to evacuate, follow their directions. Interference of lawful commands is not just illegal under the Uniform Fire Code, it also creates additional hazards for the Incident Commander and others.

An emergency scene can be confusing, with flashing red lights, loud sirens, and emergency vehicles maneuvering around the building. Under these conditions, we all must depend on each other and the emergency responders to keep the situation and building occupants safe. Teamwork and cooperation are vital.

It is the responsibility of every person present in an emergency to follow instructions given by an official emergency responder.

If you have any questions regarding this issue please contact the SLAC Fire Marshal, Robert Reek at Ext. 4509 or via email at robertrr@slac.stanford.edu.

–Robert Reek



You can't have a sandbox without the sand, so staff and student interns formed a human chain passing heavy sandbags to each other to fill the box.

EXPERIMENTERS ARE AN INVENTIVE lot, and a group at SLAC has used a sandbox mounted in the Final Focus Test Beam (FFTB) to test a theory about microwave signals from neutrinos. Astronomer Peter Gorham from Cal Tech's Jet Propulsion Lab (JPL) in Pasadena, physicist David Saltzberg from UCLA, graduate student Dawn Williams, Paul Schoessow from Argonne, and SLAC physicists Al Odian, Clive Fields, Rick Iverson and Dieter Walz have sent a beam of gamma rays into a sandbox.

Dipole antennas were buried in the sand and microwave "horn" antennas were mounted along one side of the sandbox. They were used to observe and measure signals emitted when these energetic gamma rays (photons) generate electromagnetic cascade showers in a dielectric medium like dry sand. The technique and the results should help in the observation of energetic neutrino showers using the moon as an emitter.

Neutrinos lead the pack in terms of sheer numbers of cosmic particles and they provide six possible distinct types of radiation. Scientists contend that a growing sub-field in astrophysics research should include neutrino studies.

The sandbox experiment is based on a theory proposed by G. Askaryan in 1962. Neutrinos are difficult particles to detect. They have a very small mass, no charge and only weak interactions. Like photons, neutrinos travel in fairly straight lines from their source to the point of detection. In addition, the neutrino will go through almost anything, hardly noticing that something is in its way. So to detect and observe neutrinos requires emitters and detectors with lots of material. Askaryan suggested that solids such as the ice pack at the South Pole could provide a medium for detection. But little work was done on Askaryan's theory until the 1980's, when two Russian scientists revisited the theory.

Enter the moon, nature's own emitter with lots of material. In 1988 Zheleznykh came up with the idea that large antennas used in ground-based radio astronomy should be able to detect radio pulses from neutrinos interacting in the moon's surface layers. Energetic neutrinos in the universe form a steady stream of particles and some of those pass through the moon's mass and a few interact. Those interactions will create a type of radiation known as coherent Cherenkov microwave radiation. If the interaction is close enough to the moon's sandy and dusty surface, then microwave signals might be detectable on earth. All that's needed are some radio telescopes to receive those signals, which could be provided by NASA scientists working at JPL, and of course, the ability to understand the nature of the signals.

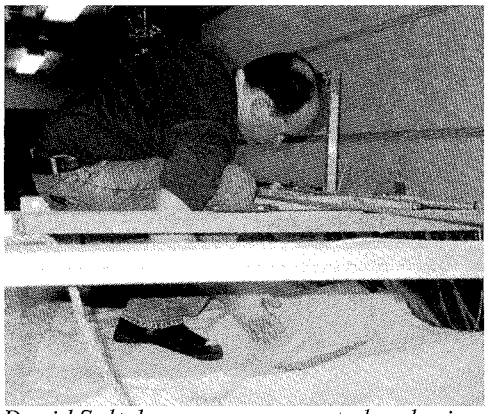
Saltzberg was thrilled to test the theory here at SLAC. According to the UCLA scientist, it's like building a scale model. "We could not have done this without the help of so many people at SLAC. I am extremely pleased that we could propose an experiment in April and have it completed by August. This result would have been impossible without the incredible precision and stability of the beams at SLAC." SLAC's FFTB is uniquely suitable for this test since the combination of its energy (30GeV) and current (1 to 2×10^{10} electrons per pulse) creates showers comparable to those expected from very energetic cosmic neutrinos (10^{19} to 10^{20} eV).

According to Gorham, "The results of this experiment at SLAC will be hugely important to current efforts to detect ultra-high energy cosmic neutrinos. This remarkably small effect went undetected for almost 40 years.We wish Askaryan were still alive to see his theory confirmed so clearly."

"The sandbox has captured a lot of attention," said Al Odian. "It's been great to see the response from others." For example, skilled workers in the crafts shops made a major contribution in the construction of the box itself. The sandbox was made of plywood in a trapezoid shape, measuring about 2 feet wide at its narrow end, about 5 feet at its wide end, about 12 feet long and about 2 feet deep. It was designed to hold 80

The carpentry shop crew were involved in the sandbox construction. Pictured here are (l tor) David Towes, Brent Johnson, Phil Brunner and Mike Hughes. George Laxson of MFD also helped out in the welding of the sandbox.

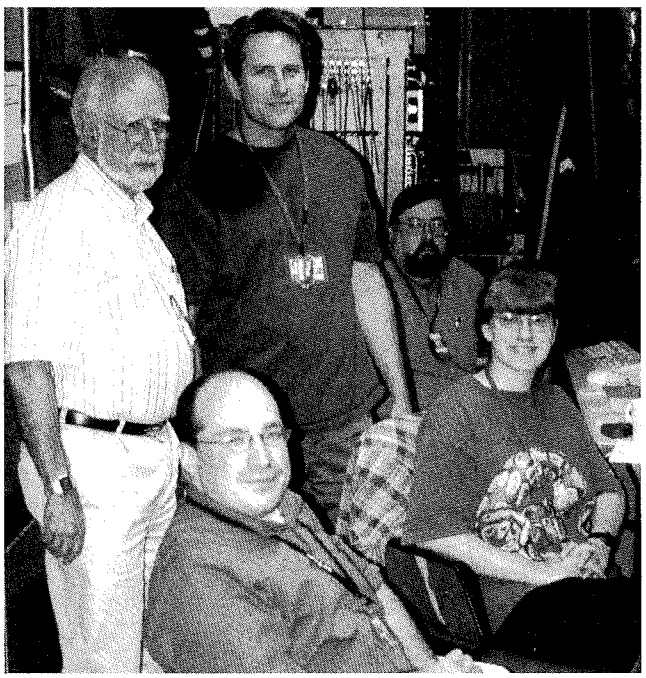
and The Moon Connection



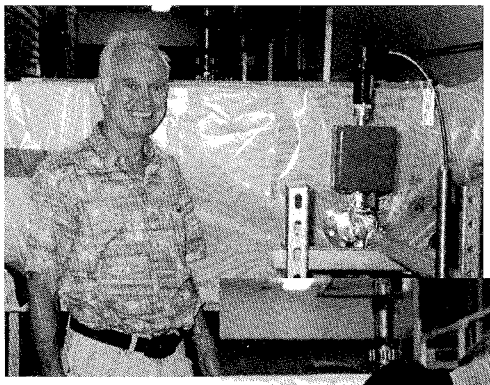
David Saltzberg may appear to be playing in the sandbox, but he is covering antennas.

cubic feet of sand. It was made to order in the carpentry shop by Brent Johnson with help from David Towes, Phil Brunner and Mike Hughes in frequent consultations with Odian and Walz. The beam was steered by Rick Iverson who also pulled cables with Walz. "It's obvious that science depends on a lot of people for success and we're all looking forward to the results," said Odian.

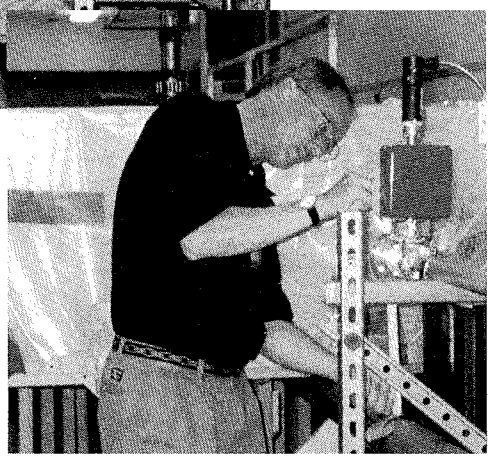
Other requirements for the success of this experiment were enthusiastically met on short order. Vacuum engineer Lynn Bentson found a dedicated current monitor. Vacuum technicians Greg Diaz, Kris Dudley and Terry McCaffrey created the necessary space in the beam line and the vacuum conditions to deliver the beam. Bob Simmons and Richard Zdarko provided a pulse generator to remotely calibrate the current monitor, and Vern Brown provided a TV camera to view the gamma ray beam. Francis Gaudreault, Tony King and John McDougal from the Metrology department made sure that the sandbox was properly placed in the universe.



Scientific staff for the sandbox experiment here seen in their "spacious" trailer near the experiment in the research yard. Standing Al Odian (SLAC) and Peter Gorham (Cal Tech's JPL), seated (front to back) David Saltzberg (UCLA), graduate student Dawn Williams, and Argonne's Paul Schoessow.



Dieter Walz helped with the final inspection before the beam was turned on.



Rick Iverson pinpoints the location of the gamma beam.

Last, but not least, Willie Lovelace was the jack of all trades securing the sandbox against earthquakes and mounting all the gadgets needed in the tunnel. Yic Liang and Patrick Shen from the EFD Cryogenics group made up and installed data acquisition cables on last minute notice. Sayed Rokni from Radiation Physics and Jim Allan and Aaron Gooch from OHP provided radiation safety guidance.

When it was finally time to fill the sandbox with the silica (quartz) sand, according to Dieter Walz, "the enthusiasm of all the participants made it feel like a party," well orchestrated by Mike Jimenez and his army. In short order about 9000 pounds of sand were placed to receive gamma rays and spit out microwaves. The party spirit continued because the next morning they found a stuffed toy cat sitting on top of the sand with the look of "Who, me?"

Needless to say, the results had to be good and scientists just had to confirm that Askaryan was right. Indeed, the early results indicate that he was. Strong microwave signals were detected; they were coherent (polarized) and they also gave a beautiful representation of the longitudinal cascade shower profile.

Walz feels pretty good about this experiment. "It looks like we are ready for the moon."

–P.A. Moore

(Photos: P.A. Moore and Dieter Walz)

Experiment-Theory Softball 2000

Experiment Crushes Theory 25-3

EXPERIMENT WILDLY CELEBRATED THEIR third softball victory in a row after crushing Theory 25-3 in the annual SLAC softball game. The first three-peat victory in over a decade was especially sweet as Experiment dominated every aspect of the contest. The victors combined a relentless hitting attack with a smothering defense to seal the victory.

Theory was outmatched this year from the opening pitch by winning hurler Burt "Big Daddy" Richter to the final out. Led by the big bat of Ron "the Rock" Cassell, Experiment tallied 12 runs by the end of the fourth inning to effectively put the game out of reach. It was a special day for Cassell who celebrated his 25th game appearance by batting for the cycle (single, double, triple and home run).

With machine-like precision, Experiment tallied runs in every inning. Timely hitting by Paul "the Bull" De Pietro, Toshi "Babe" Abe and JJ "the Rocket" Russell helped power Experiment to 25 runs, the third highest run total in the 39-year recorded history of the annual contest.

Experiment held Theory scoreless until the top of the fifth when pitcher "Big Daddy" Richter lost the shutout bid. "This game was so important to us," said Richter. "We believed we could defend the championship for a third consecutive year and we did."

Woods agreed. "It was an excellent all around effort," said Woods. "And now it's off to Krefeld's to have this year's victory engraved on the Drell-Richter trophy." The trophy is on display at the SLAC Visitor Center.

Theory Yields to Experiment

THEORY FELL TO EXPERIMENT in this year's annual SLAC softball game held in the late afternoon on Friday, June 9, at Roble Field on the Stanford campus. For Theory, it was only the seventh loss to Experiment in the past 12 years. The lopsided 25-3 final score was considered by many an unusual outcome. Recently played games have been settled by only a few runs either way.

Theory's very friendly and somewhat casual approach to the game this year was evident from the toss of the first pitch. The Theory team exhibited a refreshing camaraderie and good-natured sportsmanship that was great fun for everyone. This was especially true for the visiting international players new to the game. Their charm and diversity added much to the spirit of the game.

For some, the drama and competitive intensity traditionally generated by this annual international contest seemed to be missing this year. But that did not phase Theory fans who roared with approval over the late inning heroics provided by Theory players.

The team valiantly prevented a shutout by scoring an important run in the fifth inning. At the top of the eighth, Theory team captain Lance Dixon blasted a two-run home run off of relief pitcher Dick "Zany" Zdarko to end the scoring.

According to losing pitcher Sid "Lefty" Drell, "We introduced a record number of theorists from the international scientific community to the game and everyone enjoyed a beautiful evening. We consider it a theoretical victory."

For more details and photos, see: `www.slac.stanford.edu/gen/pubinfo/Softball/game00.html`

Experiment Team

(Photos: N. Stolar)

Theory Team

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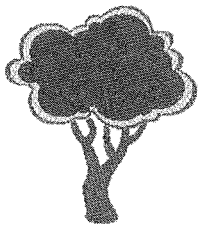
From the SLAC Library
Molly M. Moss, mmoss@slac

SLAC Library Fiction Collection

LOOKING FOR SOMETHING TO read over lunch? Going away for the weekend and looking for something other than yet another book on CP violation?

The SLAC Library has a lending collection of all kinds of fiction. It's located at the main entranceway on a revolving shelf. Choose from mysteries, adventure, science fiction, fantasy and romance. Some authors currently on the shelf are: Tom Clancy, Mary Higgins Clark, Catherine Coulter, Frank Herbert, Robert Ludlum, Julian May, and Andre Norton.

The original organizer for the fiction section was John Kieffer, formerly of the Controls Department, who generously donated books to get the collection started. Any donations to increase the fiction collection are gladly accepted - just add them to the shelves. The system works based on the integrity of the fiction readers - a healthy exchange system helps the collection stay self-sufficient and varied - and we're happy to report it has worked fine for close to two decades.



Tree Time

CAROL SWEETAPPLE LIVES ON Lilac Blossom Lane and she was recently interviewed during her tree inspection here at SLAC. "I'm really a horticulturist," she said, "and I report to a certified arborist." Whatever. "But my name makes a good story, especially when I'm on the phone placing a tree order of some kind," said Sweetapple.

SLAC's trees are being inventoried and inspected, according to SEM engineer David Saenz. "We haven't had an inventory for a long time, and this survey will allow us to proactively address trees that have diseases and then plan a long term strategy for care and maintenance."

Three campus horticulturists will be seen around the Loop Road as they conduct the survey. In addition to Sweetapple, there is Andy Butcher and Katie Joint, and no puns on what their occupations might have been based on their names.

"We're working the Main Quad and the Loop Road in grids," said Sweetapple. The survey will include data on the dimensions of the tree and its health. If needed, issues such as pest management and irrigation can be included with the survey.

Work Safe, Work Smart

In August's *TIP* we reported a new record of 175 days between claims involving days away from work as of 7/17/00. This will be uupdated in the October issue.

Quinn Wins Dirac Theory Prize

The Theory Department threw a party to honor Helen Quinn when she won the Dirac Prize recently. Bedecked with flowers, Quinn listened to accolades from Theory Chairman Stan Brodsky and Deputy Director Emeritus Sidney Drell.

(Photo: P.A. Moore)

Misuse of Government Property has Serious Consequences

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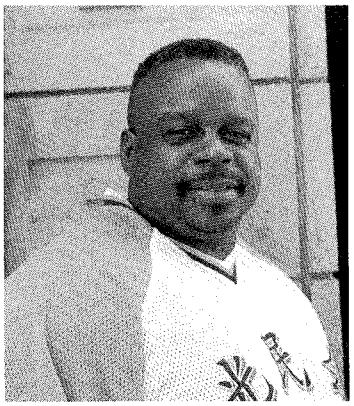
Ping Pong Champion Turns Physicist



WILLIAM HALL ADMITS THAT he is a non-traditional student. When pressed for details, he replies with a shrug, "Well, I'm 45 years old for a start." Hall quickly adds that he dropped out of high school in 1973 and didn't get his GED until the birth of his daughter in 1986. A native of Little Rock, Hall is now an undergraduate in physics at the University of Arkansas at Little Rock (UALR) and he is one of 25 students participating in SLAC's summer internship program.

"There's even a story about how I got into college," says Hall. Standing over 6-foot tall and weighing 260 pounds, you might think Hall got a scholarship for football or wrestling, but that's not the case.

"I played a lot of table tennis at the UALR Student Union," says Hall. "One day I challenged some guy who was pretty good and I beat him, too." When asked about his technique, Hall was happy to explain, and soon found out that he was explaining physics to Dr. Ed Gran, a physics professor at the University. "That was it, I knew I was going back to school," said Hall, " and physics would be part of my pre-med education."

Gran has continued to be a mentor to Hall. "I was pretty iffy about being responsible," says Hall. With a 19-year gap between high school and college, Hall says "I had no clue how to live through half my college career. One semester would be up and the next one would be down," he adds. Now Hall is much more organized about his life and his studies.

Hall credits his 1997 turning point as the time he became the recipient of the Ronald McNair Scholarship (McNair was an astronaut who died in the Challenger Shuttle). "Now I was accountable and had to do my work and report on it frequently," says Hall. In 1997 he did research on Monte Carlo simulations, in 1998 he worked on a collaborative project for the Brookhaven Lab, and in between, he switched his interest from pre-med to physics.

In addition to his studies, Hall tutors students in math and he is a bouncer at a Little Rock nightclub. "I still try to work out no matter where I am. I'm going to the Stanford gym a couple times a week for a modified circuit just for maintenance," says Hall, biceps bursting from his shirt. His tutoring is the reason he is at SLAC this summer.

When SLAC recruiter Al Ashley was visiting UALR campus, he was walking through the math lab and spotted Hall tutoring some other students at the time. Ashley introduced himself to Hall, saying "I hear you were at MIT last summer. Well, next summer you're going to Stanford." Hall replied, "Sounds good to me."

Hall loves California. "Back home, race is always there, always an issue. It's really great here. There are so many people of all kinds here at the Lab, you hardly ever refer to people by their race," says Hall. "But I have heard us called 'experimentalists," he says with a grin.

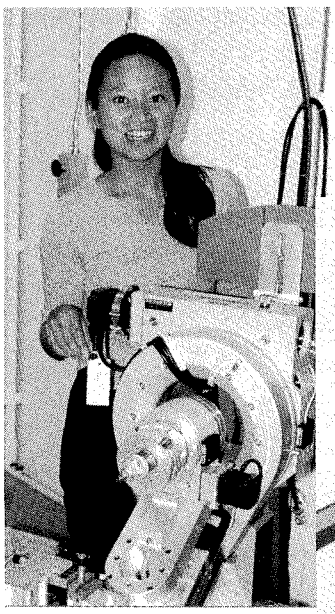
His SLAC mentor, Zack Wolf, says, "William is a very good physics student. He is learning what he needs to know for his project very quickly and is making good progress. He can work independently, which I really appreciate. We were very lucky to get such a good student and such an interesting person to join us for the summer."

Hall says that his friends back home, the ones who started their careers right out of school, are amazed by the change in him. "And my street friends are excited about what I'm doing. They're now saying that if I can do it, so can they," and to Hall, that's what it is all about, that even with his tough guy background, he can still achieve significant things in his life.

"I figure I'll be about 52 or 53 when I get my PhD," says Hall. "But you know, I'll be 52 anyhow." His next couple of years will be spent as a Donaghey Scholar, which requires that he spend a year in Europe studying a foreign language. Hall has chosen to go to Spain. As for where he plans to get his doctorate, the response was quick: "Stanford is number one on my list."

–P.A. Moore

Other SLAC Summer Interns



Amy Wu, from Pearl River, NY, is working at SSRL this summer.

Robin LaSalle, from New Orleans, LA, at her desk at SSRL.

(Photos: P.A. Moore)

Rediscovering Deflecting Structures at SLAC: New Life for Old Streakers

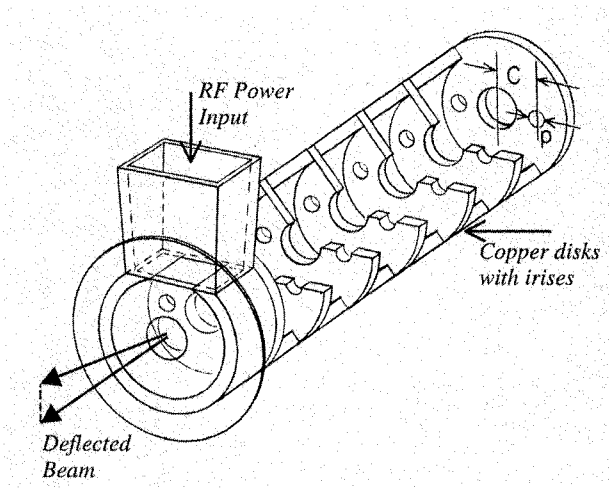
THE MARK OF A good invention is when we still find new uses for it years down the road. This is what happened with an unusual radiofrequency (rf) disk-loaded structure called an rf deflector (or separator). Nearly one thousand copper disk-loaded waveguide structures for accelerating SLAC's particle beams are installed in the two-mile tunnel. But four special structures were built with a unique configuration, as deflecting structures, so that the fields inside would kick the beam sideways instead of accelerating it straight ahead.

Greg Loew and others developed these special structures in the early 1960's as particle separators in the secondary beams emerging from targets. The structures also found use in End Station B, the C Beamline to one of the Hydrogen Bubble Chambers and the Streamer Chamber. They were also used to separate the positron beams in the first linac positron source. However, these experiments have long been dismantled, and little remains of the original beam lines.

SLAC's new application for these devices addresses future needs of accelerators for the Linac Coherent Light Source (LCLS) and the Next Linear Collider (NLC). In both of these machines, we will accelerate electron bunches which are much shorter in length than in the present linac. For example, the Stanford Linear Collider (SLC) accelerated 1-mm long bunches; about the thickness of a dime. The LCLS will accelerate bunches which are nearly 50-times shorter; about the thickness of human hair. This will require measurement tools with much finer resolution than we've previously had.

Streak cameras, which observe the light radiated from a beam, are limited to about a 0.2-mm resolution. At a recent beam instrumentation workshop, Joe Frisch and Xi-Jie Wang (Brookhaven) both independently suggested streaking the electron beam across a screen using an rf deflector, rather than inside of a streak camera. Paul Emma began calculating how to use the structure for LCLS bunch length measurements. As the discussions continued, Theo Kotseroglou remembered such a device at SLAC. The trail took us straight to Greg Loew who told us how it had been used and so we began the hunt for these ancient relics.

Where do you look for something that hasn't been used in over thirty years? On the outside the structures look like a standard piece of accelerating section. Our savvy space manager at SLAC, Roz Pennacchi, recalled something like this from her former days as linac area manager. She checked with Tom Graul, the current linac area manager, on the exact location of some likely cages to search. Sure enough, in a dusty cage near sector-20 of the linac, one 12-foot and one 8-foot long deflecting structure were discovered. Two more 8-foot structures were uncovered in End Station B. They had been stored for over thirty years.



Cut-away view of an rf deflecting structure consisting of a disk-loaded waveguide with an additional pair of holes surrounding each iris to stabilize the plane of the deflection.

Once the structures were found, Patrick Krejcik began planning how and where to install them in the linac to begin testing them in their new role as a bunch length measuring tool. The first question to be answered was whether the devices were still able to handle the high rf power under ultra-high vacuum.

Some of the structures had become homes to small creatures, making them difficult to clean properly. Eviction notices were served, but one structure remained reasonably well sealed, and rf measurements by Ron Akre showed it still had the correct behavior.

Under the care of the vacuum department, the structure has been baked for two weeks and Leo Gianinni's group says that it is now "as good as new." Greg Loew kept the original notes in an oversized binder (back when he thought all his SLAC-Pubs were going to fit in one binder) and they contained much useful information. Rather than refer to it as the "S-Band travelling wave rf deflecting structure," it was dubbed LOLA for the three original authors (Loew, Larsen and Altenmueller).

The idea for using these devices for bunch length measurements had also been preempted by Roger Miller who commandeered an early LOLA prototype to measure the bunch length of SLAC's first injector. The notes and publications from the original R&D carried out in the 1960's were all close at hand in Miller's personal archive (the big pile on top of his desk). "Good ideas just keep resurfacing," said Miller.

After nearly forty years of retirement, LOLA can look forward to a new life as the primary tool to measure the extremely short bunch length in the LCLS. We also plan to install the structure for testing in sector 29 of the linac during the next long downtime.

–Patrick Krejick and Paul Emma

News from the Web Information Manager
Ruth McDunn, mcdunn@slac

SLAC Run, Walk, 'n Roll — October 26, 2000

The run will be held a few weeks earlier than usual this year, on Thursday, October 26. Registration starts at 11:50 am on the north side of Sector 30, the race begins on the south side of the galley at 12:05 for in-line skaters, 12:10 for runners and walkers. This will be the 29th running of the 3.8 mile race, with the first race held in 1972. No one is quite sure when the walkers first joined the race (it is a 2-mile walk), but in 1996 we started keeping record of walking participants and instituted the in-line skate race, at the silver anniversary event.

Skaters, please register on the web site if you plan to participate this year. Remember that a helmet and reasonable padding is required. With the dwindling number of skaters in recent years, this could be the last year of the "roll" event.

The t-shirt this year will commemorate the tremendous success of the B Factory, in their "run for the gold." The shirt will show a computer reconstruction of a "golden event" superimposed over an image of the BaBar detector. (For information about this event, see `www.slac.stanford.edu/slac/media-info/photos/lg-event.html`.) For more information about the Run, Walk 'n Roll as well as lunch and shirt sales, keep an eye out for flyers and check out the web site at `www-project.slac.stanford.edu/slacrace`.

— Ruth McDunn

Communication, Communication, Communication

I think we'd all agree that communication has much to do with the successful completion of projects at SLAC. By sharing information at various stages of planning we strengthen safety and health efforts. Here are two examples.

John Turek, safety engineer of Safety Health & Assurance Department (SHA) in ES&H Division, just completed a survey of all eyewashes and showers, measuring the water temperature to make sure they meet code. But has he found them all? You can help by contacting your Division ES&H Coordinator (`http://www.slac.stanford.edu/esh/reference/safecoor.html`) or John Turek (jturek@slac.stanford.edu) to review his results and check for your units.

Rod Hiemstra, ES&H Training Coordinator, makes sure that both required and recommended courses in all areas of environment, safety and health are advertised and available. But the SLAC community is not always aware of the new computer-based training (CBT) courses, which are very handy and self-directed. Take a look at `http://www.slac.stanford.edu/esh/training/trainops/cbtcourses.html`

So the next time you are certain that you or the other person possess all the facts, dig a little deeper to make sure you have tapped all of your resources. Let's make sure and talk to each other before a problem or safety hazard develops—it may become a nice habit!

SLAC Milestones

AWARD

Quinn, Helen (THP), DIRAC Theory Prize (see story, page 9)

MARRIED

Reichel, Ina (ARA) to **Steier,** Christoph (LBL) 7/28 and 7/29/00 in Germany (see accompanying story)

RETIRED

Robertson, Ralph (P/C), 7/3/00

Do you have a milestone you would like published in TIP? Email tip@slac.stanford.edu to have it included.

On July 28th and on July 29th Ina Reichel (ARA) married Christoph Steier (Lawrence Berkeley Lab). It was a two day event since they got married in Germany (both are German). They first had to have a legal wedding (on July 28) before they could have a church wedding (on July 29). Here is a picture of the happy couple.