SLAC BEAM LINE

"All composite things decay. Strive diligently.
--Buddha (his last words)

Volume 9, Numbers 7 & 8 *July-August 1978*

Photo by Joe Faust

Contents of July-August Issue

--*Photo by Joe Faust*

ROY DOUGLAS RETIRES

In the photo above, Roy Douglas is shown proudly displaying a painting which depicts him at work with a pneumatic hammer--the art work of Frank Guidi. His pleasure is being shared with his wife, Rosie, and with fellow SLAC'ers Herb Rombach, Hal Zeiss, Tom Butler and Andy Vega. The occasion was Roy's farewell luncheon at the Sector 6 picnic ground. Roy chose to retire on reaching age 65 after nearly 10 years as a SLAC employee, plus several years prior to that as a sub-contractor's employee.

Roy was born in Tennessee, and during World War II he served as a gunner in the U.S. Army. He settled in California in the 1950's and worked for three different contractors before joining SLAC in 1968 as a member of the Crafts Shops. During his time here Roy became an integral member of the Crafts Shops family, handling many very difficult assignments such as concrete sawing, core drilling and excavation work of all kinds. His good humor, productivity and cheerfulness will surely be missed, and it will be very difficult to find anyone who can adequately replace him.

At the farewell party mentioned above, Roy and his wife, Rosie, were joined by 87 of Roy's co-workers and friends for a most enjoyable lunch. I'm sure that all of the Crafts Shops personnel will join me in telling Roy how much we will all miss him, and in wishing him to the best of everything in his retirement activities.

--George Petri

SSRL DEDICATED RUN

During the period from July 6 through July 13, the SPEAR storage ring was operated as a dedicated synchrotron radiation source under a special arrangement between SSRL and SLAC that was made possible by funds provided by the National Science Foundation. Normally SPEAR operates for colliding-beam experiments, and the synchrotron radiation that is produced during such runs is used "parasitically" by SSRL. The maximum single-beam energy of SPEAR is about 4 GeV. However, because of the physics program, SPEAR has generally been operated at about half of this maximum energy during the past 18 months. At a beam energy around 2 GeV, the spectrum of synchrotron radiation photons produced by SPEAR falls off rapidly above about 5 keV. Since most of the x-ray experiments at SSRL require photons of higher energy, there has been a serious "x-ray drought."

The recent dedicated synchrotron radiation run helped greatly to alleviate this drought. SPEAR was operated with a single beam at energies between 3.0 and 3.7 GeV, with stored beam current as high as 100 ma. In many cases, 2-5 operating shifts were scheduled for a given experiment, after which another experiment was moved in.

In dedicated operation, higher photon fluxes are available to experimenters because of the higher beam energies and currents, and also because the SPEAR emittance (beam size and angular divergence) is smaller than in colliding-beam mode. For some experiments, the reduced emittance yields a higher photon flux that is 2-5 times greater than is observed in colliding-beam mode at the same SPEAR energy and current. In addition, the longer beam lifetimes (about 7 hours) and shorter fill times (about 15 minutes) result in a higher duty cycle for the stored beam and thus in higher average data-taking rates.

The extremely high intensities available during dedicated running made it possible to carry out certain experiments that could not otherwise have been performed. The beam was so hot, in fact, that several new problems were encountered, such as heating effects in monochromator crystals.

All in all, SPEAR proved to be a very powerful radiation source, much experimental data was taken, and a great deal was learned about this method of operating SPEAR. Users are already inquiring about the next such dedicated run. They may have to wait until after the PEP storage ring has begun operating, since it is planned at that time to use 50% of SPEAR's operating time for dedicated synchrotron radiation running. We hope, however, to be able to arrange for at least a few more weeks of dedicated running before then.

--Herman Winick

ALETHA LORRAINE TURNER

We were deeply saddened by the sudden death of Aletha Lorraine Turner, Acting Supervisor of Operations at the SLAC Computing Services Facility, on July 10 at the age of 27. Those of us who had worked with her greatly valued her professionalism, energy and dedication to doing her job well and in assisting others.

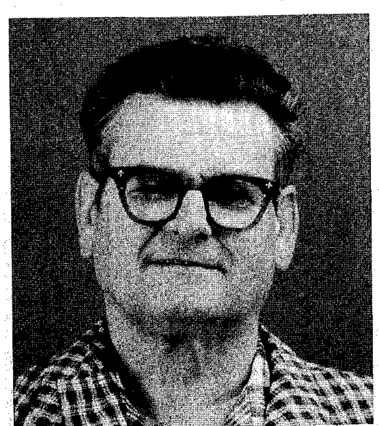
Born in Dallas, Texas, Lorraine lived for a time in San Francisco. She graduated from Menlo-Atherton High School and spent most of her life in Menlo Park. One of her favorite pastimes was visiting in Carmel, where she wrote many poems, and where she and her husband practiced their hobby of photography.

As a Stanford student, Lorraine also worked as a part-time secretary in several different Stanford departments. She started at SCS as a Tape Librarian Assistant in June 1972 and advanced rapidly to the position of Dispatcher and then Senior Operator in 1977. She was involved in many projects; in particular, her work on the training program, in rewriting the tests for the training program, and in preparing descriptive documentation for the operation of all of the SCS Facility equipment.

Lorraine will also be remembered for her hard work on behalf of her co-workers as the Steward for United Stanford Employees. She did an outstanding job representing SCIP union employees.

We will all miss Lorraine's warm, outgoing friendliness and her keen sense of humor.

--Myrna Valdez



RAYMOND CARL SANDKUHLE

Ray Sandkuhle passed away on July 14, 1978 at the age of 61. He is survived by his wife, Audrey, and three grown children: Charles, Richard and Cynthia.

Ray received a Bachelor's Degree in Civil Engineering from the University of Nevada in 1941. His first job, with Union Diesel in Oakland, stimulated his interest in mechanical engineering, and he worked for the remainder of his professional career in that field. He worked for a short time at the Radiation Laboratory in Berkeley, then went into the lumber and hardware business. After 12 years in business, he returned to engineering at the Lawrence Radiation Laboratory in Livermore.

In December, 1960, Ray joined the staff of the Microwave Laboratory at Stanford, and, except for a 9-month absence, he had been at Stanford/SLAC ever since. Ray was an extremely creative engineer. Some of his best ideas came to him in the early hours of the morning. A letter of recommendation from the Radition Lab in Livermore described Ray very aptly: "He is a 24-hour-per-day, 7-day-per-week man. He arrives at work at 8 AM with the solution to a problem that appeared insoluble at 5 PM the day before."

Puzzles and games fascinated Ray, and he created several himself. It is not surprising that he was inspired by the 17th century mathematician Fermat. Starting with an assault on Fermat's "Last Theorem," Ray developed a novel method of factoring algebraic equations that he expanded to solve a variety of numerical problems.

Ray contributed to the mechanical design of a long list of equipment here at SLAC: the linac support and alignment system, including support girders, jacks and laser-target actuators; keybanks that are still in use throughout the radiation areas; a tool for field-tuning of accelerator sections by a predetermined amount; a "milling machine" for cutting out bellows sections for the accelerator; numerous jigs and fixtures for the machine shop and accelerator; the SLED

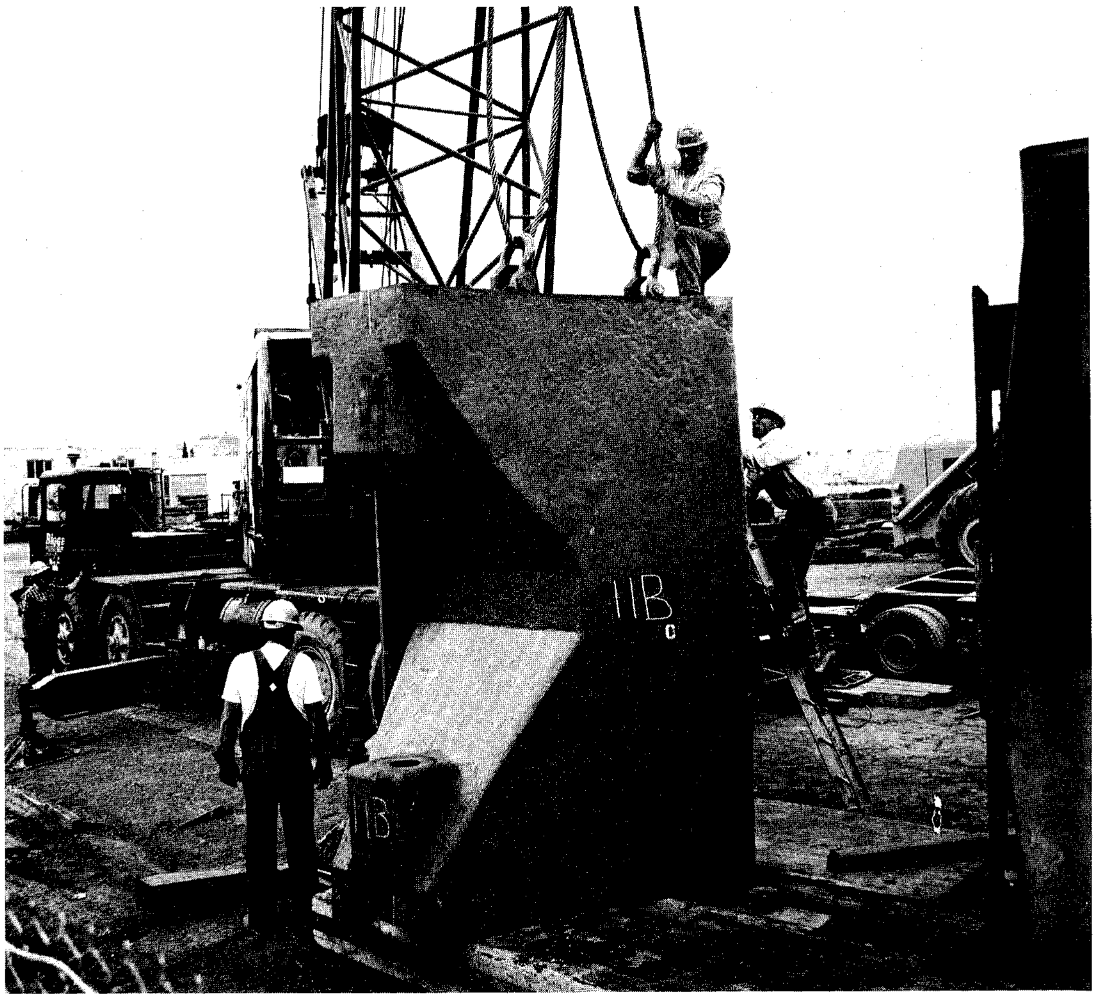
(Continued on next page)

cavities which significantly increase the linac beam energy; and most recently, the sextupole magnets for the PEP storage ring.

In the early days of SLAC, when engineers were often trying to reconcile the odd and seemingly incompatible requirements imposed by high-energy physics, Ray's cheery greeting was never "Hello" or "Good morning." Instead, it was "Can you save it?" and the inspiration behind that greeting was breath-taking. Every engineer had *something* that didn't work and immediately poured out his troubles to Ray. And almost always Ray could find a way to "save it."

Ray's multitude of friends at SLAC deeply regret his passing. Both his friendship and his unique ability to "save it" will be sorely missed.

--Al Lisin



PEP-12 MAGNET

The photograph shows a 77-ton block of magnet iron being unloaded in Santa Clara. This block is one of the pieces of the 2000-ton magnet that was formerly used with the 12-foot bubble chamber at Argonne National Laboratory. The magnet is being shipped to SLAC to become a part of PEP-12, the High Resolution Spectrometer, that is scheduled for use with the PEP storage ring.

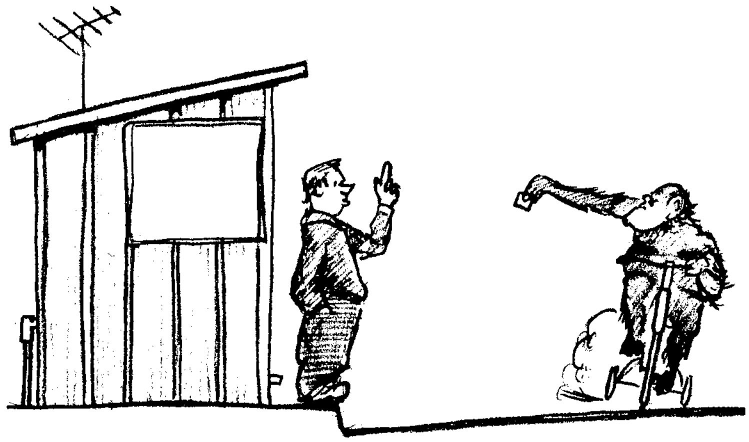
The coil for this huge superconducting magnet is still at Argonne, where it is being modified and tested for operation in a horizontal, rather than vertical, orientation. Shipping the coil to SLAC will not be an easy task, since it weighs 103 tons, is 18 feet in diameter and 12 feet high. Arrangements are now being made for shipment by truck, steamship barge, air (yes, it will fit in a C5 cargo plane) and rail.

The High Resolution Spectrometer is a joint undertaking of Argonne and Michigan, Purdue and Indiana Universities, with collaborators from LBL and from SLAC (Lew Keller) recently added. Other SLAC people who have been working on HRS are Larry Womack, John Mark, Ed Taylor and Rich Blumberg. The photograph shown here was taken by Joe Faust.

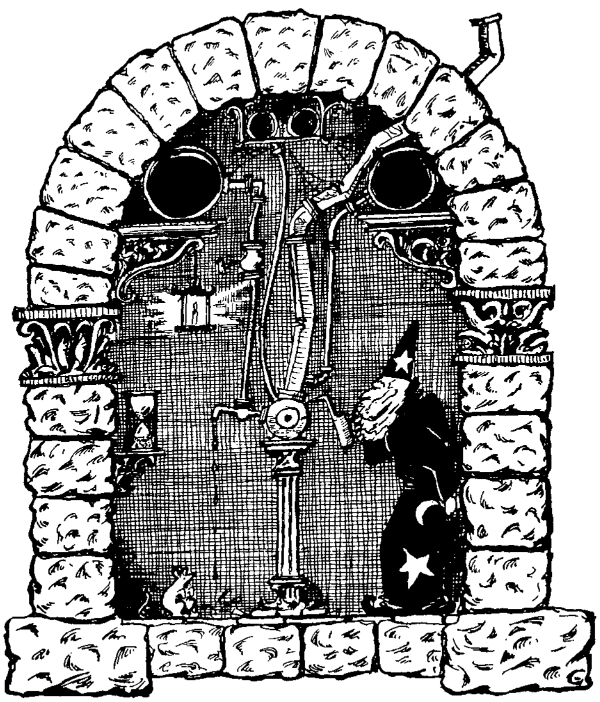
A Gould's-Eye View Of SLAC

The next four pages contain reprints of many of the drawings that Bob Gould has contributed to previous issues of the *Beam Line*. In most cases the original context in which these drawings first appeared will be evident to SLAC readers. However, we've taken the liberty of confusing the issue by adding some not necessarily relevant remarks in the white spaces between drawings.

Gould's unique way of seeing the world is closely coupled to a good right hand. In these pages we celebrate that fine recording instrument.

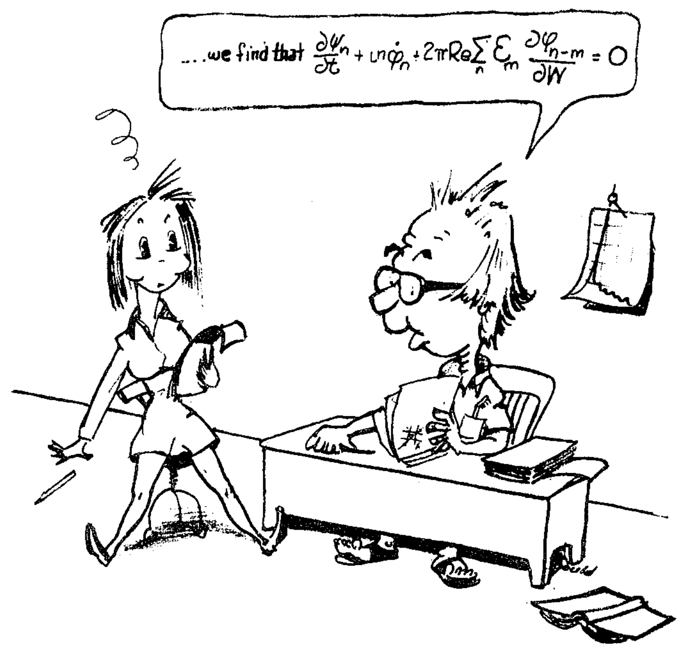


This drawing can be explained as follows: (1) One of SLAC's near-neighbors is a Primate Facility at which the behavior of chimpanzees is studied. Or (2) Access to the experimental area at SLAC is gained by the physicists by displaying a radiation badge at the Sector 30 Gatehouse. It is unfortunate that the original caption for this drawing, which might have clarified the choice, has been misplaced.



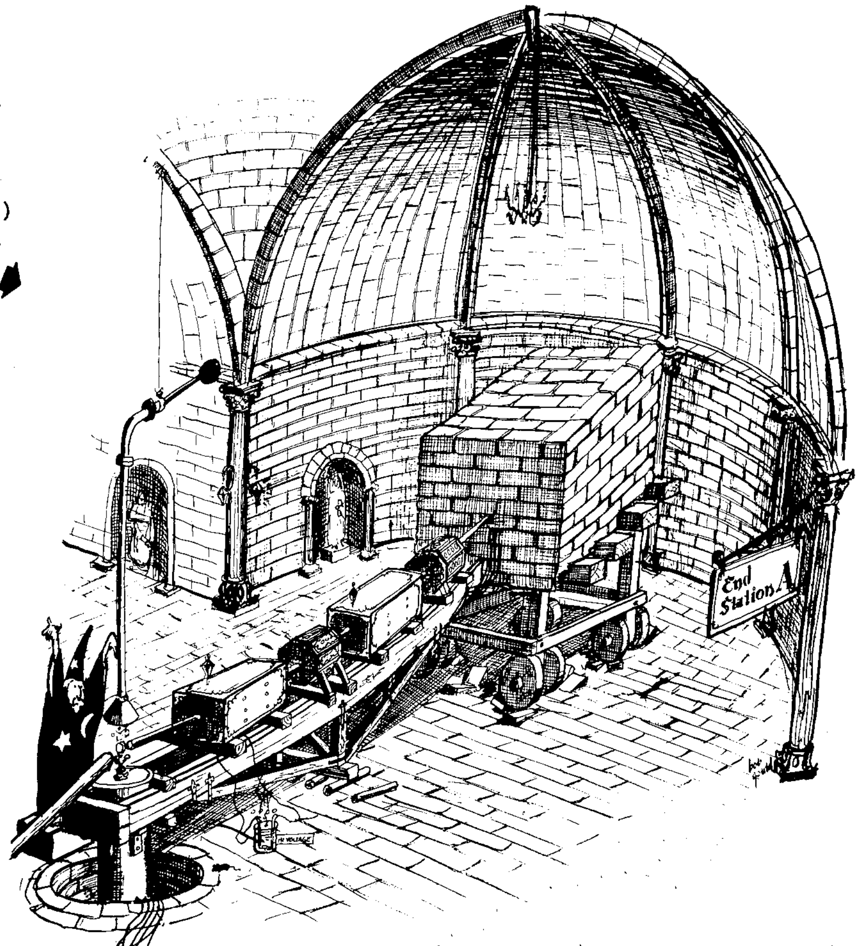
The accelerators at SLAC and elsewhere are perhaps the most complex instruments ever built. As examples of the Forefront of technology, these machines operate in ways that are very largely accessible to Rational Analysis. Thus the occasions are rather infrequent when a problem of some sort has to be referred to a practicioner of the more Ancient Arts, such as the personnage shown above, who is SLAC Special Consultant Gandalf the Grey.

Lay persons at SLAC have frequent opportunity to marvel at the ease with which many local scientists can compress even very complex ideas into a simple, concise expression. In the halls of theory, for example, it is not uncommon for a whole day to pass by without a single English sentence being heard.



Wizardry first bore fruit at SLAC in the late 1960's, when the leviathan spectrometers in End Station A were used to catch a glimpse of some tiny seeds within the hitherto "elementary" proton. These seeds (called "partons") called to mind the earlier theoretical idea of "quarks" and were thus the first step toward a great simplification. In the present consensus the proton and its hundreds of confusing relatives are no longer thought to be elementary particles, but are rather seen as the different combinations that can be formed from only 3 quarks and 3 antiquarks.

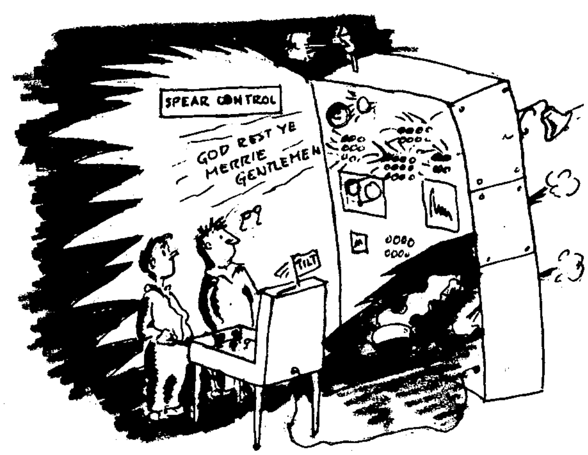
(Just recently a neat experiment in End Station A has measured "a parity-violating asymmetry in the inelastic scattering of longitudinally polarized electrons from deuterium": "$A/Q^2 = (-9.5 \pm 1.6) \times 10^{-5}$ (GeV/c)$^{-2}$" And we all know what *that* means!)



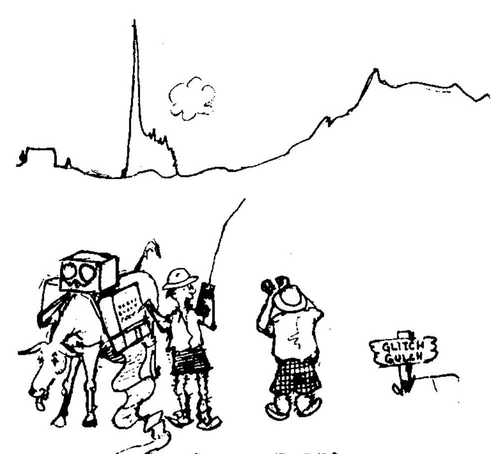
Preliminary Study - End Station A

The second Flash from SLAC came suddenly, in the wee hours of November 9-10, 1974, when the instruments recording particle production at the SPEAR storage ring began to shake, rattle and roll. The Jackpot was the ψ (psi) particle, and its claim to fame was a span of life that in human terms would last 500,000 years.

The ψ was an Everest among peaks. By coincidence not uncommon in science, this same Everest had also been spotted and named "J" at Brookhaven. The ψ/J opened a road into the Himalayan mountains, and soon SPEAR and its German sister-ring DORIS were mapping the 3...6...10 other soaring peaks that could be seen.

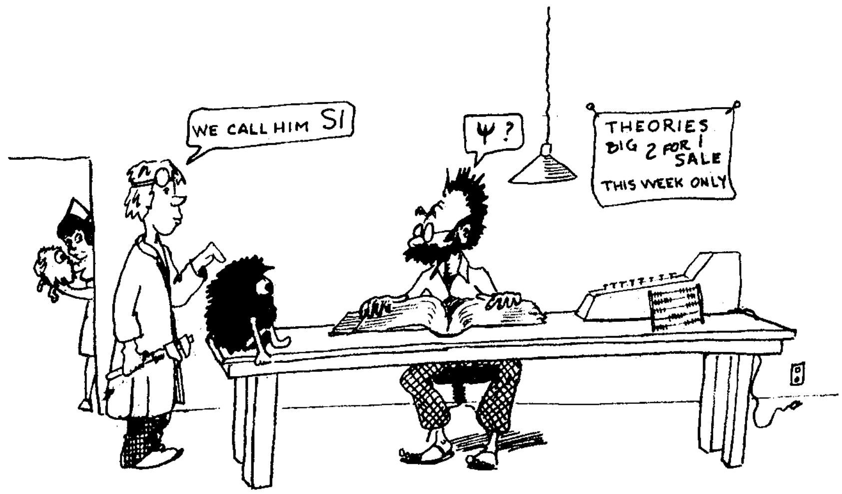


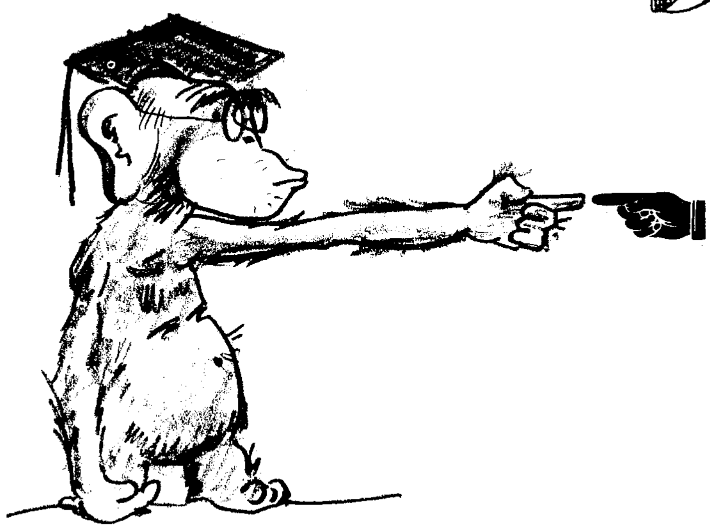
.... LIT UP LIKE A CHRISTMAS TREE



"WE HAVE OBSERVED A VERY SHARP PEAK"

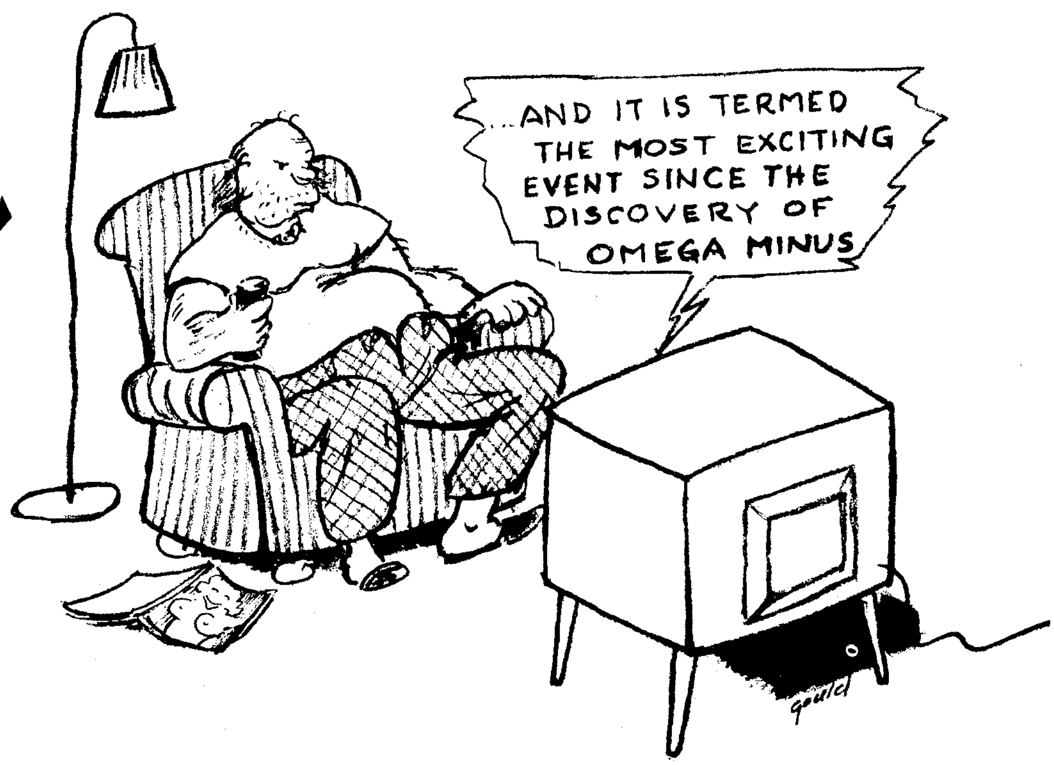
The psions set off a quake of Richter magnitude 9.3 under Theoriopolis, which few of the model houses there managed to survive. During the continuing aftershocks, there appeared among the rubble a rich variety of sleeping bags, pup tents, mobile homes, and even Quality Inns. But when the last dust had finally cleared, there towered tall above all the rest only the House of Charm.



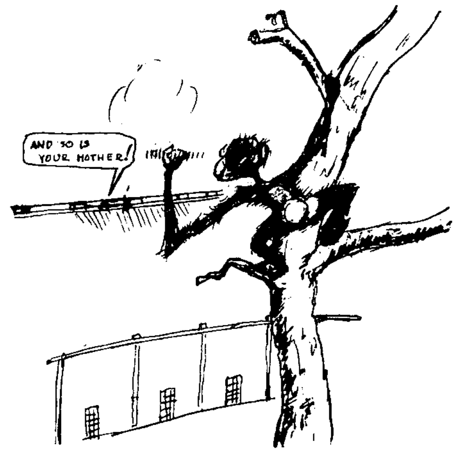


"It is charm, the fourth quark," quoth the majority, adding "Of course in the psions it is also anti-charm, and thus not charm that is visible to the naked eye." It was agreed that the proof of the pudding must be naked charm as exhibited, most probably, by the still-hypothetical D meson. So at each conference for 15 months there came down from the mountain a prophet bearing the commandment "It must be there. Go, ye, and find it."

Meanwhile, back at the tube, the world waited breathlessly for the next great development. Physicists appeared regularly on "Meet The Press" and on "Laugh In." ABC stole a march on its competitors with its true-to-life TV series called "Quark," which featured an interstellar garbage scow and 7-inch skirts.



Confirmation for the charm idea came in the spring of 1976 with the discovery of the postulated D mesons. At the Primate Facility, informed by a famous Guest Lecturer that the true Reality of matter could now be traced down in layers from illusory macroscopic lumps to molecules → atoms → nuclei → protons → quarks, the chimps indicated a certain skepticism by directing a barrage of well-aimed rocks at any of the bald, short-armed primates who happened to walk by.



So by mid-1976 there were 4 quarks to match up with the 4 known members of the electron's family called "leptons" (perhaps not a coincidence), and there were also 4 known forces through which these particles could interact with one another (a coincidence). By mid-1978 this pretty arrangement of 4+4+4 had probably changed to 6+6+3, but even before this change there had been plenty of old and new questions that a new generation of machines could try to answer. Thus back in 1974 SLAC had issued an Environmental Impact Statement on the PEP project, a machine whose energy will exceed that of SPEAR by about a factor of 4 (not a coincidence).

Since experimental equipment at the higher energies of PEP might turn out to be *big*, an early layout of an experimental area allowed for a distance between floor and beam pipe of 6 meters (subsequently reduced to 4). It is characteristic of Bob Gould that his response to a number like "6 meters" is both human and humerous.

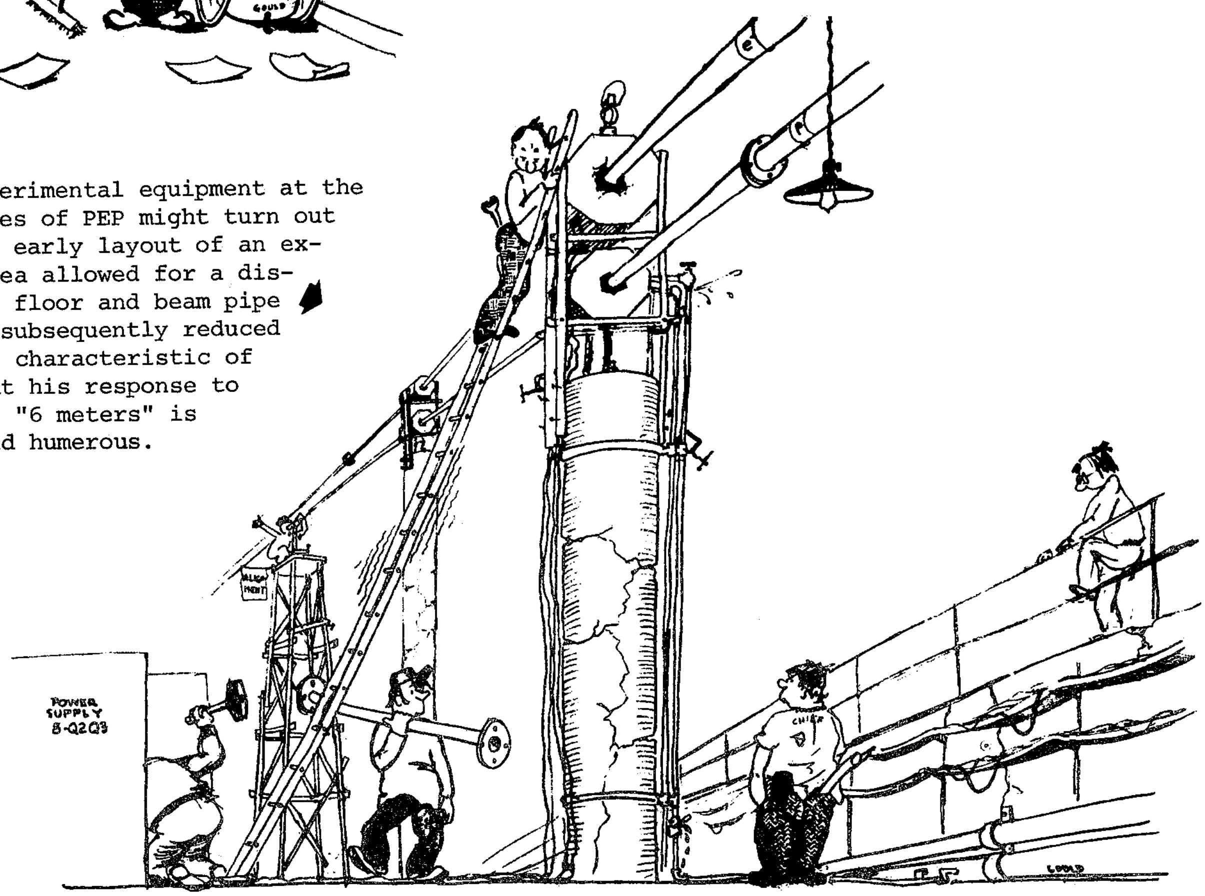


Photo by Joe Faust

SUEVON GEE APPOINTED SLAC AFFIRMATIVE ACTION OFFICER

Suevon Gee has recently been appointed to the position of Affirmative Action Officer (AAO) for SLAC. Suevon joined SLAC in April 1977 as Assistant AAO. When former AAO Carl Banks left SLAC in February 1978, Suevon took on the responsibilities of Acting AAO while the selection process for the AAO position was being carried out. She was finally selected as the best qualified of a large number of applicants for this important position at SLAC.

Before coming to SLAC, Suevon had worked for about 10 years as an Equal Employment Opportunity (EEO) Specialist in the San Francisco Operations Office of ERDA (now DOE), where she dealt with many large government-sponsored organizations (including SLAC) on all phases of their EEO and affirmative action programs. She has put this valuable experience to good use at SLAC in handling both the personal and the procedural aspects of her job.

Suevon has been particularly effective in establishing several kinds of training programs at SLAC, some of which have been or are being funded by government sources other than DOE. An example is the Vacuum Technology Training Program, funded by CETA, which is now nearing the end of its one-year program. A total of 15 persons will complete this program, and it would not be surprising if many of them wind up working here at SLAC.

--Bill Kirk

It is a commonly received notion that hard study is the unhealthy element in college life. But from tables of mortality of Harvard University, collected by Professor Pierce from the last triennial catalogue, it is clearly demonstrated that the excess of deaths for the first ten years after graduation is found in that portion of each class deficient in scholarship. Everyone who has seen the cirriculum knows that where Æschylus and political economy injures one, late hours and rum punches use up a dozen, and that the two little fingers are heavier than the loins of Euclid. Dissipation is a swift and sure destroyer, and every young man who follows it is, as the early flower, exposed to untimely frost. A few hours of sleep each night, high living, and plenty of 'smashes' make war upon every function of the human body. The brain, the heart, the lungs, the liver, the spine, the limbs, the bones, the flesh, every part and faculty are overtasked, worn and weakened by the terrific energy of passion loosed from restraint until, like a dilapidated mansion, the 'earthly house of this taberbacle' falls into ruinous decay.

--*Scientific American*, September 1868

10^{-12} boos	=	1 picoboo
1 boo^2	=	1 booboo
10^{-18} boys	=	1 attoboy
10^{12} bulls	=	1 terabull
10^1 cards	=	1 decacards
10^{-9} goats	=	1 nanogoat
2 gorics	=	1 paragoric
10^{-3} ink machines	=	1 millink machine
10^9 los	=	1 gigalo
10^{-1} mate	=	1 decimate
10^{-2} mental	=	1 centimental
10^{-2} pedes	=	1 centipede
10^6 phones	=	1 megaphone
10^{-6} phones	=	1 microphone
10^{12} pins	=	1 terapin

--Philip A. Simpson
The NBS Standard
1 January 1970

AN IMPORTANT EXPERIMENT AT SLAC

The box below gives the title, authors and their affiliations, and an abstract of a paper that has recently been submitted for publication in *Physics Letters*. This SLAC experiment, E-122, is exceptional in two ways: (1) A very precise measurement was made under difficult experimental conditions. (2) The measured quantity, a "parity-violating asymmetry," is both an important discovery in itself and a stringest test of physical theory.

Starting in the right-hand column below, we reprint a recent article from *Science* magazine that summarizes most of the essential information about this experiment and its significance. Other descriptions of a similar nature have recently appeared in *New Scientist* (22 June 1978), in *Science News* (8 July 1978), and in *Nature* (6 July 1978).

We hope to have ready for next month's *Beam Line* an article that will include some additional information about the experiment, as well as a review of some relevant physics background. Our hangup so far in writing this article has been concerned mostly with trying to extract something recognizable from phrases like "unified gauge theories of the weak and electromagnetic forces." But we hate to give up yet on the idea that physics is too important to be left to the physicists.

--Bill Kirk

PARITY NON-CONSERVATION IN INELASTIC ELECTRON SCATTERING

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ABSTRACT

We have measured parity violating asymmetries in the inelastic scattering of longitudinally polarized electrons from deuterium and hydrogen. For deuterium near $Q^2 = 1.6\ (\mathrm{GeV}/c)^2$ the asymmetry is $(-9.5 \times 10^{-5})\ Q^2$ with statistical and systematic uncertainties each about 10%.

Work supported by the Department of Energy.

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[The following article is reprinted from the 21 July 1978 issue of *Science*.]

PARTICLE THEORY: STANFORD ELECTRON EXPERIMENT CLOSES OPTIONS

One of the physicist's fondest dreams is to find a theory that explains the four basic forces of nature (gravitational, electromagnetic, weak, and strong nuclear) as different manifestations of the same underlying phenomenon. The closest theorists have come is a group of so-called unified gauge theories that unite the weak and electromagnetic forces. But enough experimental evidence to choose from among the various unified theories that have been proposed has been lacking, and the existing evidence is somewhat confusing. What has been called "just a gem of an experiment" at the Stanford Linear Accelerator Center (SLAC) is being hailed as a decisive turning point in choosing from among the options. Of the three main categories of theories, two seem ruled out. Moreover, the earliest and simplest of the unified gauge theories, introduced independently 10 years ago by Steven Weinberg of Harvard University and Abdus Salam of the International Center for Theoretical Physics in Trieste, seems to fit perfectly with the new experimental result.

The experiment, conducted by researchers from SLAC and Yale University under the leadership of Charles Prescott of SLAC, measured the difference in how strongly left- and right-handed electrons scatter off deuterium nuclei at high energies. Left- and right-handed refer to an electron's polarization or relative orientation of an electron's spin angular momentum and its direction of motion. Electrons are said to be polarized when most of the particles in a beam have their spin angular momenta pointing in the direction of motion (right-handed) or opposite to it (left-handed). The research team found a difference of 1 part in 5000, with an uncertainty of just under 1 part in 50,000, according to Richard Taylor of SLAC. It is the left-handed electrons that scatter more strongly.

The unified gauge theories involve quantized fields, including the familiar electromagnetic field. The quantum of electromagnetic radiation is the photon, which, among its other roles, is the entity that carries the electromagnetic force between two interacting charged particles. In the theory of the weak force, which is the controlling influence in radioactive beta decay, there are three photonlike carriers of the weak force. Unlike photons, however, these quanta are heavy (current estimates are from 50 to 100 times the mass of a proton), and two of the three are electrically charged. The electromagnetic and weak forces are seen as unified in the sense that, at much higher energies than accessible in any accelerator today but comparable to to particle energies in the early hot stages of the universe in a "big-bang" model, the two forces become comparable in the effects.

A triumph of the Weinberg-Salam version of unified gauge theory was the prediction of "neutral currents." Physicists use the term current to describe the flux of photonlike quanta that carry forces between particles. Before 1973, all weak force currents were charged—that is, they involved the electrically charged quanta of the weak force field. Neutral currents, involving the uncharged quanta predicted by the theory to exist, were found at the European Organization for Nuclear Research (CERN) and quickly confirmed at the Fermi National Accelerator Laboratory (Fermilab).

Subsequent detailed experiments of the same type, in which neutrinos bombard nuclei, provided additional strong evidence for the theory and also nailed down the value of a free parameter that needed to be evaluated in order to make quantitative comparison between predicted and measured properties. But the neutrino experiments could not do everything. In particular, they have not been used successfully to demonstrate another predicted effect, parity-nonconserving neutral currents. (Charged currents were known for many years to be parity-nonconserving.) Pariry refers to the effect on a particle reaction of inverting one or more coordinates. In the simplest case, parity is not conserved if the mirror image of a reaction occurs at a different rate.

Because left- and right-handed electrons are, in fact, mirror images of one another, the SLAC experiment conclusively showed for the first time that neutral currents do not conserve parity. Parity non-conservation was predicted by the Weinberg-Salam model, but not by some other unified gauge theories. The reason parity is not conserved is that, in the model, there is a part of the weak force felt only by left-handed particles. The effect is small because the weak force is weaker than the electromagnetic at the energy of the experiment. Moreover, the quantitative value of the effect agreed with that predicted when the value of the free parameter deduced from the neutrino experiments at CERN and Fermilab was used. Theorists say these results make the Weinberg-Salam model look very good right now.

One observer noted that the experiment came at a good time psychologically for particle physicists. Last year at the University of Washington and the University of Oxford optical physics experiments with bismuth vapor that were designed to search for parity-nonconservation measured a null effect. Some particle physicists down-played the result, saying the theory for the complicated bismuth atom was not well enough worked out. A more recent experiment at the Institute of Nuclear Physics in Novosibirsk, also with bismuth vapor, contradicted the Washington and Oxford results and supported the Weinberg-Salam model. With the atomic physicists in disarray, the predisposition among the particle people is to consider the SLAC experiment definitive. James Bjorken, a SLAC theorist, cautions, however, that gauge theories are so elastic that a new, more complicated version could absorb both parity conservation in atoms and non-conservation for high-energy free electrons, if necessary.

Physicists consider the SLAC experiment "a thing of beauty." Beyond the already discussed significance, it provided the first experimental confirmation of neutral currents in electron-nuclear interactions; all previous demonstrations had involved collisions between neutrinos and nuclei. Despite its straightforwardness, the experiment was exceedingly difficult to carry out. Among the problems to be solved were monitoring the electron energy to 1 part in 10^6, positioning the beam at the target to an accuracy of a few micrometers, and constructing a strong source of polarized electrons. The source chosen was a crystal of gallium arsenide, a semiconductor. Circularly polarized laser light, incident on the gallium arsenide, caused photoemission of electrons from the crystal surface. Because of quantum-mechanical selection rules, the electrons were themselves polarized. Electrons were produced at a rate of 120 pulses per second, each pulse having a randomly selected left- or right-hand polarization. The polarized electrons were then accelerated to an energy of about 20 GeV in the 2-mile-long linear accelerator at SLAC before crashing into the deuterium nuclei. Numerous checks were made to ensure that the observed effect was associated with the polarization of the electrons and was not an artifact associated with, for example, the electron source.

—Arthur L. Robinson

FIRST BEAM IN PETRA

After a remarkably fast construction period of only 2½ years, the first electron beam was stored, on July 15, in the new electron-positron storage ring PETRA at the DESY laboratory in Hamburg, West Germany. The PETRA machine is similar in most respects to the PEP storage ring now being built at SLAC, with an expected maximum energy of about 19 GeV in each beam during its initial phase of operation. PETRA has a total of 8 beam-interaction regions, of which 4 are to be used for the first round of experiments. The first experimental data-taking is expected to occur this coming October, using the detector called PLUTO, which has previously been in use for several years at the smaller storage ring DORIS at DESY. Three other major experimental devices are expected to be ready by about February or March of 1979.

JERRY LATTER LEAVES SLAC

Jerry Latter has decided that writing computer programs is more fun than engineering, so he has left SLAC to join Gain and Associates of Menlo Park. Jerry had been assigned to the Accelerator Engineering Group in the Mechanical Engineering Dept. He was responsible for the design and installation of many of the accelerator modifications that were required for the PEP injection system. More recently, he also was responsible for the design of a short accelerator section that will be installed at the positron source to improve the capture efficiency. It has been a pleasure to work with Jerry. His many friends and associates and SLAC will miss him.

--Al Lisin

Bill Collier dropped in the other day to say "hello" and to express his appreciation for making his send-off party so enjoyable. He also expressed his thanks to the people at SLAC for being "so easy to work with."

OUR ERROR

We apologize for failing to identify the photographer who took the picture of the Crystal Ball detector that appeared on the cover of last month's *Beam Line*. That photograph was taken for the Harshaw Chemical Company of Cleveland, Ohio by photographer Don Gaines.

SLAC FAMILY DAY SEPTEMBER 23

SLAC Family Day will be held on Saturday, September 23, 1978, from 10AM to 4 PM. There will be bicycle races from 9 to 10 AM. Hamburgers, beans and salad will be served from 11:30 to 2:30. There will be free soft drinks and beer for 20¢ per large cup or 6 cups for a dollar. We are planning to have tours, old movies, Carnival games for kids, an art show, foot races, volleyball, soccer, etc. (See the May 1976 issue of the *Beam Line* for photos and a description of the last Family Day at SLAC.)

Plan now to have a fun-filled day at SLAC Family Day.

--Charlie Kruse

It is a fact of science that the full explanations are often seized in their essence by the percipient scientist long in advance of any possible proof.

--John Desmond Bernal

(From *The Harvest of a Quiet Eye*, a selection of scientific quotations by Alan L. Mackay.)

One of R. W. Wood's associates told me of the time he was sent a collaborator from Rutherford's laboratory. The visitor was found to be an ideal colleague and Wood wanted to keep him at Johns-Hopkins, but Rutherford decreed differently. The man left for home, and Woods sighed, "The Lord giveth and the Lord taketh away."

--Paul Kirkpatrick

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