

SLAC BEAM LINE

"There are therefore Agents in Nature able to make the Particles of Bodies stick together by very strong Attractions. And it is the Business of experimental Philosophy to find them out."--Isaac Newton, Opticks (1704)

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In this photo, left to right, are SLAC Associate Director Dick Neal; Stan Stamp, Head of the ERDA Office at SLAC; Burt Richter of SLAC; Congressman Tom Harkin (D-Iowa), a member of the Committee on Science and Technology; Jim Wright of Los Alamos Scientific Laboratory; SLAC Deputy Director Sid Drell; Willis Smith, Scientific Staff Member of the Committee of Science and Technology; and (front) PEP Director John Rees. Wright, Smith and Congressman Harkin spent several hours at SLAC on February 4 touring the Laboratory and learning about the SLAC program and the PEP project. (Photo by Walter Zawojski.)

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SSRP: CATALYSIS RESEARCH

The Stanford Synchrotron Radiation Project (SSRP) will present a series of monthly brief reports on research or other activities at SSRP that may be of interest to the SLAC community and other readers of the *Beam Line*. This is the first of such reports.

Last month's *Beam Line* contained a comprehensive survey of synchrotron radiation research and of the existing or planned facilities for this work. Copies of this article are available from Herm Winick (Bin 69) or Bill Kirk (Bin 80). The photographs in that article, taken by Joe Faust, were so good that several members of the SSRP staff whose pictures appeared are considering careers as professional models.

(In the description of the Cornell synchrotron radiation facility at the 12 GeV electron accelerator, we neglected to mention Val Kostroun and John Wilkins, who are responsible for the program along with Bob Batterman. We apologize for this oversight.)

CATALYSIS RESEARCH

This month we give a brief review of the research on catalysis that is being done at SSRP by scientists from many different institutions. The following information was provided by Farrel Lytle of The Boeing Company, who was the first scientist to use the X-ray absorption technique to study catalysts.

Catalysts are important in a large variety of chemical and biological processes, because they control and speed up reactions. They are extremely important in pollution control, in the development of fuel cells, and in many industrial processes such as the production of artificial fibers and plastics, and in petroleum refining. Effective heterogeneous catalysts have been developed largely through a trial-and-error process. The extended X-ray absorption fine structure (EXAFS) technique that has been developed at SSRP allows the determination of the structural relationships between the catalyst atoms and those of the reacting elements. This information can lead to a better understanding of how present catalysts work and to the development of new catalysts.

As an example, the EXAFS technique has been used to study transition metal catalysts that are highly dispersed on a silica or alumina support structure. Powdered samples are studied in a boron nitride reaction cell over a wide range of temperature and pressure conditions. After hydrogen reduction *in situ* to prepare the active metal surfaces, various gases (oxygen, carbon monoxide, hydrogen) are chemisorbed on the surface, quenched at 100° K, and studied with X-ray absorption.

Analysis of the absorption data yields radial distribution functions around the catalytic

atom which permit the calculation of certain important properties (coordination number, bond distances, structural disorder parameters). For example, a study of 30-angstrom clusters of ruthenium dispersed on SiO₂ revealed that oxygen was chemisorbed on a 3-fold site, and that surface atoms were nearly fluid-like in their mobility during chemisorption reactions.

--Herm Winick

PEP: WHO GETS THE BRASS RING?

About a year ago, the parking lots filled up and the lunch lines became crowded as meetings were held at SLAC to start the search for the contractor for PEP. The scene was repeated this past month, but this time it concerned who will build what goes inside PEP--definite progress.

On February 24, 25 and 26, eight groups of physicists from across the country met at SLAC to compete for the chance to build the big experimental facilities for the PEP storage ring.

Small is beautiful is the catch phrase of today--and the high energy physicist is the firmest believer in the principle; nobody works harder to study and appreciate the very small. Unfortunately, it seems that in order to study the very small, the very big is necessary.

Most of the experiments being discussed for PEP are the size of a small house, weigh in at about 1000 tons, and cost in the millions. As with LASS, the streamer chamber and the spectrometers in End Station A, these devices will remain in place for many years, be modified for different experiments and serve as facilities for other users.

Anything as big and complicated as these will take years to build, and with PEP scheduled for turn-on in about 3 years, work must begin very soon on these large detectors. Although PEP will have 5 areas available for experiments, no more than two of these new, general-purpose detectors are now being considered for installation at PEP.

Last June, a call for proposals for these two slots was made. By the deadline, 6 months later, 8 lengthy proposals had been generated, representing 22 institutions in 10 states and nearly 200 physicists. The proposals are all clever and well prepared; but, unfortunately, 8 into 2 won't go and some choices must be made.

A committee of 15 independent physicists, the Experimental Program Committee (EPC), listened to the proponents defend their ideas and question others in last month's meetings. In the next month or two the committee will look over further studies and then advise the directors of SLAC and LBL who will then decide and break the suspense.

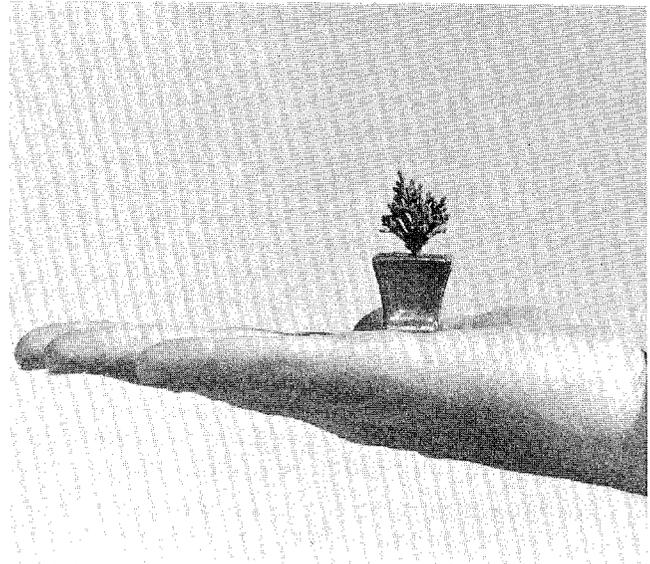
--Bill Ash

APRIL BONSAI SHOW AT SLAC CAFETERIA

The world of miniature living trees will visit the "home of the beam tree" in April. A selection of choice bonsai provided by the Kasamura Bonsai Club of Palo Alto will be on exhibit in the SLAC cafeteria from noon to 9 P.M. on Saturday, April 16th and from 10 A.M. to 4 P.M. on Sunday, April 17th. More than 150 trees dwarfed in the Japanese manner will be on display. They will range in size from 5 inches to 42 inches tall and will be from a few years to several decades old. Most of the trees have been styled and trained by club members, although a few specimens have been imported. A demonstration of bonsai styling will be given at 2 P.M. each day of the show.

Bonsai (bone-sigh') is the art of growing miniature trees in pots or trays in such a way as to duplicate the characteristics of a full-sized tree growing in a natural setting. This art form was developed in the Orient hundreds of years ago and was practically unknown to the Western world until 1909 when an exhibition was held in London. There was another exhibit in New York City about the same time, and in 1915 the Emperor of Japan sent bonsai specimens to San Francisco where they were shown at the Panama Pacific International Exposition.

During the past ten years interest in bonsai has grown tremendously in this country because it is a unique mingling of horticulture, recreation and Oriental art forms. Instruction in the techniques of growing bonsai is readily available from books, bonsai clubs, and some junior colleges. Bonsai culture is an especially attractive hobby for people who love



A very small Japanese garden juniper in its own acorn-sized pot. Such trees usually have to be "potted up" to a bigger container occasionally, although some can be maintained in very small containers for decades. An eye-dropper is a handy watering device for such trees.

(Photo by Joe Faust.)

trees and plants but have limited growing space.

The Kasamura Bonsai Club, one of the oldest bonsai clubs in the United States, meets on the second Friday of every month at 8 P.M. in the Parish Hall of St. Marks Episcopal Church, 600 Colorado Ave., Palo Alto. Prospective members and visitors are welcome to attend.

--John Griffin



John Griffin is shown here with some of the trees from his own collection. The trees at left and right are *shimpaku* or Sargent juniper. In the slender pot is a *pyracantha*, and the largest specimen is a 25-year-old Japanese white pine standing some 19 inches tall. All the trees except the pine were trained during the past year and are young specimens from local nurseries. (Photo by Joe Faust.)

HEALTH CARE AT SLAC

All ERDA facilities are required to have adequate medical facilities available, usually on-site. In many installations radiation hazard is considered the number one medical problem, and all health efforts are strongly focused on prevention and emergency treatment of such accidents. At SLAC, however, there is almost no radiation problem. Other occupational health hazards do exist: electric shock, heavy lifting in awkward positions, plus use of many solvents and other toxic chemicals. SLAC has an excellent safety program, but accidents do happen. These we either treat on-site or refer to the appropriate specialist. In-house treatment facilities include whirlpool and hot packs.

When absence due to a work-related injury occurs, employees must check in with the Medical Department for clearance to return to work, bringing with them any release for work given by their own physicians. Likewise, absences of more than five days due to nonindustrial illness or injury require clearance by the Medical Department. The cooperation of supervisors is requested in making certain that the "return to work" clearances have been given to assure that the employee is indeed fit to work.

Two other functions concern us daily. The first is the immediate care of minor health problems. Often a simple visit to Medical will enable the employee to finish the shift, and perhaps avoid the loss of considerable time in off-site physician visits.

The other major concern is in the prevention and control of chronic and disabling disease. The great American epidemic--coronary artery disease and heart attacks--takes its toll at SLAC. Lung disease, cancer, diabetes, and alcohol abuse are with us too. We believe that an aggressive program of periodic physical examinations, discussion of health problems, and referral for outside care when necessary can help to avert a health crisis.

Not only from a humanitarian viewpoint but for purely economic reasons, it makes good sense to prevent, if possible, and when they occur, to treat immediately, health problems that might keep employees off the job. Thus we invite and urge all employees to have regular examinations and to check with us on obvious or possible medical problems. We will offer our best advice, treat when appropriate, and refer to other physicians when necessary.

Physical examinations at SLAC are very comprehensive. If you are over 40, your examination might include: height, weight, blood pressure, pulmonary function, electrocardiogram, vision screening, tonometry, hearing, urinalysis, blood count, blood chemistries including cholesterol, chest x-ray when appropriate, and

TB skin testing; for women, mammography and Pap smear if indicated, and an examination and consultation by the physician. All findings will be forwarded to your personal physician on written request. Invitations to participate in the examination program are mailed in your birth month. Call Ext. 2281 if you have any questions.

There is no charge to employees. Costs to SLAC are by annual contract rather than on a per visit basis. The physician, Dr. Charles Beal, is on-site mornings only; the nurse, Joan Gardner, all day. The medical secretary is Shirley Hayward.

--Charles Beal, M.D.

HOW'S THAT AGAIN? DEPARTMENT

The following note appears on one of the drawings for the new Mark II detector:

Image of this hole pattern must match this hole pattern when this part is turned end-for-end with respect to its image.

RECYCLE - HELP THE HANDICAPPED

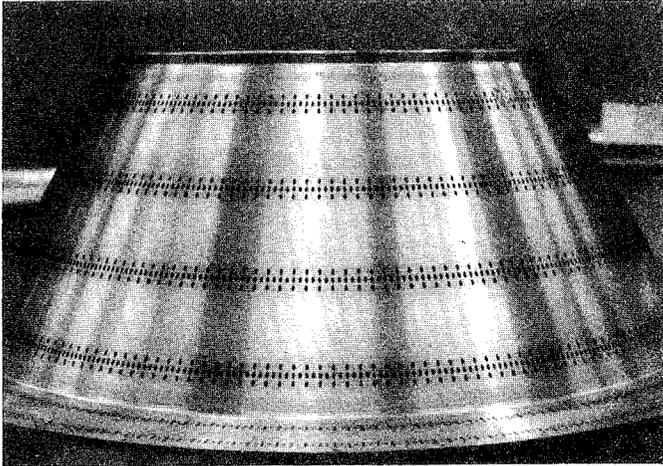
You may have noticed the light blue "RECYCLE NEWSPAPER" boxes placed in the corridors of our buildings. These have been deposited by Alpha Recycling in hopes of incorporating SLAC into its campus-wide recycling system. Conceived and established last fall by Palo Alto resident H. R. "Tom" Sawyer as a venture to help support Alpha Place, a home for the physically handicapped in San Jose, the recycling operation has grown by leaps and bounds. Recently it has joined forces with a Stanford Workshop on Social and Political Issues (SWOPSI) class concerned with solid waste reduction and recycling at Stanford.

Efforts here at SLAC are being coordinated by Ray Ortiz (Ext. 2404). If you have any suggestions or can help Ray transport the papers to the recycling center on campus, please get in touch with him.

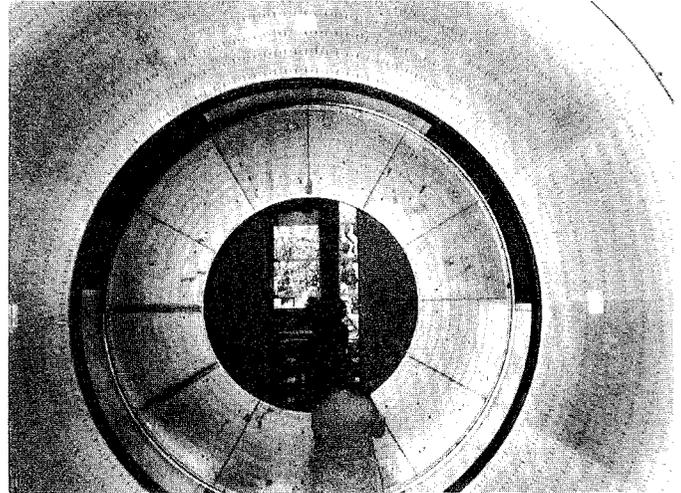
Did you know that for every ton of paper recycled, 17 trees are saved? That works out to about one tree saved for every five feet of stacked newspaper. Recycling also saves the fuel needed to harvest and process those trees. So give a boost to the environment, and help the handicapped at the same time--recycle! And why not make a practice of recycling at home too! Newspapers, glass, aluminum and tin may be dropped off at the recycling center on campus any time. It is located on Pampas Lane, off Serra Street near El Camino.

-- Jim Knox

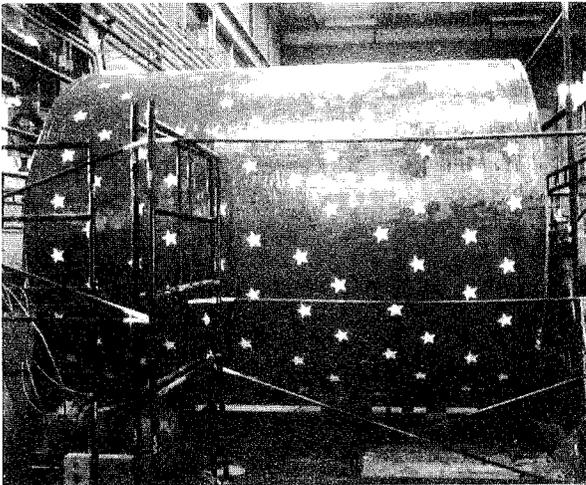
Here are some of Bill Davies-White's photos of the Mark II magnetic detector that will be installed at SPEAR starting this summer.



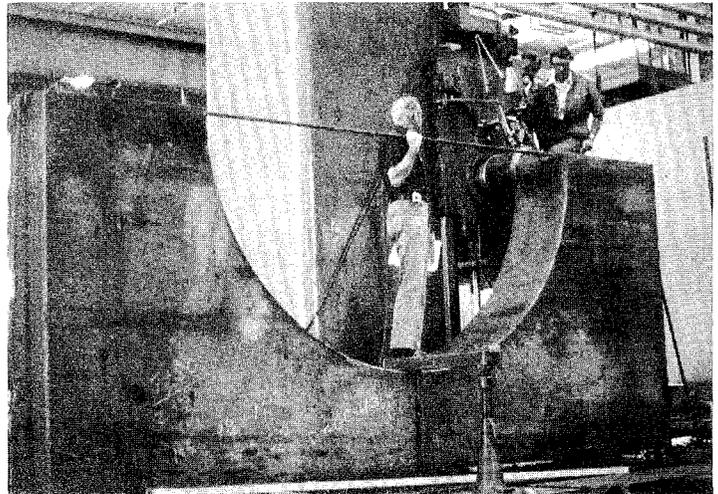
One of the two cone-section end-supports for drift chamber wires.



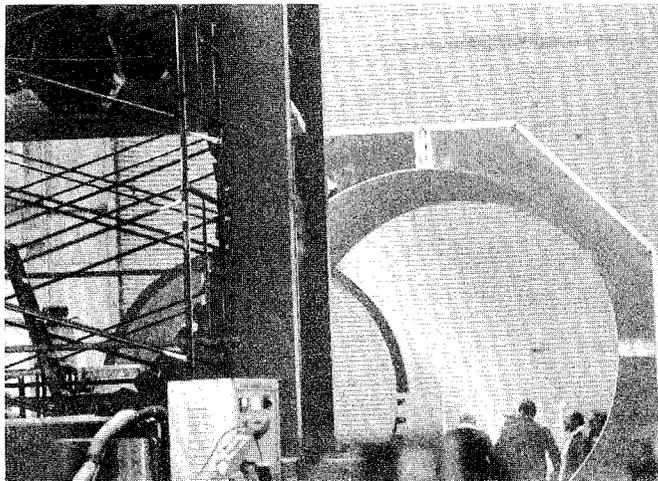
A view of one conical end-support for drift chamber wires, looking through the other cone.



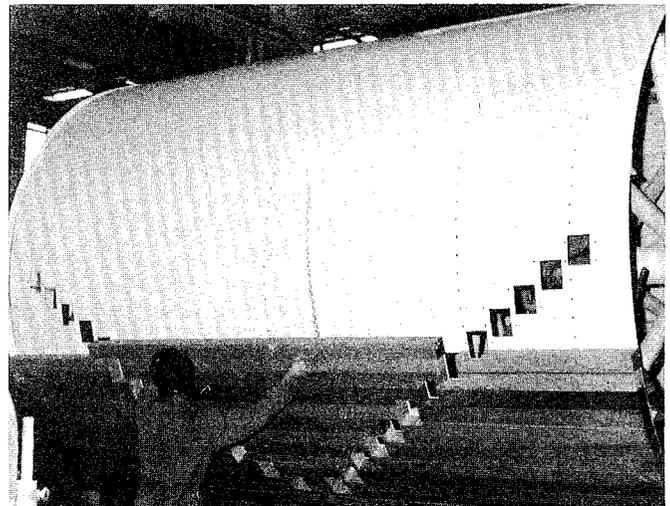
The Mark II magnet coil after completion--wound, potted, painted (blue) and decorated.



Half of one of the two large steel end plates shown during machining.



Front to back, the main steel frame, the magnet coil, and the vacuum tank for the liquid argon shower counters.



The coil-winding form in construction. The holes make room for cooling-water connections.

Three passions, simple but overwhelmingly strong, have governed my life: the longing for love, the search for knowledge, and unbearable pity for the sufferings of mankind. These passions, like great winds, have blown me hither and thither, in a wayward course, over a deep ocean of anguish, reaching to the very verge of despair.

I have sought love, first, because it brings ecstasy--ecstasy so great that I would often have sacrificed all the rest of my life for a few hours of this joy. I have sought it, next, because it relieves loneliness--that terrible loneliness in which one shivering consciousness looks over the rim of the world into the cold unfathomable lifeless abyss. I have sought it, finally, because in the union of love I have seen, in mystic miniature, the prefiguring vision of the heaven that saints and poets have imagined. This is what I sought, and though it might seem too good for human life, this is what--at last--I have found.

With equal passion I have sought knowledge. I have wished to understand the hearts of men. I have wished to know why the stars shine. And I have tried to apprehend the Pythagorean power by which number holds sway above the flux. A little of this, but not much, I have achieved.

Love and knowledge, so far as they were possible, led upward to the heavens. But always pity brought me back to earth. Echoes of cries of pain reverberate in my heart. Children in famine, victims tortured by oppressors, helpless old people a hated burden to their sons, and a whole world of loneliness, poverty and pain make a mockery of what human life should be. I long to alleviate the evil, but I cannot, and I too suffer.

This has been my life. I have found it worth living, and would gladly live it again if the chance were offered to me.

--The Autobiography Of Bertrand Russell

Note: This is the Prologue, "What I Have Lived For," from Russell's autobiography. We had originally intended to quote only the sentence that so memorably sums up the driving mechanism of physical science:

And I have tried to apprehend the Pythagorean power by which number holds sway above the flux.

But that motivating passion is always embedded within the greater whole of an individual life lived, and few individual lives have been so greatly whole as that of Bertrand Arthur William Russell, 1872-1970.

EXOTIC MUON DECAY EXPLAINED?

SIN, the Swiss Institute for Nuclear Research in Zurich, may have found a remarkable new decay of an elementary particle--the muon. An experiment set up to improve the lower limit on what was thought to be a forbidden decay of the particle has detected about six cases of the decay, above the inevitable background. In the decay the muon, which appears to be no more than a heavy version of the electron, turns into an electron with the emission of a gamma ray. That may seem straightforward but it violates what had been thought to be a sacrosanct symmetry: muon number conservation.

It has long been thought that when the muon interacted with matter, or decayed, it either remained a muon or included among its products a "muon neutrino"--a neutral, massless weakly interacting particle always associated with it. These observations were abstracted into the concept of "muon number"--that both the muon and the muon neutrino possessed one unit of "muon number" and that muon number was always conserved. Electrons and electron neutrinos appear to possess a similar conserved quantity, electron number. But the new rare decays break both rules.

While being careful to avoid direct confirmation of the SIN results--they are still preliminary--Professor Steven Weinberg, a Harvard professor of physics, believes he can explain them. In fact, he told *New Scientist* "I wish I had been smart enough to predict this earlier," and he thinks it likely that if the SIN results prove wrong the decays will still turn up later at some lower rate.

Weinberg... thinks that theorists had no right to believe in muon number conservation at all, given the experimental data before the SIN results. In a paper submitted to *Physical Review Letters* he and [SLAC theorist] J. D. Bjorken will argue that, in all but the very simplest gauge theory unifications of the weak and electromagnetic forces, the exotic muon decays are inevitable; but that equally inevitably in such theories the decays occur at an extremely slow rate.

This natural suppression of muon (and electron) number violation is thus the origin of the erroneous and unprovable assumption in earlier theory that it is exact. Weinberg and Bjorken calculate a rate for the decay, as a fraction of all other decays of the muon, of about 10^{-8} in the most favorable circumstances, and less if circumstances are unfavorable. The observed rate at SIN, taken at face value, is about 10^{-9} , well within the Weinberg and Bjorken ball-park.

It thus seems likely that yet again the gauge theories are proving their power by absorbing in a trice a result that would otherwise have caused chaos. [*New Scientist*, 17 Feb 1977]

FRED PINDAR TO RETIRE;
GENE RICKANSRUD NAMED TO SUCCEED

Fred Pindar, SLAC's Associate Director, Business Services, will be retiring from the Laboratory on August 31, 1977. He will be succeeded in this post by Gene Rickansrud, presently Business Services' Assistant Director. In announcing this prospective change, SLAC Director W. K. H. Panofsky stated the following:

"... The retirement of Fred Pindar marks the end of an era in inspired management of government-supported research at Stanford University. Fred handled the business affairs of the Microwave Laboratory (since expanded into the Hansen Laboratories) when I came to Stanford, and he has tried, generally successfully, to keep me out of trouble ever since. Stanford in general and SLAC in particular owe an enormous

debt to Fred; his skill in managing SLAC responsibly from a business point of view, while maintaining its spirit of humanity and creativity, will be difficult to match.

"I established a search committee last fall which included 5 SLAC representatives and 2 from the main campus. Solicitations were addressed to all major universities and labs, to heads of government agencies, and other recommended sources of recruitment. Forty-one applications were received; from these, 10 applicants were identified and were interviewed by each member of the committee and by me. The outcome was the recommendation to me that the most qualified applicant for the position was E. B. (Gene) Rickansrud, now BSD's Assistant Director... I am happy, then, to announce that he will become Associate Director of Business Services next September 1....

SLAC WOMEN'S ASSOCIATION

Occupying much of our attention are the growing pains that accompany the beginnings of a new organization. Despite these distractions, our program is well organized and under way.

The first program sponsored by the Women's Organization was presented by Dick McCall, Group Leader of SLAC's Radiation Physics group. He answered many questions that concern employees about the possible dangers involved in working near or around a radiation-producing machine. During the early years of X-ray machines and other radiation-producing devices, accidents and a lack of knowledge of the harmful effects of radiation led to many human tragedies. The very nature of radiation--silent, invisible, odorless--and the fact that its effects are not immediately apparent make it important to understand which fears are justified and what precautions are prudent. The particular population group that is most at risk is women radiation workers who are pregnant. McCall prepared a several-page summary of information about radiation hazards for pregnant women that is very informative. Copies of this summary can be obtained by contacting Dick McCall at ext. 2045 or Bin 48. We thank Dick for his presentation, and we deeply appreciate the obvious time and effort he put into its preparation.

The following programs are scheduled for the month of March:

March 7 & 8, at noon in the Auditorium, two films that address the careers of women. The first is *Pack Your Own Chute*, which suggests that women, like men, must make their own

independent decisions regarding their place in the business world. The second, *51%*, presents a look at stereotyping of women in their employment roles.

March 21, at noon in Orange Room 140, a business meeting of the Women's Association.

March 28, at noon in the Auditorium, the film *Other Women - Other Work*, which chronicles the lives of three women who are employed in traditionally male jobs. This 20-minute film will be followed either by a panel discussion or by another film on non-traditional work by women. Watch for notices announcing final plans.

Questions or Suggestions?

Contact any of the officers--Martha Zipf (x2877), Cherrill Spencer (x2921), Carol Heintzman (x2617), Eileen Long (x2301)--or come to the next meeting with your brown bag in hand and your ideas for sharing.

--Martha Zipf

I am interested in joining the SLAC Women's Association. Bin # _____

Name _____ Ext. _____

The following topic would make an interesting subject for a program: _____

Dues enclosed (\$3.00/year)

Return to:
Eileen Long (Bin 6)

