# 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)

*Volume 8, Number 7* *July 1977*

Technician Janet Roberts is shown above in Joe Faust's photograph taken during the installation of the wires that form the inner drift-chamber section of the Mark II magnetic detector. The Mark II will be installed at SPEAR during the next several months (replacing the venerable Mark I), and is expected to move to PEP along about mid-1979.

In This Issue


| | |
|---|---|
| A trip to Peking | *2-4* |
| Preprints, publications and all that | *5-8* |
| SSRP report and people news | *9* |
| Print room goes to microfilm | *10* |
| SLAC Women's Association | *11-12* |
| Live steamers to meet at SLAC | *12* |

## A TRIP TO PEKING

As many people at SLAC may know, I went to China from April 10 through May 16, 1977. About half of the time I was working in Peking, and the other half was spent in traveling and sightseeing. During our travels, my wife and I stayed in Hong Kong, Canton, Shanghai, Hangchow, Chengchow and Peking. Everywhere we went we were deeply impressed with the progress that has been made by the Chinese people during less than three decades. It was a memorable trip for us. We will always remember the warm reception given to us by our hosts, and we will treasure the friendship of the people we met.

Since my return I have given two talks, one for my colleagues in PEP and SPEAR, and the other for a general audience at SLAC. About 15 people attended the first talk, and about 150 attended the second. However, many of the people who missed these talks have asked me to consider giving another talk in the future. Because of these requests, I have decided to present here a brief summary of some of the things I talked about, especially in regard to the questions that are often asked about China's interest in building an accelerator of its own.

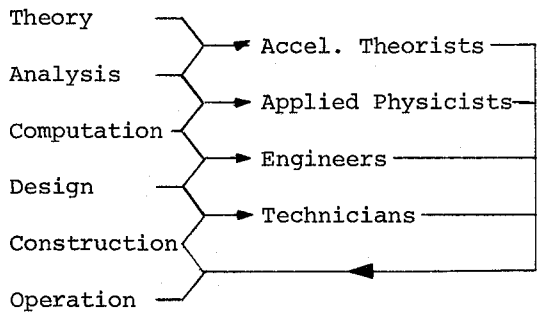
My trip was sponsored by the U.S. National Science Foundation, The U.S.-China Relations Program at Stanford, the Academia Sinica (Academy of Sciences) of China, and by SLAC. The main purpose of my visit was to try to assist some of the scientists at the Institute of High Energy Physics in Peking on problems of accelerator design, and to offer some advice of what kind of an accelerator China should build. The invitation came from Chang Wen-Yü, Director of this Institute. The person in charge of my visit was Fang Shou-Hsien, head of the accelerator group.

Since the first step in the design of a circular accelerator is to find magnet-lattice solutions, I planned to bring them the computer program called MAGIC, a code that we have developed and used for the design of the PEP lattice. uring the past two years I have been able to put MAGIC to good use in England and in Japan in helping with the design of magnet lattices for the electron-positron storage ring EPIC at the Rutherford Laboratory and for the TRISTAN proton synchrotron at the KEK laboratory in Tsukuba. This is what I had also hoped to do in China.

After a few days in Peking, however, it became clear that it would not be possible to get MAGIC to run properly on the computers that were available. Because of this, I decided to concentrate my efforts on showing them how to write a new computer code that would be suitable for their computer, and also to describe to them some of the problems that had arisen in the designs of the SPEAR and PEP storage rings. Thus the remaining days of my visit to the Institute were spent in giving a series of seminars on these subjects.

During the last meeting I presented a summary of the topics covered in the seminars to about 30 of the members of the accelerator, experimental physics and theoretical physics groups. This group included six of the people who had visited SLAC back in 1973: Chang Wen-Yü, Chu Hung-Yuan, Fang Shou-Hsien, Hsu Shao-Wang, Shen Pao-Hua and Chang Ching-Kuo. A reprint of a note that I wrote for this last meeting is given, in both Chinese and English, at the end of this report. In this note I suggested that China should build an electron-positron storage ring of about the same size as SPEAR.

The successful operation of SPEAR and the recent physics results that have come from it have made a tremendous impression upon my hosts. Because of this, it seemed appropriate that I share with them some aspects of SPEAR's organization. The problems in building SPEAR were divided into 6 classes: theory, analysis, computation, design, construction and operation. The responsibility for solving these problems was also divided among accelerator theorists, applied physicists, engineers and technicians in the following way:




As shown, theory and analysis belonged to the accelerator theorists, analysis and computation to the applied physicists, and so on down the line. At the end, all of us took part in the construction and operation of SPEAR. By sharing responsibility in this way, we were working collectively as a single unit. This led to a flow of ideas for improvements, and many of these were quickly implemented.

I concluded my last meeting by offering my advice in a short rhyme in Chinese which I presented to my hosts:

小机器小麻烦
*Small machine gives small trouble;*

大机器大麻烦
*big machine gives big trouble;*

不小不大不平凡
*neither small nor big is unnatural;*

先小後大不会难
*first small then big will be simple.*

--Martin Lee

[The Chinese and English versions of the note mentioned by Martin are given side-by-side on this and the next page.]

这篇手记对我从4月26日到5月12日对高能物理研究所的访问作了小结。

This note gives a brief summary of my visit to the Institute of High Energy Physics in Peking, China from April 26 to May 12.

第一个星期，我作了一系列关于如何利用MAGIC程序进行储存环设计以及有关计算机控制问题的报告。同时，我们还设法找一台能使用MAGIC程序进行运算的计算机。

During the first week I presented a series of talks on storage ring design using MAGIC and the computer control problems in SPEAR and PEP. At the same time, we tried to find a computer than could run MAGIC.

第二个星期，我们了解到由于计算机存贮量的限制，不能试用MAGIC，除非把MAGIC翻译成"修改的"*Fortran*语言。在这种情况下，最好用"修改的"*Fortran*语言重新编写一个仅仅利用MAGIC中的拟合子子程序（*Fitting package*）VMM的新程序。由于将VMM从MAGIC中取出来而不出一点差错是很难的，所以最好是从VMM原程序出发重新编写。为此在回国后，我将从SLAC再寄一套VMM来。

In the second week, we realized that it would be impossible to run MAGIC due to memory storage limitation unless we translate the code to modified Fortran. Under these circumstances, it would be best to write a new code in modified Fortran using only the fitting package, VMM. Since it is very difficult to remove VMM from MAGIC without making an error, it will be better to start with the original VMM, which I will send from SLAC after my return home.

第二个星期，我们讨论了如何编写一个用于设计储存环聚焦结构方案和束流线的新程序。还讨论了节省计算机存贮的某些方法。

In the second week, I gave seminars on how to write the new code which can be used for storage ring lattice and injection beam line designs. Some of the ways to save memory storage were discussed.

在座谈讨论中，还常常涉及到中国将建造何种类型加速器的问题。类似于SPEAR的加速器可以分二个阶段建造。第一阶段，建一台

The question of what kind of machine China should build often came up in these seminars. [I said that] a machine such as SPEAR could be constructed in two stages:

电子同步加速器，用单束电子产生同步辐射；第二阶段，实现正负电子对撞。要找这样一种磁铁聚焦结构方案，使之对第一阶段和第二阶段都适用而仅需改变磁铁的磁场强度，是可能的。在第一阶段不需要 *low*-$\beta$ 区。由于对两种不同的工作状态都合适的磁铁聚焦结构可能具有不同的自由振荡频率，可能需要有一个比SPEAR更灵活的注入系统；为减少高次模式热效应，可以采用比SPEAR更光滑一些的真空盒和较低的RF频率。

目前正在建造作为X射线源的加速器有二台，一台在BNL，另一台在*Wisconsin*大学。SPEAR也将增加新的同步辐射出口，作为斯坦福的同步辐射研究方案。

在这个友好、美丽而又历史悠久的城市里，无论是在技术方面还是在其它方面，我们都有极为丰富的感受。我的夫人和我对所有帮助我们作了这次旅行的同志表示感谢，这次旅行是我们一生中最值得纪念的事。

李祚荣

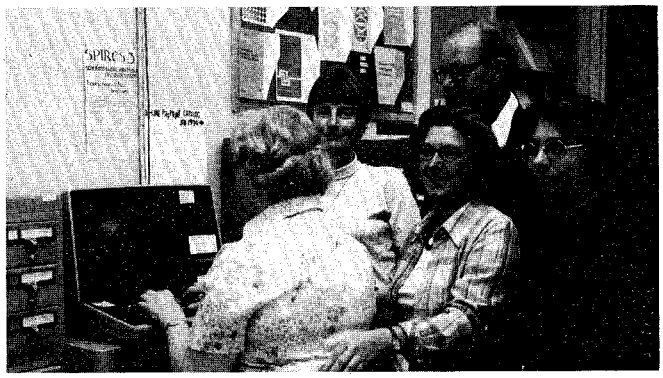
*1977*年*5*月*12*日　北京

Stage 1 for synchrotron radiation production with a single $e^-$ beam; Stage 2 for $e^\pm$ colliding beams. It should be possible to find lattice solutions by changing only the magnet strengths which are optimized for operations in either Stage 1 or Stage 2. In Stage 1, low-beta regions will not be needed. A more flexible injection system than that in SPEAR may be required since the lattice solutions suitable for these operations may have different betatron tune values. Smoother vacuum chamber and lower RF frequency than those in SPEAR may be used in order to reduce the effects due to higher order mode heating and bunch lengthening.

At present, two machines are being constructed as dedicated X-ray sources: one at BNL and another at the University of Wisconsin. New synchrotron light ports will be added in SPEAR for SSRP operations.

Our experiences, both technical and non-technical, have been greatly enriched by being here in this friendly, beautiful and historical city. My wife and I would like to thank my colleagues who have helped make this trip the most memorable event in our lives.

Martin Lee
May 12, 1977
Peking



In connection with the article on pages 5-8 of this issue, here are the SLAC Library staff members who do most of the work associated with preprints. From the left are Barbara Rupp, Louise Addis, Rita Taylor, Bob Gex and Georgia Row. *(Photo by Walter Zawojski.)*

# PREPRINTS, PUBLICATIONS AND ALL THAT

What's happening in the high-energy physics asylum is communicated among the inmates in a number of different ways. In order of preference, the several modes of learning about new results or new ideas in the field go something like this:

1. *Me*. The instant-input mode consists of discovering something new yourself, and it entitlies the bearer to do most of the talking for the next several minutes or even hours.

2. *Them*. Second best is the proximity mode, in which one of the clowns from the inert group down the hall tells you how they lucked out in their clumsy experiment by following your brilliant suggestion.

3. *Him?* Next comes the hot-line mode, usually in the form of a 4:30 AM phone call from CERN or Fermilab during which you hear of a stunning result just obtained by the former graduate student of yours whose thesis topic was *Techniques of Shoelace-Tying*.

Modes 1-3 consist exclusively of voiced communication, which is the International Anthem of physics. There remain, however, two other, more pedestrian modes for proceeding in case the melody should falter:

4. *TGIF*. The one-up or old-dependable mode is effected by arriving at the SLAC Library each Friday just in time to be the first to glom onto the cream of the 86 new Preprints as they go on out on weekly display.

5. *Frantic*. The last-resort or flipped-out mode arises only on such desperate occasions as the following: You have just hobbled into Vegas on a pair of improvised yucca crutches after 5 months at the bottom of the *Fat Chance Silver Mine's* long-abandoned and only shaft, and now you plunge into the first Smoke Shop on Neon Row and comb wild-eyed through the magazines for the plain green wrapper of a *Physical Review Letters* hidden away among all those plain brown wrappers.

Modes 4 and 5 could also be called the *Preprint* mode and the *Publication mode*, and each of these ways of keeping up with what's happening is actually much more important than the five fictions above would imply. In this article we will take a look at these Preprint and Publication forms of the written word in physics in order to get a general idea of the role they play. Nearly all of our information comes from the staff of the SLAC Library, which is itself very big in the Preprint business, all we'll try to show.

## A. PREPRINTS

A "preprint" is defined as a copy of a paper that is being submitted for some sort of formal publication in a scientific journal, conference proceedings, or book. It is thus unlike a *reprint* or off-print, which is a copy of an article that has already been published. The main fact about preprints from the physicist's point of view is that they spread the word *now*, whereas the journal in which the article will formally appear won't get here for another 2 or 6 or 12 months. When it finally does appear, the published journal article then becomes the permanent and definitive record of the work that was done, and the temporary role that was served by the earlier preprint copies of that article is finished. In fact, after formal publication, any preprint copies that remain are at best useless and at worst (as we'll see) a source of considerable confusion. But before the problems let's first look at the facts.

*How Many Preprints Are We Talking About?*

The 86 new preprints every Friday that we mentioned above is an average but not an invented number, as shown in the following table:

| Year | Preprints Received at SLAC | Per Week |
|---|---|---|
| 1970 | 3500 | 67 |
| 1971 | 3759 | 72 |
| 1972 | 5213* | 100 |
| 1973 | 4341 | 83 |
| 1974 | 4093 | 79 |
| 1975 | 4187 | 81 |
| 1976 | 4493 | 86 |

*Inflated by about 500 extra papers contributed to a conference at Fermilab.

*Where Do They All Come From?*

Over the years the SLAC Library has received at least one preprint from each of 785 different institutions or "sources" around the world. We can get an idea of where these sources are by noting some recent experience with a smaller total sample of sources. For example, during the first 42 weeks of 1976, 3609 preprints from 325 institutions showed the following pattern:

| | No. of Instit. | No. of Preprints | % of Preprints |
|---|---|---|---|
| US & Canada | 113 | 1225 | 34% |
| Europe & Mideast | 127 | 1407 | 39% |
| Far East | 53 | 328 | 9% |
| USSR & E. Europe | 24 | 590 | 16% |
| S. Amer. & Unknown | 8 | 59 | < 2% |

For the full year of 1976, the 4493 preprints received at SLAC came from 460 different *institutions*, but the *authors* of these preprints identified themselves with 570 different institutions. To extract a final answer from these differing numbers, we make an estimate that

nearly all preprints come from a total of about 550 different institutions around the world, while the authors of these papers are affiliated with about 700 different institutions. We tend to think, but cannot prove, that the difference between 550 and 700 can largely be explained by numerous examples of the following kind: East Farthing State College has never been the source of a high-energy physics paper, but physicist Frodo Baggins of East Farthing has been collaborating in an experiment at the Mordor Accelerator Center and is a co-author of 3 papers.

*Who Reads It All?*

Preprints received at SLAC are put on display in the Library for a period of one week. Anyone who wishes to have a particular preprint copy circulated to him or her after the display period can arrange this by signing a small circulation tab attached to the preprint. These tabs provide a record of how much interest the particle physicists at SLAC (roughly 100 of them) have shown in each preprint. On three separate occasions the Library staff has analyzed the preprint-circulation patterns over a 3-week period, with the following results:

| # Requests / Preprint | APRIL 73 (275 pre.) | | APRIL 74 (258 pre.) | | OCT. 76 (280 pre.) | |
|---|---|---|---|---|---|---|
| 0 | 114 | *41%* | 106 | *41%* | 130 | *46%* |
| 1-2 | 59 | *21%* | 66 | *26%* | 75 | *27%* |
| 3-9 | 95 | *35%* | 74 | *29%* | 66 | *24%* |
| 10 & up | 7 | *3%* | 12 | *5%* | 9 | *3%* |

So at least one person at SLAC is interested in more than 1/2 of the new preprints, and about 1/3 of them elicit more than browsing attention from at least 3 and often more people. And about 1 in every 22 preprints is such a winner that 10 or more people clamor for it. Not bad, actually. And here all along we thought it was just some sort of international paper-recycling plot.

*How Does The Rest Of The World Get Hip?*

With the SLAC physicists all fat and happy about their weekly data-orgy, it was time to think about spreading the good news to struggling masses on the outside. This actually began to happen way back in 1969, at which time the Library staff at SLAC took on the task of sending out every week or two a modest-looking but quite special publication called

*PREPRINTS IN PARTICLES AND FIELDS*

or "PPF" for short. A complete description of PPF's origins and purposes, and of all the services it provides its readers, is beyond the scope of this article (ask the Library staff). Briefly, however, each issue of PPF consists of a sheet or two of pale-yellow paper (the color is significant) on which preprint information is displayed in the form shown at the bottom of this page. At the present time, PPF is issued once each week to a list of 729 subscribing individuals or institutions, of which 471 are in the US and 258 are in other countries.

Of course, seeing a preprint listed in PPF is not the same as actually having a copy of the preprint itself, but that wasn't really the idea. The idea was, instead, to make available to PPF readers each week a prompt, comprehensive list of preprints in the field so that those interested could request copies of particular preprints directly from the authors. The subscribers to PPF consider this service valuable enough so that they are willing to fork over the annual subscription fee of $14 (US, Canada and Mexico) or $24 (overseas).

*Who's Holding Back The Flood?*

Since SLAC receives preprints at the rate of about 4500 per year, it would be nice not to have to hang on to, file, and in general mess around with all of this paper any longer than is absolutely necessary. There are two ways of getting at this problem: (1) Let the computer

**Preprints in Particles and Fields**

| Report No. | * | Title | Authors |
|---|---|---|---|
| LBL-6101 | ET | THE CASE FOR CHARMED MESONS Mar. 1977. 12p. | Gerson Goldhaber (UC, Berkeley and LBL, Berkeley |
| LEBEDEV-76-198 | T | 1/N-EXPANSION, VACUUM STABILITY AND QUARK CONFINEMENT. Nov. 1976. 23p. | A. D. Linde (Lebedev Inst.) |
| Print-77-0316 (LEUVEN) | T | POSITIVITY VERSUS GAUGE INVARIANCE IN DIMENSIONAL REGULARIZATION. n.d. 7p | D. Roekaerts, E. Tirapequi, A. Van Proeyen (Leuven U.) |
| [Etc.] | | | |

C = Computing E = Experimental I = Instrumentation R = Review T = Theoretical

worry about trying to remember all the facts. (2) Set up a system for annihilating any preprint that succeeds in getting itself published in a respectable journal (thus accomplishing its original mission). In more detail:

(1) SLAC Preprint Data Base. The information retrieval system in use at the Stanford Center for Information Processing (SCIP) is SPIRES3, and one of the several library subfiles in SPIRES3 is called PREPRINTS. This subfile contains information about some 20,000 preprints and reports that have been received at SLAC since January 1974. The information in this subfile is more detailed than that listed in PPF. (See the guide to the SPIRES3 system that is available in the Library for a rundown on what is in the subfile, how it can be searched, etc.)

(2) *ANTI-PREPRINTS*. Every week or two, subscribers to PPF also receive, on a *green* piece of paper, a listing called *ANTI-PREPRINTS*, which contains information in the form shown at the bottom of this page on those preprints that have actually got themselves formally published. This information is thus a signal to the physicist, librarian, editor, etc., to cancel out or throw away the listed preprints that previously appeared in PPF issue number so-and-so because they have now been superceded by the actual published paper. This helps not only with the problem of cutting down the piles of stored paper but also in specifying the date at which the scientific content of the paper has been presented in its final, definitive and quotable form.

The date of formal journal publication marks the end (or at least what should be the end) of the useful life of the preprint. If the preprint continues to be referred to after this date, the result can be inaccuracy (if new or revised data were added before publication), misrepresentation (if interpretations of the data were changed), and frequent confusion of various kinds. The editors of journals are among the most enthusiatic fans of *ANTI-PREPRINTS* because it allows them to replace some of the hallowed "To be published's" in the references of the papers they are reviewing with the actual publication data.

## B. PUBLICATIONS

*How Many Preprints Make it?*

The yellow *PREPRINTS* sheets sent out to PPF subscribers contain more listings than the green *ANTI-PREPRINTS* sheets, so some of those hopeful preprints never do get formally published. The fraction is not precisely known, but some data compiled by the SLAC Library can give us an estimate. Of the 4093 preprints received at SLAC and listed in PPF during 1974, about 58% had been published and *ANTI-PREPRINT*-ed by October of 1976. A small fraction of those remaining will probably still make their way through the jungle and into formal print eventually, so a reasonable estimate of the overall publication rate is probably something like 65%, or roughly 2 out of 3. (Those who find themselves going 0 for 3 every year may wish to consider alternative careers in tennis.)

*Where Are The Papers Published?*

The sample we use here is again the 58% of the 4093 preprints received in 1974, or a total of 2372 published papers. Of this total, all but 145 (about 6%) were published in the 16 journals that are listed in the bar chart on the next page.

*Which Journals Are The Fastest?*

The decision to submit a paper to one journal rather than another is based on a number of different factors: length, subject matter and general character of the paper; regional preferences; attitudes toward editorial policies (or editors); etc. It is characteristic of particle physics, especially experimental work, that speed of publication is important. The time required between submission of a paper and its eventual publication can vary a good deal from journal to journal, from one year to another for the same journal, and even from one article to another within the same journal issue. How-

Anti-Preprints

| First Author | PPF NO | Title, Date, Report NO | Publication Info. |
|---|---|---|---|
| Getmanov, B. S. | 76-51 | N-SOLITON STATES IN THE TWO-DIMENSIONAL POLYNOMIAL FIELD THEORIES July 1976. 8p. <JINR-P2-9996> (Russian) | Phys.Lett.66B:39, 1977 |
| Glimm, James & Jaffe, Arthur | 76-47 | QUARK TRAPPING FOR LATTICE U(1) GAUGE FIELDS n.d. 8p. <Print-76-0956 HARVARD> | Phys.Lett.66B:67, 1977 |
| Goldstein, G. R. & Owens, J. F. | 76-42 | THE ROLE OF ABSORPTIVE CORRECTIONS IN A TRIPLE REGGE ANALYSIS OF p + p --> DELTA-plus-plus + X. Sep 1976. 38p. <FSU HEP 76-9-2> | Nucl.Phys.B118:29, 1977 |
| [Etc.] | | | |

| Published In | *Journal* | Percent Of Publications |
|---|---|---|
| United States | *Physical Review D* | 28% |
| Netherlands | *Nuclear Physics B* | 21% |
| Netherlands | *Physics Letters* | 12% |
| Italy | *Nuovo Cimento Letters* | 7% |
| United States | *Physical Review Letters* | 7% |
| Japan | *Progress Of Theoretical Physics* | 6% |
| Italy | *Nuovo Cimento A or B* | 5% |
| USSR* | *Soviet Journal Of Nuclear Phys.* | 3% |
| United States | *Annals Of Physics* | 2% |
| United States | *Journal Of Mathematical Physics* | 2% |
| USSR* | *Theor. & Mathematical Physics* | 1% |
| England | *International Jour. Theor. Phys.* | ½% |
| Netherlands | *Physics Reports* | ½% |
| USSR* | *Jour. Exper. & Theor. Physics* | ¼% |
| Netherlands | *Nuclear Physics A* | ¼% |
| Canada | *Canadian Journal Of Physics* | ¼% |
| | (Not identified) | 6% |

Of 4093 preprints received in 1974, 2372 were published as shown by Oct. 1976

*Translated by Amer. Inst. Phys.

Percent Of Total → 0 5 10 15 20 25 30

ever, many of the journals have a reasonably predictable cycling time (the *Letters* journals are specifically geared to try to move rapidly), and over the years physicists have developed a sense of which journals take how long to publish what kinds of papers. This qualitative sense can turn out to be wrong for at least two reasons, the first of which has to do with the difference between an average publication time and the overall span of times from which the average emerges. Some authors might worry, for example, about a 4-month average time if the span extends, say, from 2 to 12 months rather than 3 to 6.

A second way to go wrong is to misjudge the present by extrapolating the past. It may well happen that the 3-month average achieved by the *Journal of Data Fabrication* during its initial year or so of publication has slipped a month ow two in recent times. Those who may be wondering how an extra month can possibly make any difference are referred to their friendly local experimentalist for an answer.

At any rate, to come finally to the point, the SLAC Library conducted three separate one-month surveys of the seven journals shown in the table at the lower left in 1971, 1973 and 1976. As the table indicates, there is some wandering around in both average times before publication and in the spans from least to most time. The data in this table do not represent a very extensive sampling, and should thus be regarded simply as ballpark numbers for the purposes of illustration.

DELAY IN MONTHS BETWEEN SUBMISSION & PUBLICATION

| *Journal* | Average | | | Span (Low/High) | | |
|---|---|---|---|---|---|---|
| | 1971 | 1973 | 1976 | 1971 | 1973 | 1976 |
| *Phys. Lett. B* | 1.9 | 2.6 | 2.7 | 1¼- 3 | 1 -12 | 1 - 6 |
| *Phys. Rev. Lett.* | 2.4 | 2.8 | 3.4 | 1¼- 6 | 1 -12 | 1¼- 8 |
| *Nuo. Cim. Lett.* | 1.4 | 3.4 | 3.5 | 1 - 2 | 3 - 5 | 2 - 9 |
| *Nucl. Phys. B* | 4.3 | 5.0 | 4.5 | 2 -12 | 4 - 7 | 1 - 9 |
| *Nuovo Cim. A* | 6.8 | 6.1 | 5.1 | 4 -10 | 5 -11 | 3 - 8 |
| *Phys. Rev. D* | 6.5 | 5.4 | 6.9 | 2 -15 | 2½-10 | 1 -13 |
| *Sov.J.Nuc.Phys.* | 8.4 | 6.0 | 10.1 | 5 -14 | 5 - 9 | 4 -13 |

We hope that this article has made the point that the business of preprints is large, complex and important. Elsewhere in this issue of the *Beam Line* there is a photograph of the SLAC Library people who do the work involved in getting new preprints to those who can use them, and also in producing *PREPRINTS IN PARTICLES AND FIELDS* and *ANTI-PREPRINTS*. That they are a good group is evident from the fact that the SLAC Library is universally considered to be one of the best particle-physics libraries in the world.

--Bill Kirk

## SSRP REPORT: ENVIRONMENTAL MONITORING

One of the possible uses of synchrotron radiation is in the study of environmental problems. A Lawrence Berkeley Lab group has been exploring this field using one of the X-ray beams at SSRP to determine the chemical form of various dilute elements that are present in the typical urban aerosol (atmosphere with fine particles floating around in it) that we all breathe daily.

The samples used in this experiment come from an EPA study of the St. Louis aerosol in which LBL is collaborating. These particulate samples are collected by pulling a known quantity of air through a millipore filter which is mounted on a 35-mm slide. The slides are changed at regular (usually 12-hour) intervals at 13 different sites throughout the St. Louis area. The slides are then returned to Berkeley, where an X-ray florescence system is used to determine the concentrations of each of 28 different elements. This measurement gives the amount but not the chemical form of the various elements that are present in the samples.

Some of the samples are then taken to SSRP, where the EXAFS technique (EXtended Absorption Fine Structure) is used to record spectra. In this EXAFS technique, the spectra are obtained by varying the energy of the incident X-ray beam and measuring the resulting changes in the cross section (probability) for knocking out certain electrons from the atoms in the sample. This photoelectric cross section has a characteristic variation that depends very sensitively upon the positions of the neighboring atoms and upon their identity. By comparing the measured spectra with those of certain standard compounds, a good estimate can be made of the chemical form in which the various elements are present.

The elements that are particularly important because of their effects upon human health, such as lead, zinc and iron, are only present in very small amounts--typically $\simeq$ 1 microgram per $cm^2$ on the filter. For this reason a special solid-state detector is needed to obtain accurate measurements of the florescent X-ray yield as the incident X-ray beam is scanned in energy. Spectra of good quality have been obtained for the three metals mentioned above, and also for copper, from a selection of samples that were collected during a period of particularly bad air quality, and analysis indicates that the chemical forms in which these and other elements are present can most often be identified.

This new technique has many applications where it is difficult to use conventional chemical methods because of the low concentrations or because of interference effects from other elements that may be present. Added advantages are the fact that the sample itself is analyzed non-destructively, and that what is measured is the bulk volume of the sample rather than just the surface layer. With the expected improvements in technique that will come from experience, this new method is likely to find important applications in many other fields as well.

--A. I. Thompson, LBL

## SSRP IS GROWING

Those shown in the accompanying photograph are persons who have joined the SSRP staff since January of this year. The staff is expanding because of the growing needs of the experimental program and in anticipation of the start of major construction of new beam lines in FY1978. From left to right in the picture are:

Piero Pianetta, who has recently received his Ph.D. in Applied Physics from Stanford. He is a Research Associate, and his talents are shared between the Stanford Electronics Laboratory and SSRP.

Chris Jako, SSRP's mechanical engineer, who is kept busy designing mechanical marvels. He also likes to ski, swim and play tennis.

George Brown, who joined the SSRP staff in March as a Senior Research Associate. George did his graduate work at Cornell in high-energy physics, and before coming to Stanford was a Member of the Technical Staff at Bell Labs in Murray Hill, New Jersey.

Katherine Cantwell, who is now project secretary for SSRP. Katherine spent the last few years living and working in England, New Zealand and New Mexico.

Ursula Businger, originally Swiss, who joined the project via the East Coast and the Urban Studies Program at Stanford. She enjoys reading, photography and hiking.

Sally Hunter, who has recently received her Ph.D. in Applied Physics from Stanford and has joined SSRP as a Research Affiliate.

--Herm Winick

## PRINT ROOM GOES TO MICROFILM

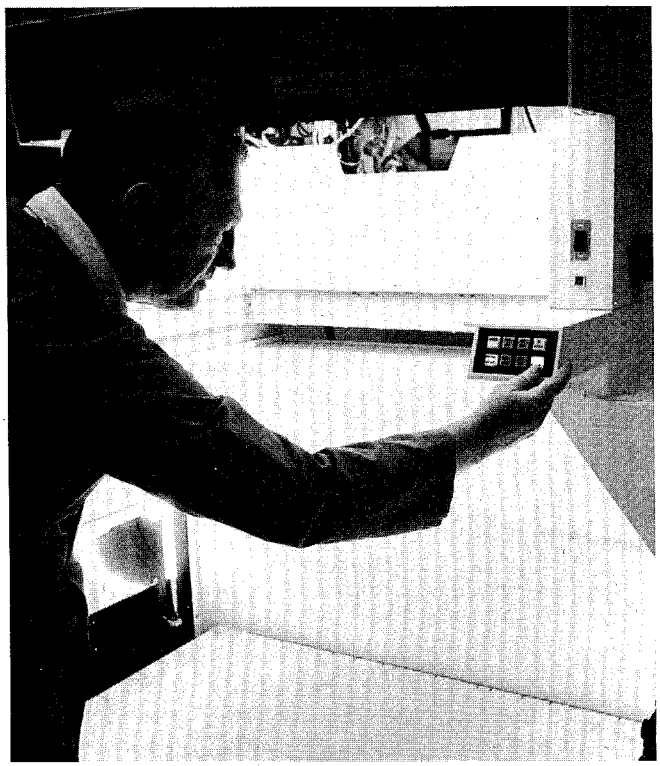
(Photos by Joe Faust)

As the PEP engineering effort goes into high gear, the stream of drawings becomes a flood. In order to keep from being drowned in the sea of drawings and print requests the print room has converted to minaturized information storage.

If you have visited the print room recently you probably noticed several new machines: a camera-processor that produces a 35 mm photo negative of a full-size drawing, a microfilm enlarger which prints enlarged copies up to 17x22 inches from the 35 mm negative, a dupli-printer which produces duplicates (duplicards) of the photo negatives, and a key punch to record the title block information for storage in the computer file and on the "aperture card" which holds the photo negative.

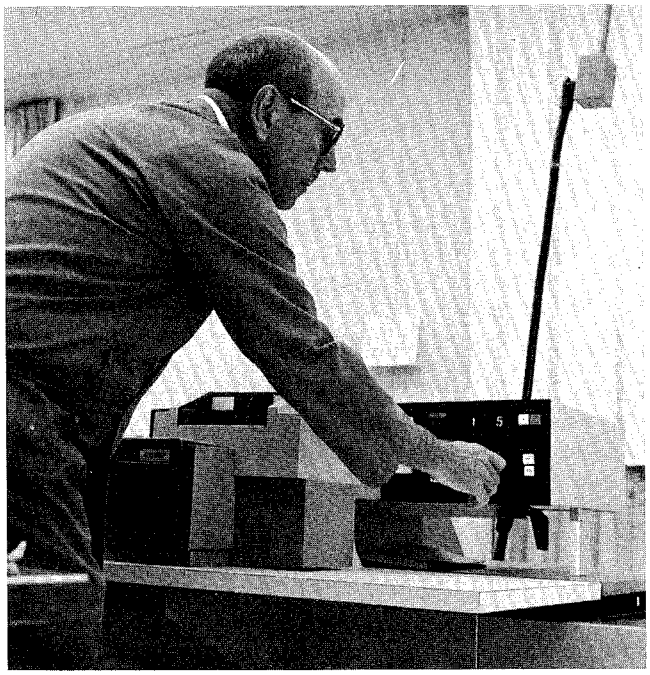
The plan is to microfilm all inactive drawings and send the originals to storage or destroy them. In the near future all new drawings will be microfilmed and duplicated and reduced prints will be made available. In the event it is necessary to revise a drawing that was destroyed, it is possible to have a full-scale Mylar made from the original aperture card. This process would take approximately two days.

-- Pete Munzell



Frank Karas triggers the photo-processor to produce the microfilm negative of a drawing.

Delores Corliss views an enlarged portion of a microfilm of a drawing on the enlarger.



Pete Munzell sets the dupli-printer to make copies of the microfilm negatives.

Whenever you can, count.--Francis Galton

I believe that there are 15,747,724,136,275,002,577,605,653,961,181,555,468,044,717,914,527,116,709,366,231,425,076,185,631,031,296 protons in the universe and the same number of electrons.--Sir Arthur Eddington.

I have no doubt that in reality the future will be vastly more surprising than anything I can imagine. Now my own suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose.--J. B. S. Haldane.

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

## SLAC WOMEN'S ASSOCIATION

*HISTORY OF THE LBL WOMEN'S ASSOCIATION*

Miriam Machlis, Lawrence Berkeley Laboratory's Assistant Affirmative Action Administrator, addressed a meeting of the SLAC Women's Association on June 13. She told the meeting how the LBL Women's Association was formed and was granted "quasi-official" status, what actions it has taken, and how it receives a yearly budget of about $1000 from LBL funds. We had invited Ms. Machlis to report on the LBL Women's Association to see if the experience at LBL in gaining official recognition and funds could be relevant and helpful to the SLAC Women's Association.

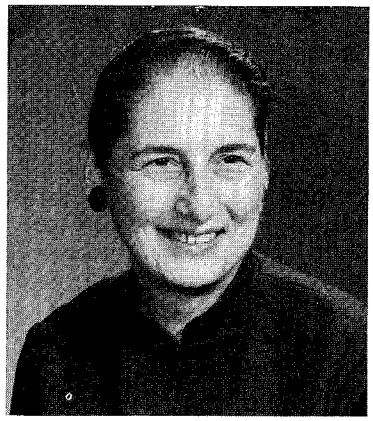
Ms. Machlis had been a secretary at LBL for 21 years when she became a founding member of the Association in 1969; she surprised herself and everyone else by her determination to set up an organization to improve the status of women at LBL. For example, women comprised 20% of the work force, but there were no women on any of the Lab's committees (e.g., Salary, Employee Relations, Pre-grievance).

It took just a few months of negotiations with the LBL management for the Association to be given permission to hold meetings at LBL, to use the xerox facilities, and to use the internal mail service. From April 1970 to May 1975 the Women's Association was considered to be a "Women's Study Group" by lab management; they did not receive any money from the lab, and they levied a yearly $3 subscription fee on their members.

For three of these five years the Association members worked on developing a new job classification scheme in which the requirements and experience necessary to qualify for each grade were made clear, and so the qualifications necessary for promotion were obvious too. Another purpose of their new classification scheme was to remove anomalies in the pay structure of the lab which had, for example, an unskilled laborer on his first day of work being paid more than a Secretary II after several pay raises, and other secretaries using food stamps in order to supplement their income to a reasonable level. This change could occur only if the LBL salaries were based on the results of surveys of comparable jobs in the area and not on the University of California-Berkeley pay scale.

The Association presented the LBL management with its detailed ideas for a new scheme in order to persuade the management to hire a firm of outside consultants to review the current classification scheme.

Some people tried to dissuade the Association from pursuing this line with the argument that a new scheme would "do the women a disservice". The Association did not believe them and continued to lobby for a review. The review eventually occurred and a completely new scheme was finalized in October 1975; it gave basic pay increases to most women (as much as 25% for some) and produced decreases for none.



Miriam Machlis, LBL's Assistant Affirmative Action Administrator. *(LBL photo)*

Ms. Machlis pointed out that during this successful project the Women's Association had not functioned as a union but as an independent group of workers who had drawn upon their own work experiences to identify a problem of concern to women at LBL and to provide the management with a solution.

In October 1972 Ms. Machlis became an intern in the LBL Affirmative Action department and in October 1973 she joined the staff of the Department. Two years later she became the Assistant Affirmative Action Administrator and Women's Coordinator. She told the meeting how much she has been enjoying her work in the Affirmative Action department - so much that she has postponed her retirement. One of her functions as Women's Coordinator is to serve as liaison between the Women's Association and the Affirmative Action department and to assist in the disbursement of the Women's Association funds which are a designated item in the Affirmative Action department's yearly budget.

The LBL Women's Association began to receive money from ERDA in May 1975, after the Director of LBL had granted them a "quasi-official" status. He did this by appointing "...the Association, as represented by its elected officers, a resources committee to the Associate Director for Employees and Information Services and to the Affirmative Action Administrator. The function of the committee would be to provide information on matters of concern to women. The LBL Women's Association would retain its independent status, with its officers elected by the membership in accordance with the organization's bylaws."

Ms. Machlis explained that ERDA labs can

seek reimbursable funds from ERDA for projects that "facilitate equal employment and improve employee morale". The LBL management recognizes the Association in its quasi-official capacity as a resource committee to be such a project, and therefore requests funds from ERDA for the Association. The LBL Black Caucus has been similarly recognized and it also has money allocated specifically for its use in the Affirmative Action budget.

The Women's Association uses its money to buy books and journals for the Affirmative Action department library, to rent films to be shown at Association meetings, and to invite speakers to address Association meetings ($250 is considered peanuts on the speaker circuit). These meetings are advertised in the LBL compendium of events. The Association has an account number and its expenditures must be approved by the Affirmative Action Administrator.

In October 1976 the Association sponsored a one-day conference for about 150 women workers from all of the ERDA-associated labs in the Bay Area. The conference comprised a keynote speech by Ms. Hernandez, ex-President of the National Organization of Women, reports from SLAC, LBL, and LLL on the status of women at these labs, and a variety of workshops on clerical professionalism, special problems of minority women workers, self-esteem, and nontraditional jobs for women.

It is Ms. Machlis' opinion that the success of the LBL Women's Association depends in part on its responsible middle-of-the-road approach, and on its willingness to find solutions to the problems it identifies.

The Association has been working on women's problems at LBL for eight years, and the end to its usefulness is not yet in sight.

The SLAC Women's Association wishes to thank Miriam Machlis for talking to us about the ups and downs of the LBL Women's Association, and the meeting attendees for their many questions, which elicited some of this interesting information.

*ELECTION OF OFFICERS*

At the June 20 meeting of the Association, the following Officers were elected for the term extending from July 1 through December 31, 1977:

President - Ruth Consul (Bin 82, x2411)

Vice President/Committee Coordinator - Cherrill Spencer (Bin 98, x2921)

Secretary - Delores Adams (Bin 62, x2710)

Treasurer - Eileen Long (Bin 8, x2301)

At this meeting, a salary and classification subcommittee was also set up to prepare a report on the SLAC clerical and administrative classification scheme, and to make a comparison of clerical and nonclerical pay scales at SLAC.

These surveys will be made available to the Affirmative Action Office and may also be submitted as information for an agenda item at a national ERDA Conference on Equal Employment Opportunity in October.

Margaret Kendall (Bin 78, x2691) and Libby Kopecki (Bin 40, x2561) were coopted onto this subcommittee. Anyone wishing to help with this study should get in touch with either of them.

--Cherrill Spencer

## LIVE STEAMERS TO MEET

The *West Valley Live Steamers Association* will hold one of its meetings at SLAC on the evening of Friday, July 22, 1977, starting at 7:30 PM. The meeting will be held in the Auditorium, and will feature a display of model stationary steam engines built by the members. Interested people at SLAC are invited to drop in and check out the display.

*SLAC Beam Line*
*Stanford Linear Accelerator Center*
*Stanford University*
*Stanford, CA 94305*

**Published monthly on about the 15th day of the month. Permission to reprint articles is given with credit to the *SLAC Beam Line*.**

Joe Faust, Bin 26, x2429
Walter Zawojski, Bin 70, x2778 } *Photography & Graphic Arts*

Ada Schwartz, Bin 68, x2677 *Production*

Dorothy Ellison, Bin 20, x2723 *Articles*

Bill Kirk, Bin 80, x2605
Herb Weidner, Bin 20, x2521 } *Editors*

| *Beam Line Distribution at SLAC* *Total: 1458* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-*3* | 7-*2* | 14-*1* | 24-*15* | 40-*106* | 53-*41* | 63-*18* | 69-*31* | 75-*4* | 83-*5* | 89-*14* | 96-*20* |
| | 1-*16* | 8-*4* | 15-*4* | 25-*3* | 45-*7* | 55-*40* | 64-*15* | 70-*1* | 78-*28* | 84-*8* | 90-*4* | 97-*94* |
| | 2-*9* | 9-*2* | 20-*28* | 26-*27* | 48-*8* | 56-*10* | 65-*22* | 71-*51* | 79-*79* | 85-*21* | 91-*4* | 98-*21* |
| | 3-*7* | 10-*11* | 21-*4* | 30-*50* | 50-*21* | 60-*19* | 66-*24* | 72-*4* | 80-*8* | 86-*2* | 92-*3* | |
| | 4-*11* | 11-*22* | 22-*16* | 33-*25* | 51-*57* | 61-*25* | 67-*12* | 73-*13* | 81-*51* | 87-*9* | 94-*16* | |
| | 6-*16* | 12-*102* | 23-*17* | 34-*4* | 52-*8* | 62-*38* | 68-*12* | 74-*8* | 82-*15* | 88-*20* | 95-*41* | |