SLAC BEAM LINE

Physics is much too hard for physicists.
--*David Hilbert (a mathematician)*

Volume 13, Number 3 *March 1982*

Several physicists discuss new tricks of the trade during a break in the International Conference on Instrumentation for Colliding Beam Physics held at SLAC on February 17-23. About 150 participants were invited to this conference from Europe, Japan, the Soviet Union, and the United States. This was the second in a series of conferences, the first of which was held at Novosibirsk in 1977.

SLAC Beam Line, Bin 80
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In This Issue

THE STATE OF SLAC

W. K. H. PANOFSKY

Note: This is the text of the annual "State of SLAC" talk that was presented to the staff by SLAC's Director on March 2, 1982.

It is almost impossible for anyone reading the newspapers not to be exposed to the widespread controversy surrounding the budget message which President Reagan delivered to the Congress on February 8, 1982. I would like to follow my usual custom of discussing with you the probable implications of this proposed funding soon after the President's budget message has been delivered.

The public discussion surrounding the President's proposed budget for fiscal year 1983 (FY'83) has very little to do with the Federal Government's involvement in basic research, to which SLAC is solely dedicated. The issues are broader. There is the debate on the size of the deficit and its impact on interest rates, and also on the advisability of proceeding with planned tax reductions in the face of such deficits. There is the debate on guns vs. butter, that is, the problem of the relative funding for defense vs. human needs. As a citizen I have, of course, views on these subjects as do most of you in this audience. While the eventual resolution of these controversial issues does not directly relate to support of basic research, the debate does, however, create a general climate of uncertainty because the eventual determination of the FY'83 budget may produce a result very different from that contained in the President's message. Therefore, the usual warning that I have incorporated in this talk in all previous years--that the President's budget is only an input to the Congress and that there may be a large gap between final appropriations and the President's proposal--has to be emphasized this year with unusual strength. Let me mention parenthetically that the President's budget for SLAC as first submitted to the Congress for FY'82 (the current year) was $7.5 million larger than the sum we finally received. Of course, last year was a special year because there was a change in the Presidency so that changes in the initial budget were initiated both by the Executive and Legislative branches of government. However, in some respects each budget year is a "special year," although the budgetary process is in a more turbulent state this year than has been the case before.

In respect to support of science, there has been a substantial shift in the position of this Administration relative to previous ones, but this has been in the area of applied rather than basic research. Only a relatively small fraction (less than 10%) of the nation's total Research and Development budget of about $40 billion goes to basic research. This Administration feels that private industry should take a larger responsibility for the support of applied research, and in particular applied development. The idea is that the market place should play a larger role in determining what is to be developed rather than having the Federal Government support large projects in order to "demonstrate to private industry what they need." Again this shift is not expected to affect SLAC's work on basic research.

There is complete agreement between Republicans and Democrats, and between this and previous administrations, that support of basic research is the responsibility of the Federal Government. Basic research is essential as a

FIGURE 1 - FUNDING FOR SLAC IN PRESIDENT'S PROPOSED BUDGET FOR FISCAL YEAR 1983

($ x 1,000)	FY'82 as Appropriated	FY'82* in FY'83 Dollars	FY'83 Proposed
Operating Expenses	$60,500	$67,300	$76,000
Capital Equipment**	10,200	11,345	9,000
Accelerator Improvement Projects	1,600	1,780	2,000
General Plant Projects	1,100	1,225	1,200
Total New Budget Authority	$73,400	$81,650	$88,200

* Assuming a growth in the SLAC cost index of 11.25%

** Including PEP equipment for SLAC and non-SLAC groups.

source of all new technical knowledge on which eventually all future technology-based progress depends. One cannot expect that private industry will support basic research to a large extent, since no one industry is likely to recapture the benefits of such research for its own gain in a reasonable amount of time. Thus support of basic research, particularly in the physical sciences, is an area that is expected to receive continuing support from this Administration. To the extent that there is any shift in basic research policy between this Administration and prior ones, this Administration will foster a more selective policy of supporting research. To quote Dr. George Keyworth, the President's Science Advisor, "The first criterion must be excellence...the excellence of investigators, the excellence of the field. We must be sure that there is an open door for all to achieve the merit and excellence needed for the best science, and then support the individuals, groups and institutions who succeed in walking through that door." This means that even more than in prior years, the support which SLAC can expect to receive will depend on our ideas, the quality of our proposals for innovation and the importance of our research output. I am happy to say that thus far our record in this respect has been very good, and I would like to express my thanks to all of you for having contributed to that record.

The funding for SLAC contained in the President's proposed budget for FY'83 is shown in Figure 1 which also shows the corresponding figures for the present year (FY'82). I would like to devote most of the balance of this talk to discussing the plans for the work of our laboratory during the next and subsequent years in the light of this proposed budget. As mentioned, this discussion has to be based on the assumption that the budget will remain as proposed by the President, an assumption which may or may not be correct.

On the face of it the proposed FY'83 budget represents an increase in total funding of almost 20% over FY'82. However, when the effects of inflation are taken into account, as shown in Figure 1, the increase is closer to 9%. This increase is certainly welcome news, although I must again caution that this proposed level may not survive the long budget process. In addition, the comparison shown in Figure 1 between the proposed FY'83 budget and the current figures is made with a FY'82 budget which was reduced from the initial President's budget by roughly 10%. Therefore, the funding proposed by President Reagan for SLAC this year results in total purchasing power that is just about the same as that proposed by the previous administration.

Looked at in further detail, the conclusion must be that our "way of life" at SLAC will not change very much--either up or down--as a result of the proposed budget changes, should they materialize. The reason is that the principal uses to which the increases will be put are two: (1) more machine running for experimental research, and (2) increased support for the research and development effort leading to the realization of the SLAC Linear Collider (SLC). Let me discuss these in a little more detail.

The principal reason why this Administration has decided to increase the support of operating funding not only for SLAC but for all components of the national high energy physics program (total DOE operating funds for high energy physics in FY'83 are proposed at $331 million as compared to $269.2 million this year) is the realization that the very expensive national facilities in high energy physics at Brookhaven, Fermilab and SLAC are severely underutilized; that is, they are being used at only a fraction of their capacity. The consequence of this underutilization is what I call high "leverage": Such a large fraction of our operating money goes into the initial or fixed costs of operating and maintaining our machines and plant that

SLAC Director W.K.H. Panofsky discusses the principle of the proposed SLAC Linear Collider (the SLC) in his State of SLAC talk to the staff on March 2.

even a relatively small increase would produce a disproportionate increase in productivity. Roughly speaking, the "leverage" at SLAC is about 3 or 4, meaning that for each 1% increase in our operating funding we could produce 3 or 4% additional research. Thus a substantial fraction of the increased funding would be applied to stretch out our operating hours and to increase our operating efficiency. Some of the funding in support of this goal will be needed to pay an increased electric bill. As you know, SLAC gets its electric power from both public and private power sources. Since the public power rates are much cheaper, we are doing our best to manage our program such that the large majority of SLAC's power needs can be met from the public source (the Western Area Power Administration--WAPA). However, almost all of the increased operation that the funding for FY'83 should make possible would have to be met through the more costly PG&E electricity.

The second goal to which we wish to apply the recommended budget increase is the SLC. As shown in Figure 2, for the past several years we have been dedicating increased funds to developing the technology for the SLAC Linear Collider. We are greatly encouraged to pursue this work and are now focusing on full authorization for the project for FY'84; that means actual construction would begin roughly by October 1983. This encouragement stems from several sources. First, the results obtained in the technical research and development work at SLAC have been most promising. Second, a special subpanel of the High Energy Physics Advisory Panel reporting to DOE has concluded a review of the SLC project and has just rendered its report recommending construction authorization for FY'84. To meet this goal, we intend to increase the momentum of the research and development program dedicated to the SLC prior to the beginning of construction.

As a result of these considerations, the FY'83 budget increase proposed by the Administration would be almost totally absorbed by increased operations and increased accelerator R&D costs. Funding for our particle physics research program and for construction of new equipment as a part of our program would be essentially unchanged. Thus although the support level recommended by the Administration to the Congress is indeed encouraging, in particular in expressing good faith in increased support for the SLC, this budget does not imply any significant change in the other aspects of the "way of life" at SLAC. Of course, this means that should the Congress pass a lower appropriation figure, this would have a very serious adverse impact.

Figure 3 shows how SLAC's budgetary support has evolved over time. In this chart the figures are given both in "then-year dollars" and in "dollars of constant purchasing power," that is, corrected for inflation as it affects SLAC. You will note that the President's proposed FY'83 budget does indeed represent a significant increase over FY'82. As a sobering perspective, I would like to note that this level is about the same in real dollars as the support level we received back in the late 1960's. Those of you who can remember that far back may recall that at that time SLAC's program consisted almost entirely of the electron scattering and photoproduction experiments in End Station A. Since then, in addition to the End Station A work, we have added the secondary particle beam programs involving the bubble chambers, LASS and other detectors; we have also added the SPEAR and PEP storage rings and are now dedicating very substantial resources to the research and development leading to the construction of the SLC. Thus the same amount of support which we had in the late 1960's now covers an enormously larger range of activities. SLAC is spread very thin; we must remain lean and efficient, and at the same time we have to continue to phase out some of our older activities as we have done in the past. The in-

FIGURE 2 - ADVANCED ACCELERATOR DEVELOPMENT FUNDING
FISCAL YEARS 1981, 82, 83 ($ x 1,000)

	FY1981		FY1982		FY1983	
	Linac	SLC	Linac	SLC	Linac	SLC
Operating	$1,601	$3,444	$3,059	$4,601	$5,914	$9,071
AIP	140	750	835	420	1,500	--
GPP	--	1,000	450	--	--	--
Equipment	500	--	145	1,415	580	140
PE & D	--	750	--	350	--	?
Total	$2,241	$5,944	$4,489	$6,786	$7,994	?

creased budget, should it be enacted, would permit only a minimal manpower growth.

The SLC Project

Let me refresh your memory as to what the SLC project is all about. In essence the idea is the following: The work with SPEAR and PEP and their European counterparts DORIS and PETRA has demonstrated that colliding-beam devices (colliders, for short) which result in the annihilation of high-energy electrons and positrons are enormously productive tools for exciting results in elementary particle physics. As is usually the case, one set of results achieved at a given collision energy answers some questions we have about nature but raises new ones which can only be answered at higher energies. Thus after the great discoveries starting late in 1974 made at SPEAR, there was first an exploration of the new spectroscopy made possible by the discovery of the Psi particle. This exploration immediately raised the question whether similar phenomena would occur at higher energies, in other words, whether the Psi particles have a big brother. The answer to this question was yes: "big brother" was discovered at Fermilab and explored in greater detail at Cornell and at DESY in Germany. It will be studied further once SLAC's Crystal Ball is fully installed at DESY.

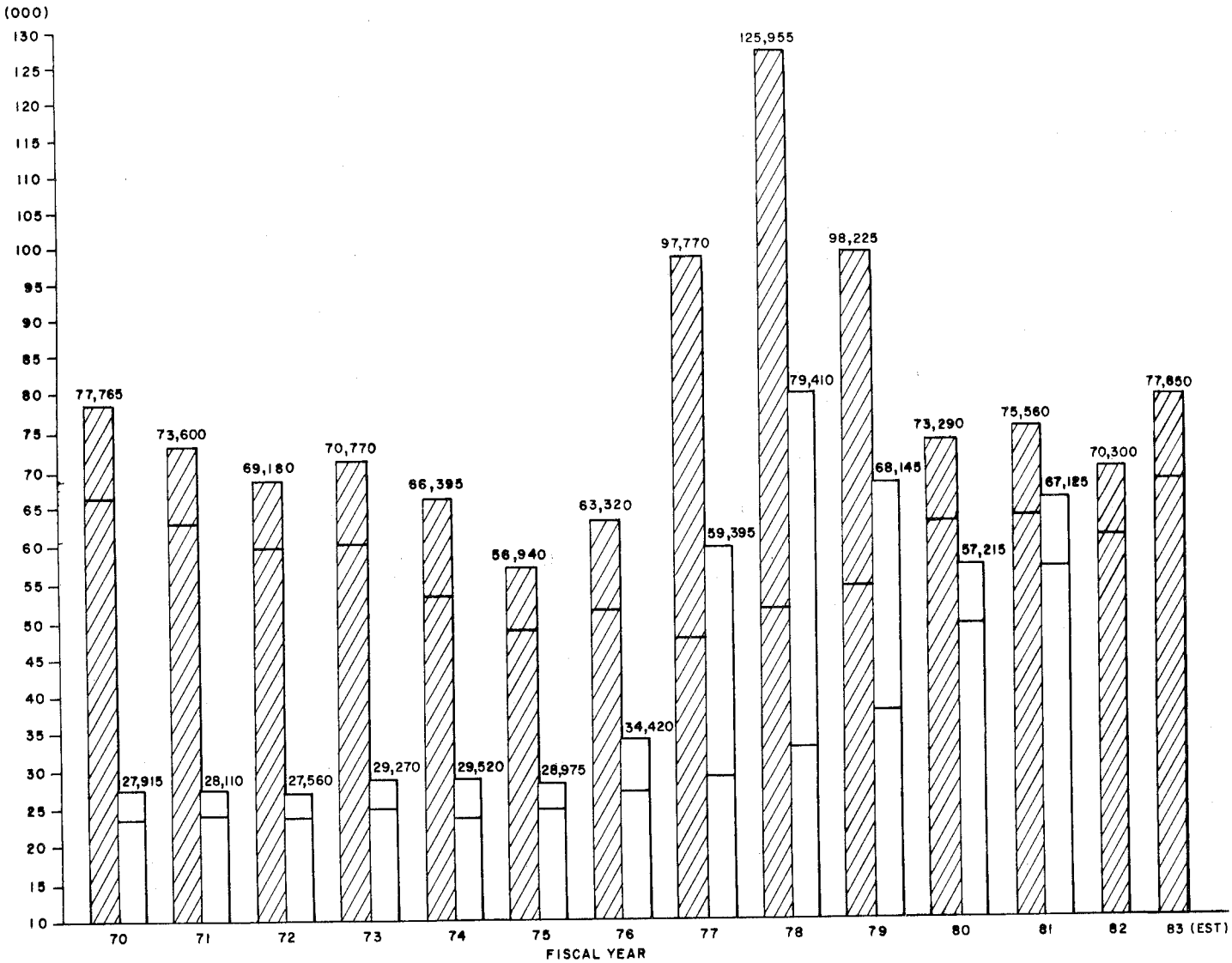

FIGURE 3 - Total SLAC funding by fiscal year expressed in both actual dollars at the time (open bar) and in 1982 equivalent dollars based on the SLAC cost index (crossed bar). Each bar is divided into operating funds (bottom) and capital equipment funds (top). Non-recurrent funding, such as construction, is included.

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In addition, there is now a clear prediction that a whole new set of phenomena will be brought under investigation at collision energies near 100 GeV (50 GeV for each beam). The question is how to get such energies. There seem to be two ways: a straightforward but expensive way, and an innovative way leading to a less expensive solution. The straightforward way is being pursued in Europe through CERN's ambitious LEP program. LEP is a storage ring of design similar to SPEAR and PEP but much scaled up in size. It turns out that the diameter of a storage ring and its cost both go up as the square of the collision energy attained. That is, a machine designed to produce twice the collision energy will cost about four times as much. For the LEP machine, the circumference turns out to be 27 kilometers, or about 16 miles, and the cost will be on the order of $500 million.

In contrast, we at SLAC are taking a novel approach to the problem of producing very high energy electron-positron collisions. This approach is based on the fundamental proposition that the cost of a linear machine, as opposed to a storage ring, goes up only as the first power of the energy. That is, a machine designed to produce twice the energy will cost only twice as much. To be practical, however, such a machine, a linear collider, will have to solve a number of important problems. The most striking of these problems is the need to achieve collisions between two beams that have been focused down to extremely small diameters--much smaller than the diameter of a human hair.

The general plan of the SLC project is shown schematically in Figure 4. The first step in the SLC project is to upgrade very substantially the quality of operation of SLAC's two-mile linac. In fact, all of the changes that we will make in the linac in the process of building the SLC will greatly improve its performance as an injector into PEP and SPEAR as well as an accelerator in its own right. I will not describe here in any detail how the SLC works, except to remind you that electrons and positrons will be accelerated simultaneously through the linac, with each beam achieving an energy of up to 50 GeV. At the end of the linac, the two high energy beams are deflected in opposite directions, then each beam is guided magnetically around a separate arc and brought to a final focus at the collision point.

We have made a great deal of progress on developing the SLC concept during the last two years. An architect/engineering firm, the Tudor Engineering Company, is at work studying the geotechnical aspects of the future tunnel location and designing the experimental halls and tunnels; magnets have been designed and new control systems are being installed into the linac itself. The vault that will house

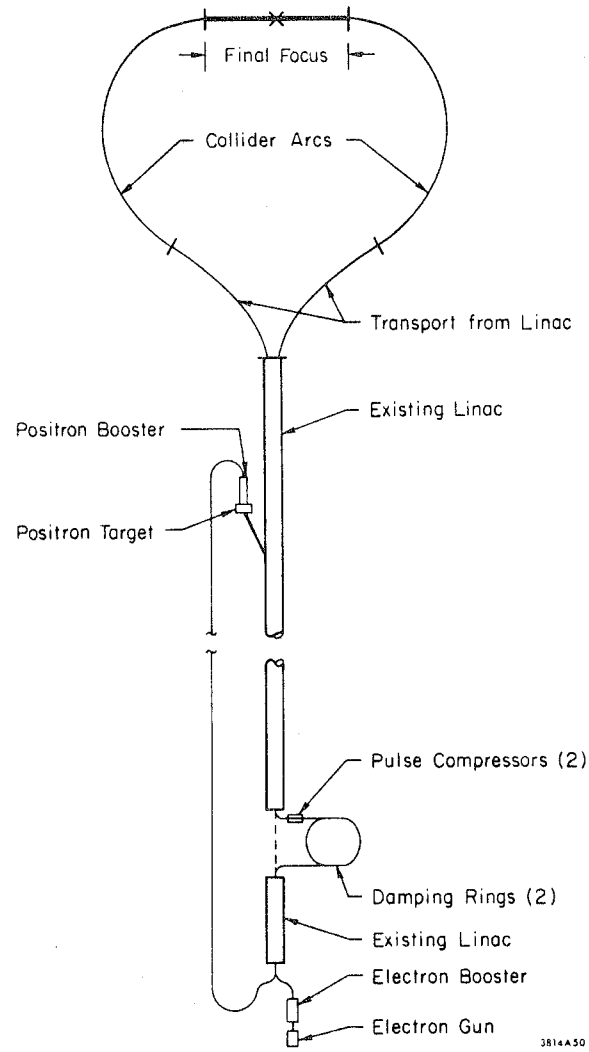


FIGURE 4 SKETCH OF THE SLC -- THE SLAC LINEAR COLLIDER PROJECT

the damping rings has been completed. The work is well on schedule so that we can proceed to full-bore construction starting late in 1983, provided no setbacks are encountered.

None of this means that we have a full green light to proceed with construction of the SLC. All we can say today is that we see no insurmountable technical or administrative obstacles towards building this novel device, and also that we have now received scientific endorsement to go forward. For all these reasons, in the Federal planning for the FY'84 budget (that is, the budget one year beyond the one I am presently talking about today), construction of the SLC is a very strong candidate.

SLAC Anniversaries

Let me now turn to a different subject of a more nostalgic nature. The year 1982 is a multiple anniversary for SLAC. In fact we are

planning for what I like to call the "Five times X" anniversary celebration on August 14-15, 1982. Let me explain. As shown in Figure 5, many of the events associated with linear electron accelerator history at Stanford and at SLAC occurred in years that are related to each other by multiples of five-year intervals. For example, the first significant date in this history is 1947 (35 years ago; X = 7), when the first electron beam ever accelerated by a linear accelerator was produced under the inspired leadership of Bill Hansen. This was the original Mark I accelerator, and its first successful operation resulted in perhaps the briefest Status Report ever submitted to a government sponsoring agency (the Office of Naval Research). The entire content of the report was "We have accelerated electrons."

There followed the development of the Mark II and Mark III accelerators at what are now the Hansen Laboratories of Physics on the Stanford campus, and the success of these machines led to tentative planning for a Very Big machine of this kind. In April 1957 (25 years ago; X = 5), this resulted in the submission to several agencies of the federal government of a "Proposal for a Two-Mile Electron Accelerator." The machine was known locally as "Project M" or "The Monster" and the proposal was the first formal step taken that eventually led to the creation of SLAC.

Five years later, in April 1962 (20 years ago; X = 4), a contract for the construction of SLAC was signed between Stanford University and what was then the Atomic Energy Commission. This was followed a few months later by the formal ground-breaking ceremonies on the present SLAC site.

The SLAC linac achieved its design energy of 20 GeV in January 1967 (15 years ago; X = 3). First full operation of the linac, with a beam through the full two miles, had been achieved during the later part of 1966. Shortly after this time, the first important physics results began to come out of the early SLAC experimental program.

1972 was also a red-letter year in SLAC's history, for this was the year that the SPEAR storage ring first began operating. That was 10 years ago (X = 2). It is worth noting that many particle physicists consider SPEAR to be the most successful single physics tool that has ever been built. (I tend to agree!)

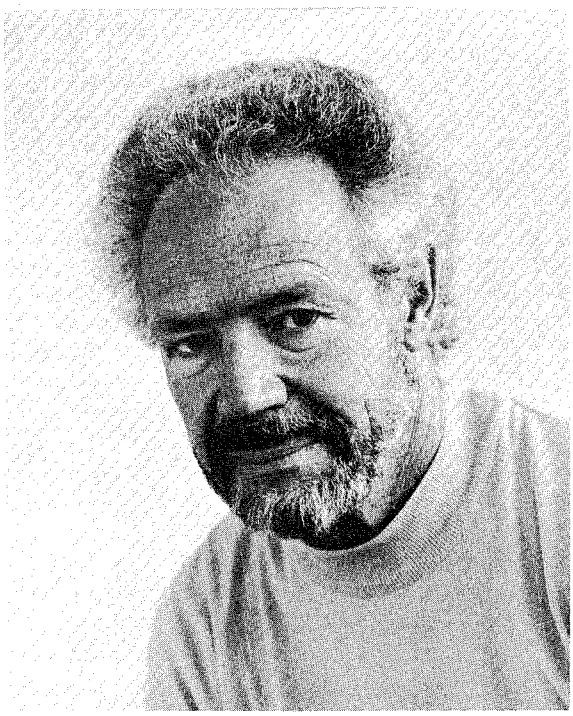
So 1982 is indeed a multiple anniversary of all these events that have made history in the annals of particle physics. If the SLC project is authorized for construction in FY'84, as we now hope, then it may well begin operating in 1986. Perhaps its first major discovery will occur in 1987, so that our interval of 5 years between great events can be maintained!

I hope in this talk I have conveyed to you the message which I want to transmit: SLAC has accomplished a great deal in the past, and we are optimistic about the future. We are expecting to receive adequate support for our work, but these are very uncertain times and any forecast about the future must be tempered with caution.

-W. K. H. Panofsky

FIGURE 5 - THE FIVE TIMES X ANNIVERSARY CELEBRATION: AUGUST 14-15, 1982

X	YEAR	EVENT
7	1947	MARK I OPERATES ("We have accelerated electrons".)
5	1957	PROJECT M PROPOSAL (March)
4	1962	CONTRACT SIGNED (April)
4	1962	GROUND BREAKING (July)
3	1967	20.16 GeV (January)
2	1972	SPEAR OPERATES



BOB ROWE RETIRES

Bob Rowe had been considering retiring and cruising in his newly completed thirty-five foot sailboat, Salacia, for several years but his final decision was rather sudden. Last November he and his wife Jean, who is also an ardent sailor, were sailing the waters off the southern California coast visiting the Channel Islands, Catalina Island, and various yacht harbors along the coast on their way to San Diego. During that trip, Bob decided that life on a cruising sailboat was too hard to resist so he submitted his resignation to SLAC and within three weeks he was back on board in San Diego.

The latest word we have is that they are sailing off Mexico on their way to Cabo San Lucas. Thereafter, they plan to sail down the Central American coast to Panama. At Panama they will head either east or west depending on how they feel at that point.

Bob was born on May 13, 1920 and spent his childhood in upstate New York. After two years in the U. S. Navy as an Electronics Technician during World War II, he attended Tufts University where he received his BSEE in Electrical Engineering in 1951.

After college he worked in electronics at various companies on the peninsula: Stanford Research Institute, Lenkurt Electric, Pulse Engineering, and Curad Corporation. He joined SLAC in March, 1963. During that time he married and had two daughters, Helen and April.

When Bob came to SLAC, the modulator program was behind schedule and plagued with serious difficulties. Bob took on the problems of the pulse transformer tank and pulse cable assembly, which hang onto the bottom of the klystrons. He came through with flying colors. He continued to take care of those items, as well as many others, until his retirement. His excellent education coupled with his many years of experience and his attention to the finest details made for success in his every endeavor. This is quite evident in the fine workmanship on their boat.

He and Jean purchased a new bare fiberglass hull about five years ago and both of them worked on it at Docktown Harbor in Redwood City in their spare time. The interior had to be finished, countless items and systems installed, the mast stepped and rigged, and many items had to be installed on deck, a formidable project indeed.

We wish Bob and Jean many years of happy sailing on the blue waters of the world. Bob will be missed by his many friends and colleagues at SLAC. He leaves a spot that will be very hard to fill. We are all indebted to Bob for his fine work which contributed to the success of SLAC.

- Carl Olson (Retired)

THE FRENCH DIS-CONNECTION

On December 1, 1981, a French military aircraft bound for Tahiti stopped off at Los Angeles to unload 14 crates of equipment and two French physicists. They were on their way to SLAC to use one of the best high energy test beams anywhere, Beamline 19, where positrons of energy as high as 17.5 GeV are available. The device to be tested was a prototype of a new design of electromagnetic calorimeter intended for use in an experiment at the LEP electron storage ring which is to be built at CERN.

The physicists were Henry Videau, of the Ecole Polytechnique, the principal investigator of the test, and Jean Badier. They boarded a flight to San Francisco, while the crates were taken to Western Cargo to be flown north.

When the two scientists went to the airline cargo office two days later to claim the shipment, they found only 12 crates had arrived. The two largest, weighing 260 and 130 pounds, were missing. A "Catch 22" situation then arose: Western Cargo could not find the missing crates. U. S. Customs would not release the partial shipment. What could be done? The next several days were frustrating, but there were some humorous aspects. While

Henri and Jean made many trips from SLAC to the Western office at the San Francisco airport to demonstrate that they still really wanted all of their equipment, the number of people looking for the missing cartons increased, with Roger Gearhart and John Kadyk joining the search, plus four more from Europe (Jean-Jacques Veillet, Tom Meyer, Patrick Poilleaux, and Alain Busata) who had just arrived. Western dispatched telegrams to all of their U. S. offices in an attempt to locate the errant boxes which were each the size of a coffin, and their cargo storage warehouses were personally "walked" by the local cargo managers at Los Angeles and San Francisco, to no avail. After several days, Customs was persuaded to release the 12 smaller boxes.

The tests, due to start in a few days, required the missing gas containment vessel which could be raised to several atmospheres of pressure. Also missing were the numerous supports, the gas plumbing system, manometers, multiconductor feed-throughs and other hardware.

Fortunately, Henri had had the foresight to bring with him two excellent technicians (Patrick and Alain) who immediately began to construct a gas containment vessel out of pieces available at SLAC, with the indispensible aid of many SLAC technical people. By the middle of the following week, to the dismay of all, the missing equipment was still not located, and the time to begin the test was past. Now the team had grown with the arrival of Alain Blondel, Ioana Videau, and Jacques Le Francois and time was running out as the end of the operating cycle neared.

With plumbing concocted for this emergency, a reasonably stable and reliable system was started and the tests were finally assembled. In a little over a week of almost continuous hard work, significant and important information was obtained regarding new modes of calorimeter operation, thanks to hard work by the visiting group and help from SLAC personnel who supported them in their time of need.

At the present time, the two lost crates are still lost, and the claim for the value of the equipment therein, $5,126, has not been settled (Western is claiming legal responsibility for only $154, or about $.50 per pound).

Has anybody seen two large heavy wood boxes with labels written in French?

- John Kadyk
Lawrence Berkeley Laboratory

VIC CARTY RETIRES

One of our younger "old timers" opts for the easy life at age 61. Vic found a home at Stanford University almost a quarter of a century ago. He started with the Campus Utility Group in 1958 where he was involved with plumbing and installations. Vic joined the SLAC staff in 1962 and helped to bring the laboratory into operation. He later became supervisor of the MFS Plumbing and Sheet Metal Shops.

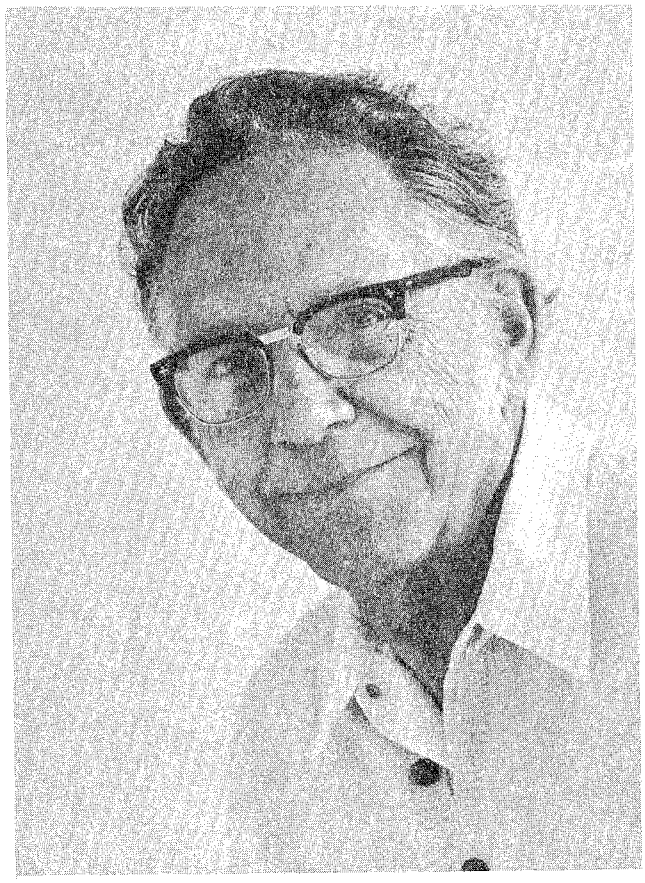
Raised as an Illinois farm boy, Vic married his wife, Marilyn, some 40 years ago and says he would do it again. They migrated to California in 1941 where he worked at Lockheed for a while and then did his bit with the Army Air Corps. After the war, he returned to farming for a time before moving to the redwood country to help maintain the Pacific Lumber Company.

Their children, Chris, Vicki, Kari and Steve, all reside with their families in California so the Carty's will remain in their present home in between trips in their fifth-wheel trailer. They are active square dancers and Vic threatens to return to his first love, farming.

The SLAC shops will miss Vic, but who can deny that he has made another good decision.

- Stan Butler

WADE MILNER RETIRES



Surveying at SLAC is somewhat different from surveying building lots or cow pastures, as the accompanying cartoon by Bob Gould shows. Wade Milner, after 12 hard years as head of SLAC's Precision Alignment Team (PAT), is heading back to those pastures. To be more precise, he's heading for his seven-acre spread in Cool, CA. He bought the land before he came to SLAC and, working in his spare time, has built a home including a solar water heater and a garden. For the last five years his wife Rosanne has been living there while Wade spent the work-week at SLAC.

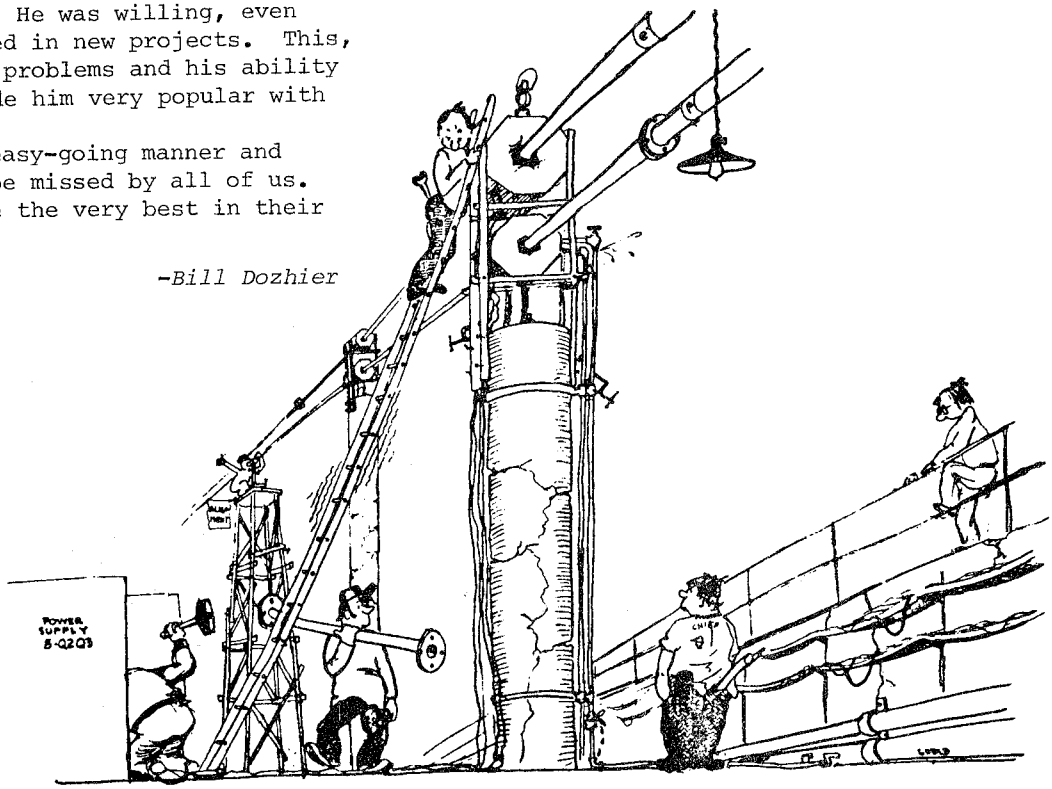
Wade was raised on a maple tree farm in Ohio, where he helped his dad collect the sap to make maple syrup. Later, he worked as a sailor on the Great Lakes.

Wade came to California in 1958 to work at Aerojet in Sacramento, as a Quality Control Inspector for liquid-fueled rocket engine parts. He joined SLAC in 1966 as a temporary employee, was quickly hired on permanently and became PAT supervisor in 1970. He has been intimately involved in the design, construction, installation and operation of every experiment and facility at SLAC since that time.

Wade's work put him in contact with a large number of people at SLAC. His knowledge and skills made him invaluable to physicists and engineers. They relied on him to devise ways to install and align components of detectors and beam transport systems. He was willing, even eager, to become involved in new projects. This, with his quick grasp of problems and his ability to devise solutions, made him very popular with PAT users.

Wade's talents, his easy-going manner and friendly attitude will be missed by all of us. We wish Wade and Rosanne the very best in their retirement.

-Bill Dozhier



HIGH TECHNOLOGY ADDRESSES

HITECH is a new data base containing addresses of over 3700 companies whose products are of potential interest to SLAC. It is intended to be the information retrieval system for the Technical Data Library. Eventually it will include products and trade names.

The library would like to make HITECH a complete collection of vendors of interest to SLAC. Your help is needed. Please tell Bob Gex (x2411) or Shirley Livengood (x2338) any company names or product areas we should add.

If you are unfamiliar with SPIRES call the library for help in getting started using HITECH.

Example:

Find address (any word in a company address)

type (this command gets you a list of all companies with that word in their address)

```
-> find address varian
-RESULT: 2 RECORD(S)
-> type

Varian Assoc.
611 Hansen Way
Palo Alto, CA 94303
    TEL: (415) 493-4000


Eimac Div.
Varian Assoc.
301 Industrial Way
San Carlos, CA 94070
    TEL: (415) 592-1221
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This is what a typical search of HITECH looks like. Note that address includes telephone no. (Local reps and their telephone numbers are included in many cases).

GOOD ANSWERS TO BAD QUESTIONS

The eminent sculptor, Alexander Calder, was given a questionnaire by the Whitney Museum. The Museum asked, "Presuming that you as an abstract artist are drawn to nature by certain eternal qualities of forces sensed there, would you say that your work is a predominantly subjective expression of your personal relation to these qualities and forces?" Answered Calder, "I do the best I can."
(*Gina Maranto in the* Rensselaer Alumni Magazine, *December, 1981)*

MIKE ACHEFF RETIREMENT

Mike Acheff, who had been primarily a hydrogen brazing furnace operator in the Klystron Department, retired at the end of 1981 completing 20 years at Stanford almost to the day. He started with Project M on campus after ten years at Pyromet in San Carlos.

Mike was born in Clear Lake, Washington and received his early schooling in Seattle. He came to San Francisco in 1934 and worked in office building maintenance. In 1938 to add some spice to his life he went to work in the Alaskan placer mines. While in Alaska he married his wife, Alice. During the war he was with the Bureau of Mines and in the Army Corps of Engineers.

Of their sons, Ivan lives in San Diego and has a marine supply business and Bill is a well-known artist specializing in western style paintings in Taos, New Mexico.

In retirement Mike and Alice plan to keep their homebase in Belmont, but will probably do a lot of traveling up and down the coast between Alaska, where she has relatives, and San Diego and New Mexico. We wish them the best for the future.

-Bob Boesenberg
-Gerry Konrad

STANFORD HELP CENTER

1982 is really here with a bang of rain and snow, the 49'ers win the Super Bowl, Uncle Sam wants both voluntary and involuntary donations before May, 90 more days before our children have spring vacation, my sixteen-year-old son/daughter dislikes school and wants to spend most of his/her time playing video games at the 7-11 Store and they do not understand simple family rules, my PG&E bill has increased by 60%, my aged parents cannot support themselves and refuse assistance, my cat had kittens and my dog bit the paperboy, my daughter broke the neighbor's window with a baseball and he wants to sue me, AAA is glad to announce another increase in auto insurance, my spouse is too exhausted to talk to me, I'm smoking too much and my cocktail hour is ending later and later.

Yes, 1982 is really here and so is the Help Center, an employee benefit which provides short-term, confidential, problem-solving conseling to any Stanford employee and his family. Counseling at SLAC is on Fridays, 9am - 1 pm. Please call Victoria at 87-4577 for an appointment.

-Lawrence J. Starkey LCSW

(The following excerpt from Science *magazine describes a learning experiment performed with monkeys. Either monkeys are getting a lot smarter, or...)*

Every 15 minutes a tone sounded and three white lights were illuminated above the left response lever. Simultaneously, either a red or a green light was illuminated above the right lever. At this time, responses on the right lever had no programmed consequence. Four consecutive responses on the left lever resulted in a change in the color of the lights over the right lever (from red to green or green to red).

Each additional four-response sequence changed the color again. Any time after a minimum of three color changes had occurred, the first response on the right lever turned off the tone and white lights. Further responses on the left lever no longer changed the lights over the right lever. Right-lever responses prior to the three required switches reset the initial conditions.

Completion of 31 additional right-lever responses produced either the injection or the five food pellets followed by a 15-minute time out (all lights off).

If the 31 additional responses were not completed in 15 minutes, all lights were extinguished and the animal was required to wait for the next trial.

CONFERENCE CALLIGRAPHY

In his opening remarks to the recent International Conference on Instrumentation in Colliding Beam Physics SLAC Director W.K.H. Panofsky referred to an old Chinese proverb.

The calligraphy was redone in a modern horizontal format to fit our page by Yong-Xiang Zhao who works in the PEP RF group at SLAC. It is scanned in the same way as English and each set of three characters translates to the corresponding line of text at the right.

The principle that can be stated

Cannot be the absolute principle.

The name that can be given

Cannot be the permanent name.

Laozi, Dao De Jing (550 BC)