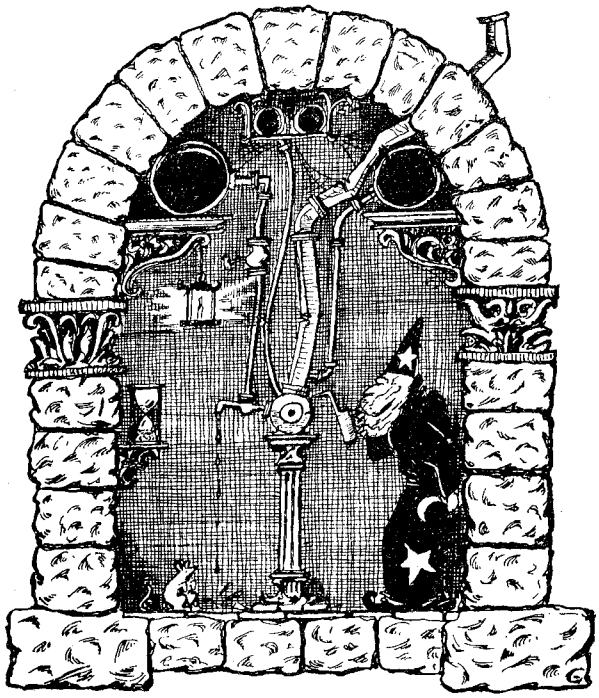
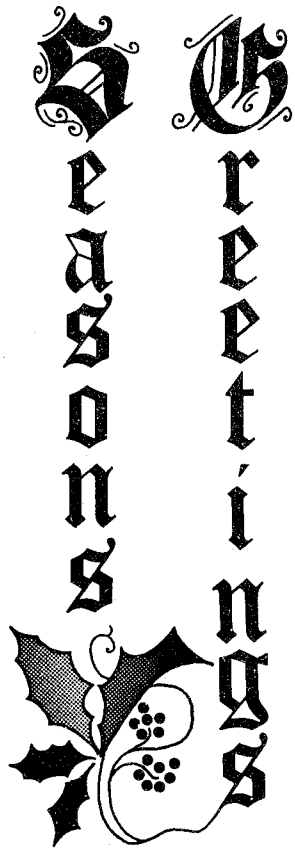
SLAC BEAM LINE

Where there is matter, there is geometry.
—*Johannes Kepler*

Volume 12, Numbers 11-12 *November-December 1981*



typical cross-section



Cartoon by Bob Gould

SLAC Beam Line, Bin 80
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In This Issue

THE U.S. HIGH ENERGY PHYSICS PROGRAM

An important report on the future of the high energy physics program in the United States was recently completed by a panel of physicists and passed on to the Department of Energy. The topics included the present programs and planned projects at the major U.S. laboratories with special emphasis on ISABELLE, a 400-GeV proton-proton colliding beam accelerator now under construction at Brookhaven. The following excerpts from the November 13th issue of the journal *Science* are a fair example of the attention that this report has generated in the scientific press.

...the High Energy Physics Advisory Panel (HEPAP), which counsels DOE on the research community's priorities, met on November 1 to receive a report from its long-range planning subpanel headed by George Trilling of the Lawrence Berkeley Laboratory. Trilling told HEPAP that from fiscal 1983 onwards, about $500 million would be needed to complete ISABELLE, which started out as a $275 million project and which has already cost $130 million. Nonetheless, Trilling's subpanel found the research that ISABELLE would make possible compelling enough to recommend strongly that the project go through.

The hitch is that the subpanel also concluded that several other components of the U.S. program, especially ensuring the adequate use of existing facilities, are more compelling. The subpanel arrived at a figure of $440 million (in fiscal 1982 dollars uncorrected for inflation) as the minimum annual DOE expenditure needed to support these components and complete ISABELLE. "If support at this level cannot be made available in time for ISABELLE completion within this decade, the ISABELLE project cannot be continued," read the principal conclusion of the report...

In its assessment of U.S. high energy physics, the Trilling subpanel steered a careful course. It concluded that "ISABELLE provides a major new facility that will enable the U.S. high energy physics program to remain active and healthy during this decade and into the next." But it then identified six components of a core program "which must be supported whether or not ISABELLE is constructed." The six are:

*More support for accelerator operations and for the physicists that use them at the Stanford Linear Accelerator Center, the Fermi National Accelerator Laboratory, and Brookhaven.

*Completion of the superconducting ring at Fermilab that will double the energy of the existing proton synchrotron at 1000 GeV.

*Modification of the Fermilab accelerator to allow proton-antiproton colliding-beam operation, although at much lower luminosity than ISABELLE would have.

*Research at Stanford leading to the possible construction of an advanced electron-positron colliding-beam machine (the single pass collider).

*Research on superconducting radiofrequency cavities at Cornell University that could make circular electron-positron colliding beam machines cheaper to operate.

*Research on advanced accelerator concepts.

Trilling told HEPAP that during its deliberations the subpanel received about 170 letters from high energy physicists. The dominant theme was an extreme concern that ISABELLE construction without an adequate budget for the total program would irreparably damage U.S. high energy physics. The subpanel's conclusions mirror this concern.

In transmitting the subpanel report to DOE, HEPAP unanimously endorsed its conclusions. HEPAP also recognized that a jump in high energy funding to $440 million, even if forthcoming, was unlikely to occur in just 1 year. It, therefore, asked for a substantial increase in fiscal 1983 and a Reagan Administration commitment to the full figure in 1984 and beyond. HEPAP estimated that the level of spending needed to finance the subpanel's core program would still come to $385 million, but noted that the loss of ISABELLE would be a severe blow...

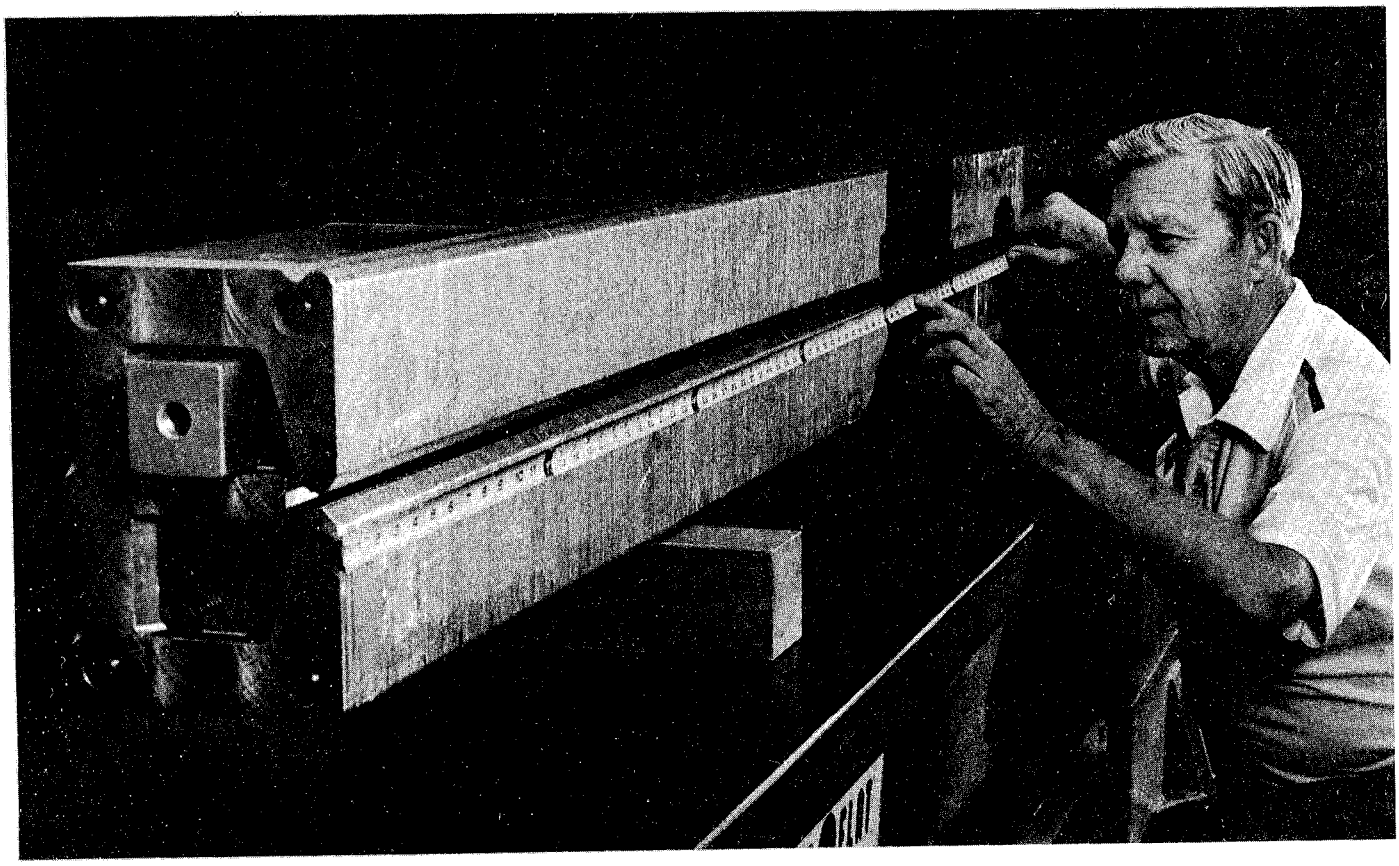
SLAC Christmas Party

SING CAROLS! ENJOY FREE COOKIES AND PUNCH! GREET SANTA & RECEIVE HOLIDAY BEST WISHES FROM DR. PANOFSKY! WIN A BEAM TREE IN THE RAFFLE AND SAVOR THE SPECIAL CHRISTMAS LUNCHEON!

Festivities begin @ 11:30 in the cafeteria. Santa arrives at noon to lead the carol singing. Our Director speaks at 1:00 and the raffle begins at 1:15. (You must be present to win)

Join your friends for a gala SLAC celebration!

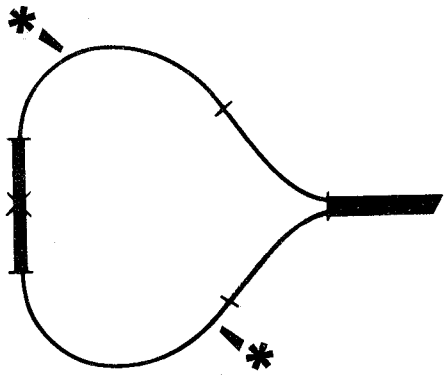
WEDNESDAY, DECEMBER 23



SLC MAGNETS

This is not what is meant by magnetic measurments at SLAC. Engineer Marty Anderson is just holding a scale for the photographer in order to illustrate just how small these bending magnets for the SLC arcs really are.

The figure below shows how these magnets fit into the SLAC Linear Collider scheme. The bunches of electrons and positrons leave the end of the linear accelerator at the right of the diagram and are bent around in the two arcs to the long straight section on the left. The experiments will surround the collision point marked by the X.



These magnets will be quite different from those which SLAC has produced for the rings of PEP and SPEAR. Most noticeable is the size--with the SLC models about half the height of the PEP standard. Since the beams at the SLC will be only a millimeter in the arcs, and since there is no need for a very high vacuum system, the beam pipe will be quite small. With a small pipe, the magnet gap can also be small, and the body of the bending magnet shrinks as well. A close look at the gap shows a second significant difference. The edges of the steel here are cut quite sharply, whereas the PEP magnets have a nice flat gap. This shape produces a magnetic field which focuses the beam as well as bending it around in the arc. At PEP separate magnets--quadrupoles--are used to focus the beam. By combining the focusing and bending into one magnet, critical space is saved in the SLC arcs.

This magnet was built up by stacking together many thin laminations of steel. Again, size has made a difference. The SLC magnet laminations were made by a process called 'fine-blanking' instead of by stamping out very thin steel sheets. In this process, developed in Switzerland for watch parts, the metal is essentially extruded into form between die sets with virtually no clearance. The very large presses required (250 Ton in this case) make such a process impractical for pieces much larger than these.

Reception at SLAC for Chinese Vice-Premier

Wang Ju-wen, a visiting scholar from Tsinghua University in Beijing who is working in the accelerator physics group at SLAC, greets the Vice-Premier for Science and Technology of the People's Republic of China, Fang Yi, at a recent reception for the delegation at SLAC. Other visiting scholars at the reception included Wang Lin-Chow of the Institute for High Energy Physics (IHEP) in Beijing, visiting University of Michigan and working on the HRS at SLAC; Mao Zhen-Lin, IHEP and Yale University; and Yan Wu-Guang, IHEP and Stanford University. (Photo courtesy of Stanford Campus Report)

CHINESE VICE-PREMIER VISITS SLAC

Fang-Yi, Vice-Premier of the People's Republic of China, visited SLAC on Wednesday, October 21, 1981. His party numbered about 15 persons, and included a number of other high-ranking members of the government of the PRC. These officials were in the United States for the purpose of renewing the agreement between the governments of the USA and the PRC on Cooperation in Science and Technology which was originally signed in January of 1979.

One aspect of this general agreement is the US/PRC Cooperative Program in High Energy Physics, a program that has now been in effect for the past several years. The specific interest of the Fang-Yi party in SLAC is based on the fact that the PRC is now considering the construction of a research facility near Beijing that will have much in common with our facilities here. This includes a linear electron accelerator and an electron-positron colliding-beam storage ring. Given this similarity of interests, the scientists at SLAC and the members of the PRC group found a great deal to talk about. SLAC has offered to assist this proposed new PRC scientific enterprise in whatever ways may be useful and possible.

While visiting, Fang-Yi and his party met some of the PRC scholars who are presently in residence at the laboratory. Such scholars have been visitors to SLAC for varying periods ever since early 1979. The PRC party also visited the Ames Research Laboratory at Moffet Field. The party had lunch at the Buck Estate near the Stanford campus with a group which included Stanford President Donald Kennedy and SLAC Director, Wolfgang Panofsky.

BILL WALSH RETIRES

On November 1, Bill Walsh retired. After 17½ years at SLAC, Bill and his wife, Anna, have decided to move to their home at Clear Lake. He will be sorely missed in Group B. Bill was our liaison with the real world in the experimental area; he helped build LASS from the start and helped to keep LASS from falling apart. He designed, aligned, surveyed, repaired, plumbed and rigged his way through the years. It is impossible to think of anyone ever filling Bill's shoes, just as it is impossible to conceive of ever finding someone as friendly, eager or as helpful as Bill.

He enjoyed his work. He knew that the work we in Group B were doing was important, but also that it could be done only because his colleagues in the yard were there doing their part.

Bill was born in Mansfield, Ohio on March 5, 1916, but as a youngster his family moved to Cleveland. He was educated there and after graduation set himself up in business as an owner/operator of a Firestone Dealership. Later on, he and a partner set up the Buckeye Tool & Supply Co. which did R&D on antiaircraft gunnery and submarine diesel engine components.

He saw action as a Seabee during WWII in such garden spots in the South Pacific as the New Hebrides, Guadalcanal, the Solomon Islands, New Guinea and the Philippines.

On his return, Bill worked for Ryan Aeronautical Co. in San Diego for many years, working on target drones, aircraft manifold systems, VTO military aircraft and jet engine subassemblies in many capacities. Finally, in 1962 he moved to this area where he joined Dalmo Victor and then Lockheed Missiles & Space Co.

Bill was hired at SLAC in 1964 and participated in the construction and alignment of the accelerator, and beam switchyard. Soon thereafter, Bill joined Group B where he has enjoyed the respect of his colleagues for 15 years.

Bill helped design, build and test instrumentation and fixtures crucial to experiments carried out by our group. Starting with E-11, E-41, E-67, E-75, E-85, E-127, E-128, E-129, E-132, E-135; Bill has left his mark on all of these. Another important contribution was his work with our graduate students.

What with collecting cameras, stamps, guns, coins, books and motorcycles to hunting and fishing. He and Anna will have no trouble filling their time at Clear Lake. We all wish them well, and our hopes go to them both for a long, happy and healthy retirement.

-Steve Shapiro

TO MY FRIENDS AT SLAC:

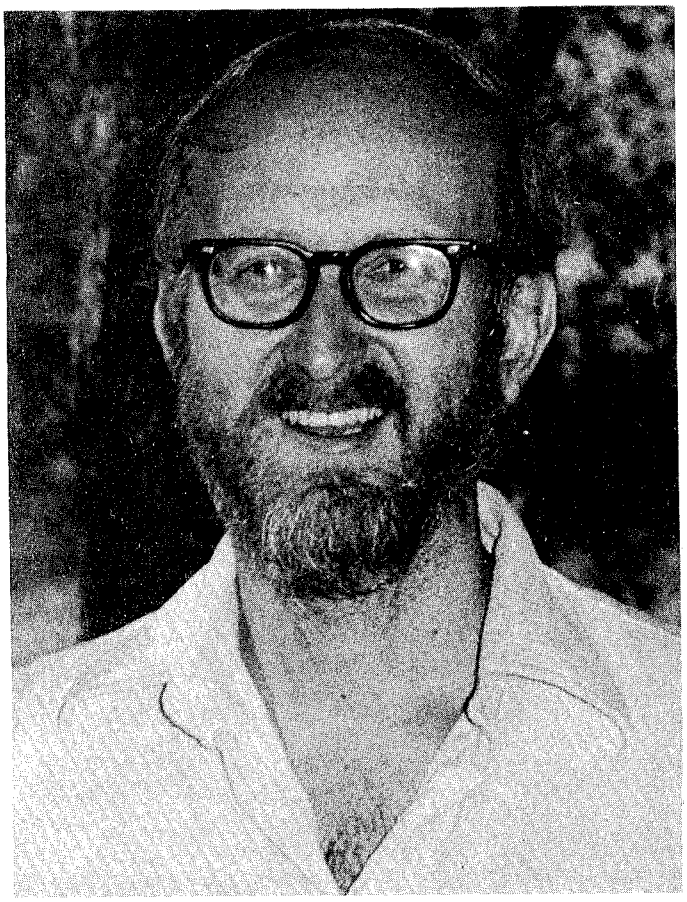
I really want to thank all the well-wishers who in the weeks prior to my retirement either called, stopped by to chat and/or attended the event at Bldg. 121 on Oct. 30th. It was heartwarming to see so many friendly faces at one time each bringing back memories of events occuring throughout the years. I attempted to "press the flesh" with everyone but failed. I now remember so many faces present that I missed. I do want everyone to know that I acknowledge their participation and wish to thank them individually for their good wishes and kindnesses.

Collectively, those present represented the total spectrum of what SLAC is and is all about, with their talents, skills and willingness to do an outstanding job. To say that I am sorry to leave your ranks is an understatement.

Retirement beckons us all and offers additional opportunities and challenges. I can only wish that the future years are as satisfying as those gone by. Thanks again and best wishes.

Sincerely,

Bill Walsh



BEN CHERTOK

Benson Chertok died of cancer on September 24, 1981, at the age of 46. With his passing the physics community lost an imaginative and inquisitive mind full of curiosity for the world around us. To many, Ben was also a fine friend who will be keenly missed.

Ben grew up in New Hampshire and attended Tilton Prep School. He earned his B.S. and M.S. in nuclear engineering at the Massachusetts Institute of Technology. While there, he met Barbara Liss and they were married in 1961. After spending a year at Goettingen he continued his studies at Boston University where he received his Ph.D. in physics in 1964. There followed a year and a half in the U.S. Army where he rose to the rank of captain and received the Commendation Award upon discharge. In 1966, he began his career as Professor of Physics at the American University. From 1964 to 1970, Ben was a guest worker at the Center for Radiation Research at the National Bureau of Standards.

Ben first came to SLAC in 1971 on sabbatical leave from the American University. With his previous experience in low energy nuclear scattering experiments and with his interest in fundamental measurements of the simplest nuclear systems, he quickly recognized the potential at SLAC for measuring high energy scattering of electrons from light nuclei. Overcoming some initial scepticism, Ben assembled a team of physicists to perform a series of three scattering experiments of electrons off deuterium and helium. These measurements were very successful in furthering our understanding of the nuclear form factors in the region of momentum transfer where the traditional picture of nuclei made of nucleons begins to merge with the picture of nucleons made of quarks. The American University Group at SLAC continues to pursue the research Ben started. Much of the interest in and motivation for a new high-duty, several GeV accelerator to explore the transition from nuclear to quark physics comes from the stimulation given by the experiments Ben initiated and from the discussions he promoted about the role of the quark degrees of freedom in nuclei. His energetic contributions to this field will be missed.

Ben not only worked at improving our understanding of the physical world but also strongly believed that scientists had a humanistic obligation to fulfill. Almost every year for a decade, he organized and taught courses on social issues as they related to technology, nuclear power and the arms race. The peril for our times posed by the threat of nuclear war was a frequent theme of his discussions. His course, "Arms Control, Politics, and Science," became one of the most popular courses offered by the American University Physics Department.

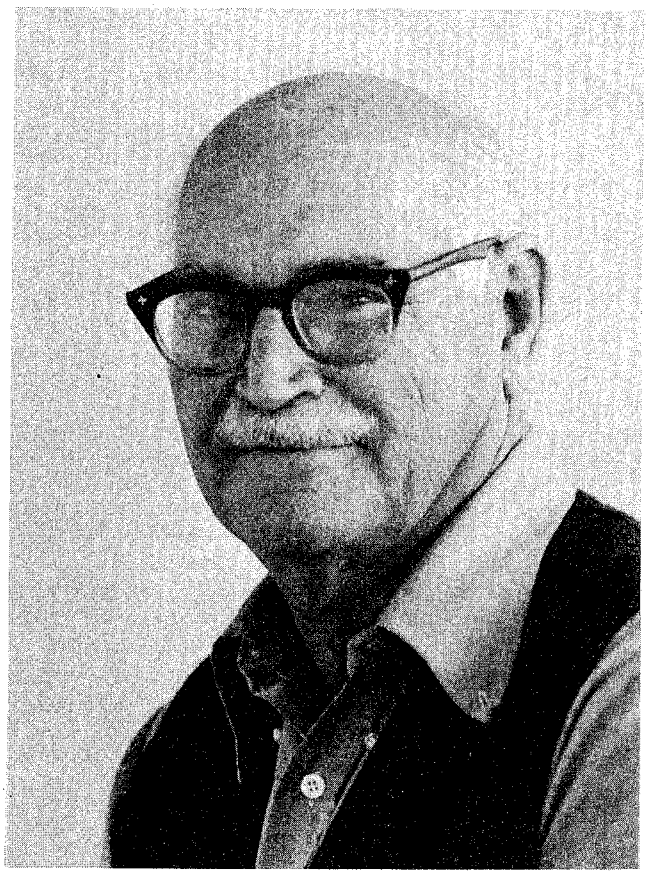
-Ray Arnold & Fred Martin

MEMORIAL GATHERING

A memorial gathering of the friends of Ben Chertok was held on Monday, November 23, in the Orange Room at SLAC. The group was mixed--experimentalists, theorists, engineers, and general staff--but all had been touched by a fine and gentle man.

Several people talked about their experiences with Ben. Some of the stories were about his profession and the enthusiasm with which he pursued his experiments and their interpretation. Mostly, though, the talk was about people. Ben worried very much about the welfare of his younger colleagues. He exercised constant courtesy toward everyone he dealt with. He was genuinely interested in the people with whom he worked.

Ben Chertok is well remembered by the many friends he made at SLAC.



NORM CROUCH RETIRES

Another of our old timers has left SLAC to pursue other interests. Norm Crouch spent fifteen and a half years tending the measuring machines for the Data Analysis Group - an unglamorous but vital job. In April 1981, he retired to devote full time to his hobbies.

Norm grew up in Berkeley. He attended the University of California for one year and then dropped out to go to work. He entered the Air Force in 1942 and served 3½ years. After the war he worked as a toolmaker and model builder in Los Angeles and in the Bay Area. He joined SLAC in April 1965. During these busy years, he and his wife, Juanice, raised a family of three boys, Stanley, John and Paul.

Norm won't be idle in retirement, he has wide ranging interests. An avid reader, he haunts garage sales to pick up paperbacks at 5¢ or 10¢ a copy. He sang in a barbershop quartet (The Baynotes) for nine years. He was a member of the SLAC Amateur Radio Club and was a co-founder of the Mid-Peninsula Oldtime Auto Club which is still flourishing.

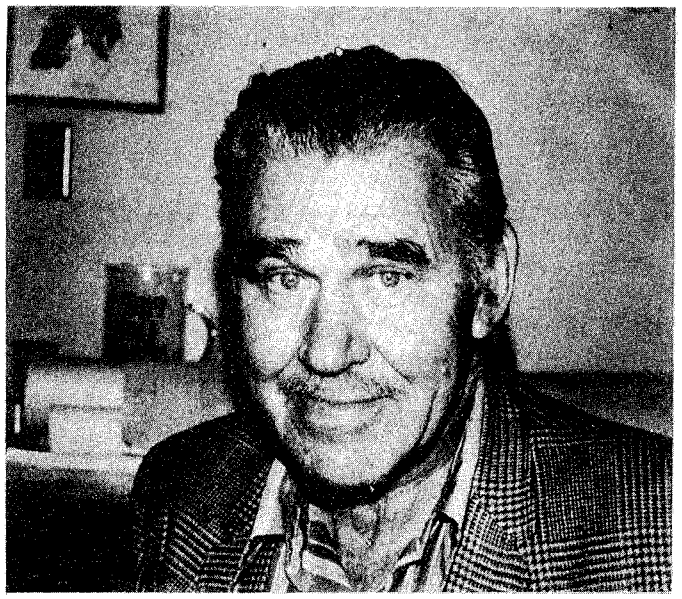
Since his retirement, Norm has been prospecting for gold, prowling around ghost towns and tending his half acre in Paradise. He's enjoying his well-earned leisure--we wish him well.

DIRECTOR'S SEARCH COMMITTEE

In accordance with Stanford policy two SLAC Associate Directors, Joseph Ballam--Research Division and Richard Neal--Technical Division, will step down from their administrative positions next summer.

For the past several months a search has been underway for their replacements. Burt Richter is the Chairman of both Search Committees. Sidney Drell, SLAC Deputy Director, is a member of both committees as is Stanford Vice-Provost and Dean, Gerald Lieberman.

The positions have been advertised in *Physics Today* and the *CERN Courier*. In addition, the Committees have sought the advice of colleagues and of Department Chairmen and Laboratory Directors through personal interviews and correspondence. The Committee's recommendations will be submitted to Stanford President Donald Kennedy for further action.



FRED JOHNSON

Fred Johnson passed away on Sunday, Nov. 1. A native of Sweden, he graduated in Mechanical Engineering from the Technical College in Stockholm. Fred came to SLAC in September of 1963, after many years of experience with several of this country's leading automobile companies.

At SLAC, Fred contributed to the design of the BSY support structures, 8-GeV Cerenkov pressure vessel, spark chamber camera, positron source solenoids and target and the SPEAR vacuum system. He retired in 1972 and immediately returned as a job shopper to work at SSRL. Fred retired again in March of 1977.

-Al Lisin

MARIJUANA RESMOKED

Should marijuana be legalized? Can workers use it safely? An article in the October 16th issue of the Journal of the American Medical Association may help clarify these questions.

What is marijuana? By now most of us have seen the reed-like cannabis plant which may have any odd number of serrated prongs on its leaves. The plant contains over 400 identified chemicals of which 60 are "cannabinoids," the most important being delta-9-tetra-hydro-cannabis (THC). This chemical produces some 30 metabolites, which are new chemicals formed during the body's detoxification of the THC. The drug is stored in the body fat. The marijuana smoked today in the USA is "higher quality" having up to five times the THC content of that available just five years ago. This fact, perhaps as much as any other, necessitates reassessment of the substance, particularly when used as a recreational drug.

Medical Benefits

THC when smoked or taken orally will relieve some of the nausea and vomiting secondary to cancer chemotherapy. In some people at least, it is more effective than other antiemetics available. Younger people tend to benefit from the drug more than older patients, who often complain about its side effects such as hallucinations, rapid heart rate, drowsiness and anxiety. Marijuana also seems to reduce intraocular pressure in patients with glaucoma, but considerably more research needs to be done, including the question of whether the active ingredient is THC or some other chemical.

Recreational Benefits

The review did not address this issue, except to note the large number of users, particularly among young people. Marijuana is said to be the largest cash crop in California. It is well known that the novice smoker may experience alarming cardivascular and psychic effects. Blood pressure drop may cause fainting, hallucinations may occur. In chronic smokers these reactions are modulated to pleasing sensations.

Hazards of Acute Intoxication in Recreational Use

The typical "high" is accompanied by measurable psychomotor impairment, including prolonged reaction time to stimuli, decreased motor coordination and impaired visual perception. These effects increase the risk of accident when driving vehicles, piloting airplanes and operating machinery. In addition there seems to be a marked amplification of the effects when combined with alcohol, greater than that of either substance alone.

Long Term Hazards

We are now coming to realize that cigarette for cigarette, marijuana is more destructive to pulmonary tissue than is tobacco. There is evidence that smoking only one "joint" per day reduces vital capacity of the lungs as much as does smoke from 16 tobacco cigarettes. This finding overshadows the temporary relief from bronchospasm that asthma sufferers may experience from an occasional marijuana cigarette. Whether such smoking is "carcinogenic" is not yet clear. Patients with coronary artery disease and cardiac angina usually note reduced exercise tolerance with marijuana. Perhaps this effect is secondary to the increased heart rate and the blood pressure drop caused by THC.

Mental effects of marijuana smoking are said to be memory defects and reduced knowledge acquisition, at least on a short term basis. Young people seem to be especially susceptible. Also, marijuana often has been associated with acute emotional disturbance, panic reactions and "flashbacks." People who have a history of psychiatric problems, particularly the young, are at especially high risk for this type of reaction.

Conclusion

Marijuana seems to be a dangerous combination of chemicals but with certain perceived and objectively measured benefits. Support for governmental control or decontrol would seem to relate to such issues as one's philosophy of individual freedom versus the welfare of the community. As with alcohol, there certainly should be no excuse for its use in the workplace.

-C.B. Beal, M.D.

CAR POOLERS NEEDED

A car pool running from FREMONT-SLAC, 7:00 am to 3:20 pm is looking for two or more riders. If you are interested, please call Jim Wahl, SLAC Bin #68 or ext. 2001.

PEOPLE PICTURES

This issue of the Beam Line is no exception in the number of articles about people, with each of those articles requiring a picture. Many of the photos can be found in the recent SLAC picture book. Some require going back to an earlier edition. Some come from dusty polaroids. And some come from group pictures and a bit of finesse in the darkroom. Our thanks in all this go to Walter Zawojski, long time photographer in Graphic Arts at SLAC.