SLAC NEWS

OCT 21 1970

VOLUME 1, NO. 6 STANFORD LINEAR ACCELERATOR CENTER OCTOBER 16, 1970

SPEAR APPROVED AND CONSTRUCTION STARTED

STORAGE RING TO BECOME REALITY!

"You learn a lot more by colliding two baby elephants than you do by having a moving elephant run over a stationary flea."

"In order to have the same interaction energy, you'd have to extend SLAC all the way to Hawaii."

"Hopefully, the first beam will be stored by April Fool's Day, 1972."

These quotes by SLAC physicists all refer to SLAC's newest innovation which has recently been approved in SLAC's budget and which has moved from the planning to the construction stage. The new facility is SPEAR — Stanford Positron-Electron Asymmetric Ring, which will be placed in the research yard on the north side of End Station A.

What is SPEAR? Physically, it is an oval-shaped ring, 198 to 244 feet in diameter and roughly 2 inches by 10 inches in beam pipe cross section. The ring threads through 34 bending magnets, 51 gradrupoles, 33 sextupole magnets and a pair of octuple magnets and one radiofrequency (rf) cavity.

Electrons and positrons from the two-mile accelerator will be injected into the storage ring so that electrons will be travelling clockwise, while positrons (the antiparticle of the electron) will rotate counterclockwise. The magnets steer and focus the beams as they travel. The rf cavity will permit the counter-rotating particles to have energies of 2.5 billion electron volts (2.5 GeV) each, with the capability of going up to 4.5 GeV after adding more cavities. The beams will collide "head-on" in one of two interaction regions about 20 centimeters long, 0.6 centimeters wide, and 0.02 centimeters high.

A natural question at this point is: "Why have collisions occur this way? If you have two 2.5 GeV particles colliding, you only have 5 GeV of available energy, while the SLAC electron beam can produce up to 21 GeV electrons and 14 GeV positrons. Why not, say, collide 14 GeV positrons with stationary electrons in their atomic orbits?"

The answer is that if one particle is sitting still while another particle hits it,

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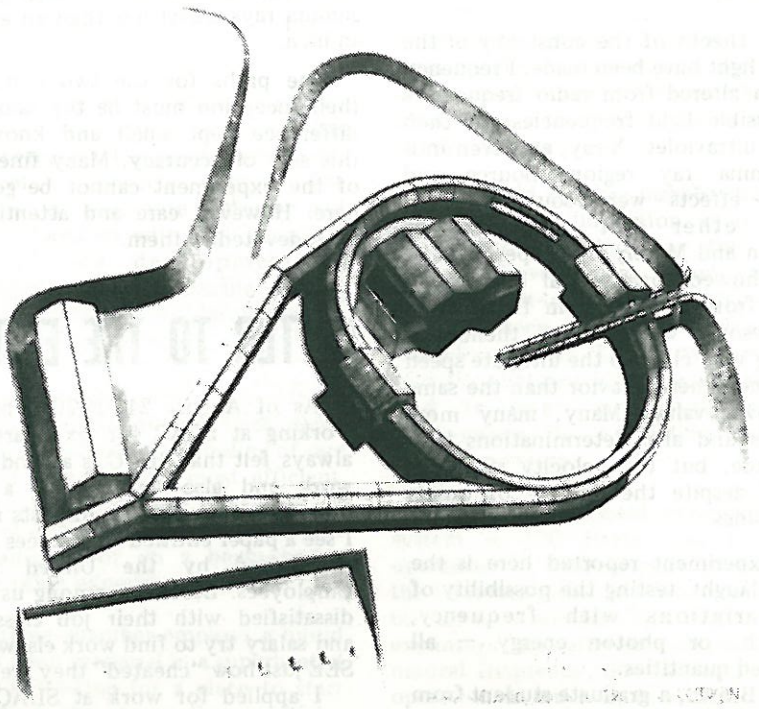

The north side of End Station A appears at lower left of illustration.

See Page 4 for earlier versions of the proposed storage ring facility.

JIM KALLGREN

New Personnel Director Takes Over

James A. (Jim) Kallgren, former Director of Personnel, Flight Systems Division of Sperry Rand Corporation in Phoenix, Arizona, accepted the position of SLAC Personnel Director in mid-July. He replaced Bob Nelson who became Stanford's Personnel Director at the beginning of the year.

Jim, a native Californian who received his Bachelor's Degree in Social Work from San Francisco State, became familiar with SLAC during the ten years he spent at Varian Associates before going to Sperry. At Varian, he was initially Manager of Employment and then became Personnel Manager of their Palo Alto Facility. He had worked in Production Control at Ampex prior to going to Varian.

A veteran of three years in the Marine Corps, Jim is married and has six children. His wife and family joined him out here in mid-August and they are now making their home in Menlo Park. Jim states that he was glad to return to the cool of the peninsula after four hot summers in Arizona and to be back among his friends and relatives here.

SUMMER EMPLOYMENT PROGRAM

By Larry Esquibel

Last spring I promised to inform you about the results of SLAC's Summer Employment Program. The summer ended September 22nd and the Employment Program (SEP) terminated September 11th, so now is as good a time as any to relate our experiences.

A total of 117 youths were engaged in the SEP '70, with 91 in the Youth Opportunity Program and 26 as NON-YOP's. Thirty-two (32) departments at SLAC were participants in providing these 117 youths with the type of opportunity that, not only is supposed to, but does keep young people out of trouble and more importantly, keeps them productive. The Technical Division provided the most slots, however, the Plant Office of the Business Services Division led the Center in having the most participants. This fact we greatfully acknowledge and we hope that they will continue to be the pacesetters for the many SEP's to come. Of course there were a few who missed the tune and sang out of it, but the majority kept the effort going, and more good than damage was done.

Herewith some comments from the participants themselves, and from some of their supervisors:

"It was extremely exciting working (at SLAC). I have enjoyed working for SLAC as a summer assistant employee. I wish to work here again next summer. It was wonderful!"

"Many outstanding opportunities are available for the questioning mind to explore new fields of applied science. People are friendly and helpful when questioned about their fields. SLAC is a mecca."

"In all the summers I have worked at SLAC, this one has been the most enjoyable. I have learned a lot. The work has been stimulating and the people with whom I work have provided a wonderful atmosphere for an inquisitive student."

"I did my share of work, but it came in spurts... I'd do something for a couple of days and then I wouldn't have anything to do but walk around the shop, and this makes it seem as if you work 12 hours instead of eight... you get so bored... so if you hire me next year for work, that's what I want to do. work... I can walk in the park."

Quotes from supervisors:

".....type of individual who can fit into any situation — excellent attitude and ability to get along with his fellow workers. Outstanding attendance record. I would like very much to have him again."

".....he proved to be intelligent, willing, and I would be pleased to have him work for the group again."

"Excellent sense of responsibility and interest in his work."

A very positive aspect of the SEP was the Summer Science Research Project coordinated by Bob Clemons with the cooperation of Dr. Sid Drell. Eighteen young students were able to spend a summer at SLAC, both giving and receiving impressions of their experiences with science. Under the able direction of Bob Clemons, a lot of classroom theory became fact for these students. Bob put it this way, ".....much thanks to all who helped the young men participating in the Summer Science Research Project. The participant's exposure to physics and/or

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Slac Experimental Results Of Much Interest At KIEV

The discovery that neutrons as well as protons may contain a point-like internal substructure constituted one of the most interesting reports of new experimental data submitted to the XV International Conference on High Energy Physics, notes SLAC Director Dr. W.K.H. Panofsky in an article to be published in the journal Comments on Nuclear and Particle Physics.

The conference was held in Kiev, USSR, between August 26 and September 4. Dr. Panofsky, a participant at the Conference, is referring to an experiment reported at Kiev by Dr. R.E. Taylor of SLAC and recently completed by a SLAC-MIT collaboration which has been studying inelastic electron scattering since 1967. Earlier data from the collaboration, reported at the XIV International Conference on High Energy Physics, Vienna, in 1968 provided the initial evidence that the proton might have point-like constituents, which have been given the name "partons."

The most recent experiment of the group involved the scattering of electrons from atoms of "heavy hydrogen" or deuterium. Since a deuterium nucleus consists of a proton and a neutron loosely bound together, scattering from deuterim, yields information about scattering from neutrons. The scattering experiment involved a wide range of energy and momentum transfer from the incoming electron to the target neutrons and protons, and while the analysis of the data is not complete, some striking facts have emerged nonetheless.

It was found over a wide range of energy and momentum transfer that

Continued on Page 4

Constancy Of Speed Of Light Under Study

by Charles Oxley

The Maxwell theory of electromagnetism includes the constant c as the veolicity of all electromagnetic waves, including light. This constant is also determinable from the observed static interactions of electric charges at rest compared with the magnetic interaction of electric currents. A cornerstone or postulate of Einstein's Theory of Special Relativity is that the speed of light is the ultimate speed. The theory also says that the speed is independent of the speed of the source, and observer.

Many checks of the constancy of the speed of light have been made. Frequency has been altered from radio frequencies on to visible light frequencies and then through ultraviolet, X-ray, and even into the gamma ray region. Source and observer effects were sought in the famous ether drift experiment of Michelson and Morely. An experiment at CERN showed that several billion volt gammas from the decay in flight of pi zero mesons which were themselves travelling very close to the ultimate speed showed no other behavior than the same old known value. Many, many more variations and also determinations have been made, but the velocity is always constant despite the barrage of onsets from all sides.

The experiment reported here is the latest onslaught, testing the possibility of some variations with frequency, wavelength, or photon energy — all interrelated quantities.

Bruce Brown, a graduate student from the San Diego campus of the University of California, together with Professor George Masek, also of San Diego, is conducting an experiment to compare the velocity of visible light with that of 10 billion electron volt gamma rays. The first half of the accelerator is used to accelerate electrons in well-spaced short bursts; the remaining length of the accelerator is used as a flight path to measure any difference in time of flight between the two. Electrons strike a thin copper target about halfway down the accelerator. This interaction converts the electron energy to gamma ray energy; the effective "target" which produces the visible light is a magnetic field at the same point, which bends the electrons gently and thus produces low-energy radiation in the visible region of the electromagnetic spectrum. A characteristic of both of these sources is their strong preference for emission along the well-defined direction of the electron beam. After travelling the remaining 5,000 feet through the evacuated accelerator tube, gamma and light rays emerge into the beam switchyard where the experimenters are ready to distinguish the hares from the tortoises. Actually, the expected result is a dead heat between the radiations of two-volt and 10-billion volt energy. The more precisely this result can be pinned down with surety, the more significant will be the importance of the result. The most precise determinations of speed of light constancy are near the optical energies; previous experiments with gammas have been much less accurate.

In the beam switchyard, the beam is cleaned of any charged particles by the usual separating magnets and the detector arrays are placed in the forward beam line.

The low energy light is separated and bent out by a quartz prism; the gamas are converted by a metal target to electron-positron pairs; a magnet selects the highest energy positrons and then they are in turn converted to visible light by the Cerenkov effect in a gas. Both Cerenkov light and visible light from the synchrotron light are converted to electrical signals by photomultipliers of special design. The difference in time of arrival can then be measured by timing circuits.

By comparing the time of travel with the brevity of the electron burst which generates the radiation, we may get an idea of the hoped-for precision. The time of the burst is a few trillionths of a second, the time of travel is a few millionths. Thus a precision of a few parts per million can be hoped for. In the few trillionths of a second corresponding to the width of the beam burst, light or gamma rays travel less than an eighth of an inch.

The paths for the two signals since their inception must be the same or the difference kept small and known with this sort of accuracy. Many finer details of the experiment cannot be gone into here. However, care and attention have been devoted to them.

LETTER TO THE EDITOR

As of August 24, 1970, I have been working at SLAC for six years. I have always felt that SLAC is a good place to work and also enjoy being a part of Stanford University. It disgusts me when I see a paper entitled Employees Organize published by the United Stanford Employees. Let those among us who are dissatisfied with their job classification and salary try to find work elsewhere and SEE just how "cheated" they are here.

I applied for work at SLAC when I was 43 years old having been, by choice, a housewife and mother for nineteen years. At that time a daughter was in college and a daughter and a son were soon to graduate from High School so I felt a little "beefing up" of the family exchequer was a good idea. I really wondered whether anyone would hire me due to my age and having been out of circulation for so long. I was hired, treated fairly, and, believe it or not, I am being paid what I feel I am worth at the present time.

There must be many more people who feel as I do. Let's hear from them.

Dee Dee Mayes
SLAC Stores

WANT ADS

FOR SALE: 1964 Valiant 4-door, radio and heater, in fairly good shape for 87,000 miles. $400. Call R. Moulton, ext. 2202.

FOR SALE: 1967 Volkswagon sun roof. Excellent condition. Call Charles Oxley, ext. 2515 or 328-8793.

FOR SALE: 1969 World Book Encyclopedia, $150. 1969 World Book Dictionary, $30. 1969 World Book Atlas, $20. 1969 Cycle Teacher, $40. These are asking prices. Make offer. Call PIO Ext. 2204.

FOR RENT: Small, secluded cabin, ideal for recreation or retreat, Del Monte Forest, Carmel. Available $40/weekend. Call Mike Menke, ext. 2775 or 941-2093.

NOTICE: RACIAL, RELIGIOUS OR ETHNIC DISCRIMINATION in the Sale OR Rental of Housing is absolutely ILLEGAL. If you are experiencing discrimination in housing, call for free assistance. MIDPENINSULA CITIZENS FOR FAIR HOUSING, 327-1718.

SLAC Dictionary

Part VI

NEUTRINO: A stable neutral particle which is probably massless. Its existence was postulated in 1931 to explain the decay of free neutrons, but because of its extremely low probability of interaction with matter, it wasn't observed directly until 1953. It is a product also of pion, muon, and Kaon decay. It is grouped into the family of "leptons" along with electrons and muons.

NEUTRON: An uncharged particle with a mass nearly equal to that of the proton. The isolated neutron is unstable and decays with a mean life of about 16 minutes into an electron, proton, and neutrino. Neutrons and protons bound together determine an atom's nucleus.

NUCLEAR REACTION: A reaction involving an atom's nucleus, such as fission, neutron capture, radioactive decay, or fusion, as distinct from a chemical reaction, which is limited to changes in the electron structure surrounding the nucleus.

NUCLEON: A constituent of the atomic nucleus; that is, a proton or a neutron.

NUCLEUS: The small, positively charged core of an atom. It is only about 1/10,000 the diameter of the atom but contains nearly all the mass. Except for ordinary hydrogen, all nuclei contain both protons and neutrons.

PAIR PRODUCTION: The transformation of a high-energy gamma ray into a pair of particles (an electron and a positron) during its passage through matter.

PHOTON: A discrete quantity of electromagnetic energy. Photons have momentum but no mass or electrical charge. Low energy photons make up visible light, while high energy photons are called gamma or X-rays.

PI-MESON: A subnuclear particle, also contracted as pion. The mass of a charged pion is about 273 times that of an electron. An electrically neutral pion has a mass 264 times that of an electron. Charged pions have a mean life of 26 billionths of a second, while the neutral pions' life is over a billion times shorter.

POSITRON: A particle with the mass of an electron but charged positively. It is the "anti-electron," and is emitted in some radioactive disintegrations. It is also produced in pair production.

PROTON: A particle with a single positive electrical charge and a mass approximately 1840 times that of the electron. The atomic number of an atom is equal to the number of protons in its nucleus.

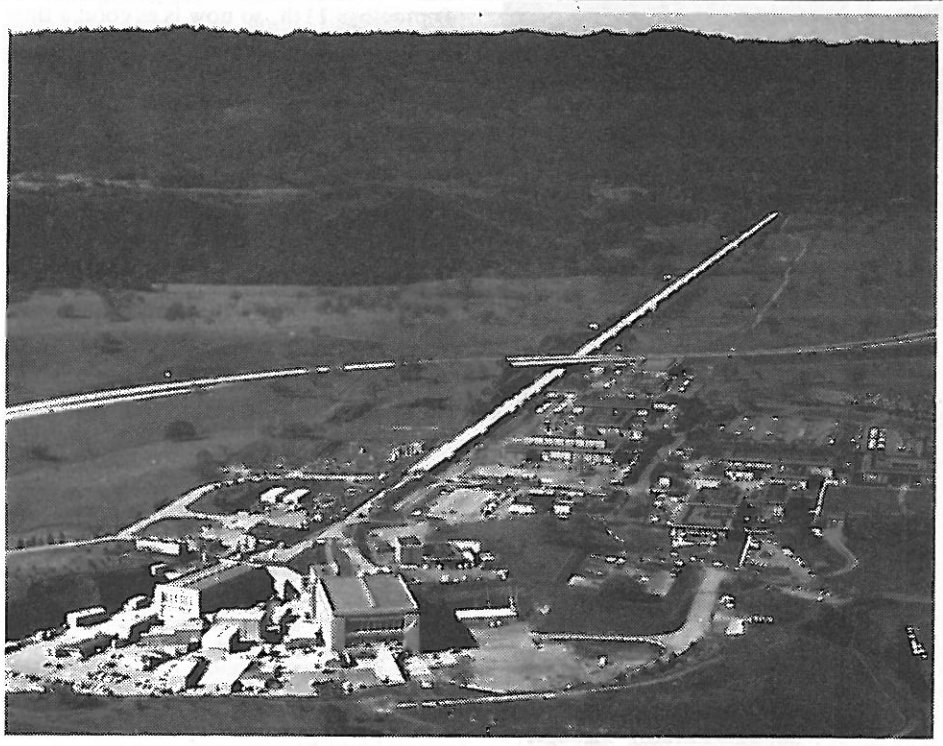
QUANTUM: The minimum discrete quantity of those physical parameters, like angular momentum, which are observed to be non-continuous in nature.

RADIATION: The propagation of energy through matter or space in the form of waves. In atomic physics the term has been extended to include fast-moving particles (alpha and beta rays, free neutrons, etc.). Gamma rays and X-rays, of particular interest in atomic physics, are electromagnetic radiation in which energy is propagated in packets called photons.

RADIOACTIVITY: The spontaneous decay or disintegration of an unstable atomic nucleus, accompanied by the emission of radiation.

SCATTERING: A process that changes a particle's trajectory. Scattering is caused by collisions with atoms, nuclei, and other particles or interactions with electromagnetic fields of force. If no new particles are produced by the collision and the target is not left in an excited energy state, the scattering is termed elastic. Otherwise the scattering is termed inelastic.

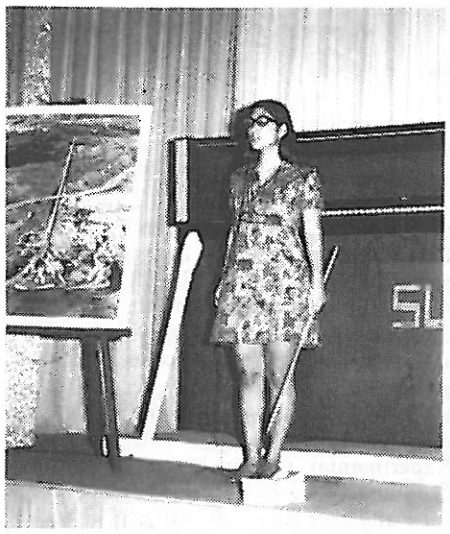
SCINTILLATION COUNTER: An instrument that detects and measures ionizing radiation by counting the light flashes (scintillations) induced by the radiation in certain materials.



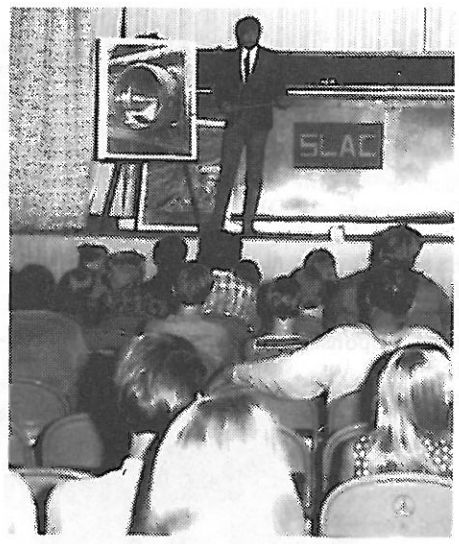
COLORED AERIAL PRINTS SOON AVAILABLE

A 19 x 23-inch colored aerial print of the project with a view similar to that shown is being prepared by a lithographic company and should be available for purchase by SLAC employees and other interested persons near the end of October. Mimi Lewis of the Budget Office and located in Room 210 of the A. & E. Building will handle the sale of the prints which will cost a dollar apiece.

As soon as the prints arrive, the Public Information Office will post copies on the various project bulletin boards to indicate that they are available and to let people see what they are like. PIO reports that the prints are being done by the same lithographic company that prepared the aerial view of LRL at Berkeley that has been sold by that laboratory's employees' club for a number of years.



STUDENT PRISCILLA STEPHENSON DISCUSSES SLAC'S 10-FOOT ACCELERATOR DISPLAY.



STUDENT TED WILLHITE EXPLAINS CONSTRUCTION OF SLAC's 40-INCH BUBBLE CHAMBER TO AUDIENCE.

SLAC Turns On At Fair

During the August 14-23 run of the Santa Clara County Fair in San Jose, SLAC turned an estimated two thousand people on to the purposes and techniques of high energy physics.

SLAC was involved with the Industrial Participation Program at the Fair and twenty-six, 15-minute stage presentations were put on by two Santa Clara valley high school graduates during its ten-day run. The presentation featured the ten-foot accelerator display and discussion of bubble chamber physics.

A great deal of preparation went into the presentation. The high school nominated students, Ted Willhite of Campbell and Priscilla Stephenson of Sunnyvale were selected by SLAC's Public Information Office last April and given an intensive orientation on the Center. When it was decided that Priscilla would be talking about the operation of the accelerator and Ted would discuss bubble chambers, appointments were set up with experts in these areas. Ron Koontz of Accelerator Physics and Vernon Price of Accelerator Operations briefed the students and Gordon Bowden of Bubble Chamber Operations turned Ted into somewhat of an expert on SLAC's 40-inch chamber.

Meanwhile, Willie Johnson of Accelerator Electronics had designed an all solid-state electronic system for the ten-foot section to replace the somewhat cumbersome electro-mechanical system previously employed, and he and Hiro Takeda, an electronics technician summer worker, were busy putting the unit together.

The large pictures used to illustrate the bubble chamber portion of the presentation were produced with the help of Ada Schwartz, SLAC's publication Coordinator and Norm Chin, Technical Illustrating.

Getting the bulky 1000 pound model to and from the Fair was accomplished with the help of John Nolan and Ernest Stevens, riggers, and Reyes Valenzuela, Plant Office.

The success of the program was mainly due, however, to the students' ability to synthesize the vast quantity of information they were given into a lucid and fast-moving discussion.

There was a significant piece of "spinoff" from the program. Ted Willhite, now beginning college at U.C. Berkeley, has tentatively changed his major from chemistry to physics as a direct result of his involvement here at SLAC.

SLAC B Team Takes Championship

By Raphael Palacio

The old adage, "hitting is the name of the game," once again stood the test of time, as the SLAC BEE's outslugged Shell Oil 7-5 to win the double elimination post-season tournament and capture the Adult Softball League Championship. (The "B" team had won the first half of their league play and then moved up to the "A" league for the second half, returning to take the B Division championship in the playoffs.)

SLOW-PITCH SOFTBALL CHAMPIONSHIP TROPHY

Throughout the season the SLAC squad battered opposition pitchers, scoring in double figures in all but five of their contests. The highlight of the tourney was an 18-9 massacre of Shell, which set the stage for the title game.

Winning ballgames by scores such as these: 18-6, 17-3, 23-14, 22-9, 18-12, the SLAC'ers depended on raw muscle at the plate to bring home their victories. Closing statistics revealed seven team members hitting .500 or above, plus an amazing team batting average of .525.

Among the starters, the leading hitter was Stanford grad student Lee Schiff with a .587 percentage. Trailing closely were Dick Early, Experimental Group A, and Bob Rodgers and Court Collins, SLAC Facility of the Stanford Computation Center, averaging .526, .525, and .500, respectively.

The team's overall season's record was 13-6, but it should be noted that the SLAC BEE team, after ripping apart the "B" league with an almost perfect 8-1 record in the first half of the season, was moved up to the "A" league for the rest of the year. Though continuing to hit well, the BEE's ran into rough going in the higher league, and retreated back to the "B" division and won the title.

Rapid Cycling Bubble Chamber

A new rapid cycling bubble chamber is under construction at SLAC. It will be 15 inches in diameter and operate at 60 expansions per second. This will allow it to turn out more data and use a larger share of the beam time than the existing 40-inch and 82-inch, two expansions-per-second hydrogen bubble chambers. Rather than hydraulic expansion actuation, the new chamber employs an electromagnetic drive similar to those employed in loudspeakers, but on a much larger power scale. The mechanism is more like an electrically driven shaker used in testing airplane wings.

From its inception about eighteen years ago, the bubble chamber has become perhaps the most universally useful tool of particle physics. The development of large pure hydrogen and deuterium chambers with high magnetic fields and the development of semi-automatic track measuring devices have all contributed to the increasing usefulness of the chambers.

The fact that one sees interactions in all their glory in a simple and fairly dense nuclear medium makes the finding of rare events and new particles most efficient. Moreover, the bubble chamber is economical of beam particles and may be run parasitically or on a beam-sharing basis with other experiments.

The bubble chamber employs a liquid which has been prepared in a superheated state and is looking for a place to start boiling. If, at the proper time, particles with electric charge pass through the liquid losing energy as they go, this energy appears as local heat or other available energy along the path. Then vapor bubbles will begin to grow at these places in preference to others. The design of bubble forming sites, considerations of optical viewing, and much mechanical design to compress the liquid and then suddenly release the pressure prior to beam passage are required for effectiveness of the chamber.

The bubble chamber however has some operating disadvantages in the efficiency of employment of people and resources. The maintenance of flammable cryogenic gases in liquid form for long periods of time makes operation expensive. The huge amount of precision stereoscopic film used makes Kodak rich and many frames are not interesting at all from a particles physics viewpoint. The pictures all, however, require scanning for selection. The analysis of the film takes highly trained scanners who are often in short supply.

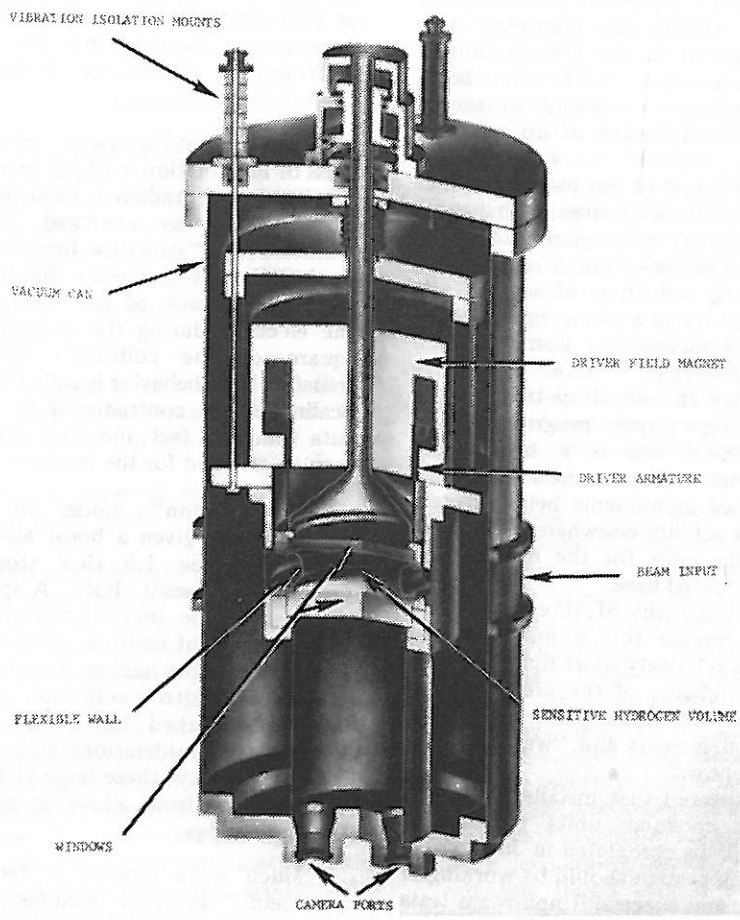
Two ways of improving the situation are being pursued. One is selection by auxiliary detectors and electronics of interesting events and only photographing those. This greatly reduces film and scanning expenditure. It may also provide useful supplementary information. The second way is to speed up the cycling rate of the chamber.

The rapid cycling bubble chamber is shown in the illustration as it is now being constructed by the Bubble Chamber Development Group. The liquid fills a fifteen-inch diameter, five and one half inch deep cyclinder, which is viewed from the bottom. Liquid hydrogen is fed into the chamber when it is initially filled and is kept at liquid operating temperature by a cooling bath and positive pressure.

The natural resonant frequency of the system is 120 Hertz, but for better operation in recondensing old bubbles, the chamber piston shaker is driven only 60 times a second. This results in less expansion on alternate cycles of the natural frequency, due to damping. The operation is much more critical than the conventional chamber with its larger, over-compression leeway.

Before designing the present chamber, test chambers of two and four inches were made and operating conditions evaluated.

The construction is now nearly half completed. In actual operation, the chamber will be surrounded by auxiliary particle counters which will yield additional information about particles that leave the active chamber volume. The chamber is scheduled for operational testing in June of next year. Compared to the 40-and 82-inch chambers, there is a loss in sensitive volume, but the counters will compensate for this to a large degree.



CUTAWAY VIEW OF RAPID CYCLING CHAMBER.

Earlier Storage Ring Design Proposals

Continued from Page 1

the interaction energy is not the energy of the incoming particle. It is quite a bit less, because some energy is associated with the motion of the system's center of mass. But, if two particles collide head-on, no such energy is wasted, since the system's mass center sits still at the collision point.

To illustrate: a 14 GeV SLAC positron striking a stationary electron produces an interaction energy of only 0.120 GeV! Thus a 2.5 GeV storage ring produces over 40 times as much in the way of available energy.

Another consideration is related to this article's first quotation. A manifestation of Einstein's Theory of Relativity is that a 14 GeV positron has 27,000 times the mass of a positron at rest, so the collission of one with a stationary electron (same rest mass as a positron since they're antiparticles) is equivalent to a Volkswagen being hit by something weighing 50 million pounds with a speed close to that of light. You wouldn't learn much about the VW.

What will be learned using this new facility? Summarizing the unique research value of the ring in colliding beam experiments, physicists say it will:

1. Permit observation of processes initiated by electrons in an energy region not available with any existing accelerator;

2. Open up a range of particle interactions with particularly simple and well-determined sets of final products, especially particle and anti-particle pairs, under conditions not attainable with ordinary accelerators; and

3. Extend the present accelerator research into regions now inaccessible and thereby make possible some crucial tests of fundamental particle theory.

The use of storage rings to permit colliding-beam experiments was pioneered by Princeton and Stanford physicists at Stanford's High Energy Physics Laboratory during the early 1960's. This work proved the feasibility of electron-electron colliding beam experiments, and has stimulated the construction of new storage rings by scientists in the USSR, France, Italy, Germany and at the 12-nation CERN laboratory in Switzerland.

Since the original Princeton-Stanford research ended in 1965, only the Harvard-MIT Cambridge Electron Accelerator (CEA) has continued this type of research in the U.S. A circular electron accelerator, CEA - is being specially equipped to permit storage of electron-positron beams of up to three billion volts.

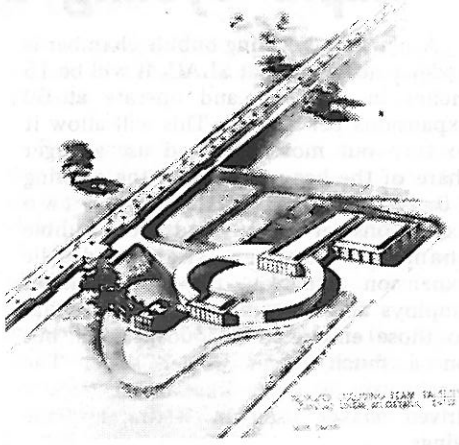
"The net result of not having facilities like the (CERN storage rings) is that more U.S. scientists try to program research at these unique facilities which results in an accompanying reduction of such efforts in the U.S.," states a recent report of the U.S. Joint Congressional Committee on Atomic Energy. "The committee considers this an unhealthy trend in the U.S. high energy physics program."

The SPEAR site is a bee-hive of activity, with utility tunnels being dug and reference monuments being erected. But there is activity elsewhere at SLAC as well: All the coils for the magnets are being constructed here.

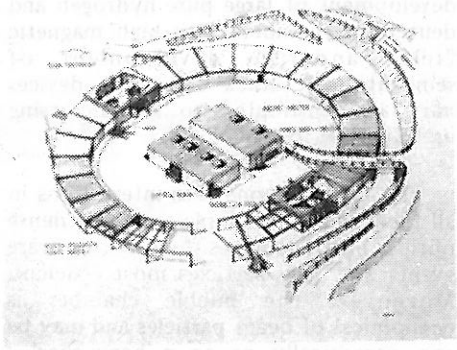
In explaining why SLAC expects to be able to complete this 5 million dollar project in a relatively short time, Dr. Burt Richter, in charge of the project, notes that SLAC has been planning storage rings for nine years and "we should be experts by now."

It is expected that installation of the thirty-foot modular units making up SPEAR will be completed in June 1971. The vacuum system should be working in September and successful non-beam tests whould be finished late in 1971.

Beam is expected on April Fool's Day of 1972 and physics research should



INITIAL 1964 PROPOSAL FOR STORAGE RING AT TWO-THIRDS POINT. Illustration by Walter Zawojski, Tech Info.



DUAL-RING 1969 SPEAR DESIGN PROPOSAL. Illustration by Bob Gould, Plant Engineering.

(appropriately?) begin on Halloween.

The reasoning which had led to SPEAR received powerful, if unexpected, justification by the excitement generated recently at the Frascatti storage ring facility in Italy and reported elsewhere in this issue. SPEAR should have 300 times the Frascatti interaction rate and thus can provide answers to some of the most pressing questions in the physics of fundamental particles.

KIEV Conference

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scattering from neutrons is less (often considerably less) than scattering from protons. This fact, together with some other data from older experiments by the group, definitely limits the applicability of two theoretical models — the vector dominance model and the various "diffractive" models which have been formulated.

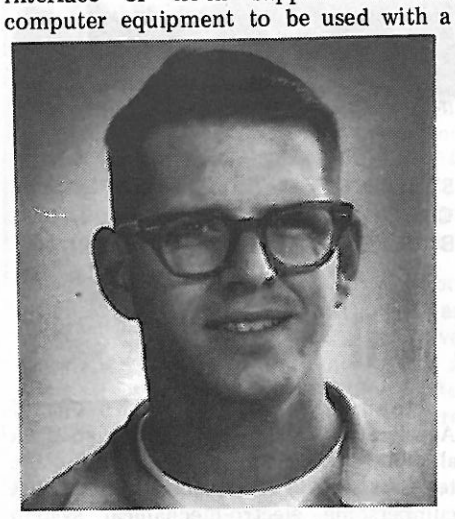
A theoretical "survivor" of this new mass of information is SLAC theorist J.D. Bjorken, who predicted, even before the older data was analyzed, that the mathematical "structure functions" used to describe the scattering should depend only on the ratio of the energy lost by the electron during the collision to the square of the collision's momentum transfer. This behavior is called "scaling." Scaling is not contradicted by the new data which, in fact, indicates that scaling may be satisfied for the neutron.

This "parton" model of nucleon structure was given a boost also by new data from the 1.5 GeV storage ring facility at Frascati, Italy. A spectacular discovery made there is the surprisingly large number of hadrons (particles which participate in the nuclear force) produced in electron-positron collisions. This result also has wreaked havoc upon various theoretical considerations and, according to Dr. Panofsky, these large yields add to the evidence from SLAC in support of the parton idea.

"Much work remains to be done in this field," states Dr. Panofsky, "before the tantalizing questions dealing with the reality of a point-like substructure of the hadron will have a clearer answer."

Specialist Joins U.S. Team in Russia

John Kieffer, an Electronics Specialist from the Electronics Instrumentation Section of the Experimental Facilities Department (EFD), left SLAC Thursday, October 1st, for the Institute of High Energy Physics at Serpukhov in Russia. John, who will be at the institute near Moscow for approximately 60 days, has the responsibility for providing the interface or tie-in support for the computer equipment to be used with a



JOHN KIEFFER

joint U.S.-U.S.S.R. experiment that will be performed at the 76-Bev Russian proton accelerator at the start of 1971.

The U.S. participation in the experiment was announced in the following news release from the U.S. Atomic Energy Commission on September 19: "Five U.S. nuclear scientists from the University of California at Los Angeles are enroute to Moscow to conduct research in the peaceful uses of atomic energy in laboratories in the Soviet Union, the Atomic Energy Commission announced today.

All assignments, which are for periods of six months, are part of an exchange program to study the peaceful applications of the atom. The five UCLA scientists are specialists in high energy physics. They are — Dr. Darrel Drickey, Team Leader; Dr. Edgar B. Dally, Dr. Arthur D. Liberman, Dr. Paul F. Shepard and Mr. John Carter Tompkins.

The physicists will work with Soviet scientists from the Joint Institute for Nuclear Research in Dubna on an experiment to be conducted at the Institute of High Energy Physics at Serpukhov. The Serpukhov Institute, situated near Moscow, has the world's highest energy accelerator (76 Bev). The experience gained at Serpukhov should prove useful to the experimental program on the 200 Bev accelerator, which is under construction at the National Accelerator Laboratory at Batavia, Illinois.

These exchanges are provided for under the Memorandum of Cooperation between the USAEC and the USSR State Committee on Atomic Energy, which is part of the overall US — USSR Exchanges Agreement. Reciprocal research opportunities will be provided USSR scientists in U.S. laboratories at a later date."

Darrell Drickey, a frequent visiting experimenter at SLAC, had been with Experimental Group D on the project until he left for UCLA in the fall of 1968. Ed Dally was also a Senior Staff Member with SLAC's EFD until his departure this fall, so John will be working with familiar people with regard to a part of his job. (Darrell and Ed took their families with them because of their six-month assignment. John went alone as he is expected to return in two months.)

The tie-in of a Hewlett-Packard 2116B computer to the Russian system for data acquisition is another matter and John understands that he will be working with a group of English-speaking Polish technicians. They will be responsible for the computer peripheral equipment and its connection to the Russian detection device while John will be responsible for the connection and compatibility of the equipment to the H—P computer.

Summer Employment

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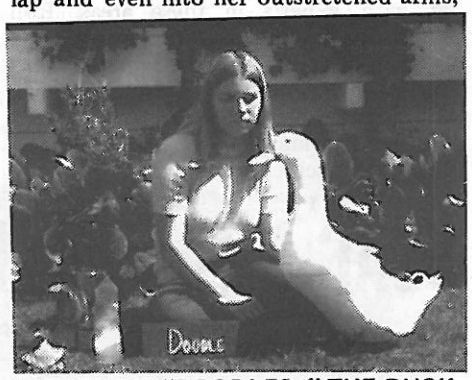
engineering in an actual on-the-job situation helped them to (a) move closer to forming specific academic and career goals, (b) see the correlation between the academic and the experimental in their field, and (c) perceive some of their strengths and weaknesses (primarily, but not exclusively, scientific), using these perceptions to their advantage. Needless to say the project can be improved in many ways. I think we have taken a rather healthy step forward in addressing ourselves to the lack of competent engineers and physicists from disadvantaged backgrounds.... and your help in writing up criticisms of the project will allow us to go even further toward negating this lack."

Bob's point is our point. We could not have done it without you. We hope that you have gauged and appreciated the work that our Summer Employment Program participants did for you, and that you will help us spread the word. A good time was had by all.

Pet Duck Steals Show

Joe Pulis, the head of Printing Services and Document Control, gave his daughter Irene a pretty little duckling this past Easter. Though Joe had been told the critter was pure bred and from good Pekin duck stock, Irene could have cared less, for she loved him and named him "Doodles."

Doodles soon learned to love Irene, too, and, apparently not realizing he was a duck, he began following her around like a puppy. As he grew up, he'd jump into her lap and even into her outstretched arms,



IRENE AND "DOODLES," THE DUCK

completely un-ducklike. Irene did little to discourage this and, in fact, spoiled him by stuffing him with his favorite food, hot dogs.

By August of this year, Doodles had really grown up and his feeling for Irene had grown right along with him to the point that she was the center of his world and he had little truck with other creatures, including Joe and any stray dogs or cats that might roam by.

Because he was so big, weighing in at better than 12 pounds. and because, at least in Irene's eyes, he was so pretty, she entered him in the Santa Clara County Fair in mid-August. (SLAC was also on exhibit there as reported elsewhere in this issue.) To everyone's surprise, except Irene, Doodles won first prize for "Best of Breed." The honors didn't stop there, and soon even Irene was agog. The next award was for "Best of Waterfowl." Fully elated, Irene was ready to take duck, ribbons and trophies home when she was stopped by the judges. Doodles was considered to have such good lines, fine carriage, and all such things by which a bird is judged, that they named him "Best of Poultry, All Classes!"

If there's a moral to this story, it's "If you're going to give your kid a duck, make sure it's a good one, and stock up on weiners!"