The Beam Line

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SPEAR Detector Undergoes Successful Checkout

The 200-ton detector built for SP-1, the first experiment using SPEAR, worked remarkably well during the April running cycle, said a jubilant Rudy Larsen, the Group C physicist coordinating the detector project.

"All parts of the SPEAR detector were brought successfully into operation this cycle throught the fantastic efforts of a large number of people from all over the project," he said.

The detector, described in the January 15, 1973, BEAM LINE, surrounds the west interaction region of SPEAR. It is in the form of a 15-foot-long octagon and has been designed to study what happens when electrons and positrons (anti-electrons) annihilate, with hadrons (particles which interact via the nuclear force) subsequently being produced.

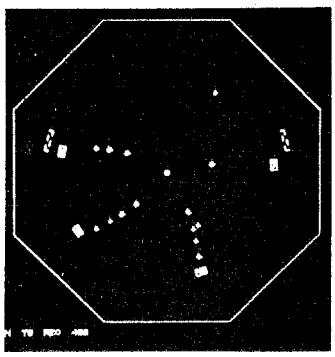
It would be impossible, noted Dr. Larsen, to name everyone who contributed to the successful construction of the detector, but a number of groups and individuals were particularly important.

Among these from Mechanical Engineering were Bill Davies-White, who was Project Engineer; Wally Scott, spark chamber engineering; and George Lee, design and layout.

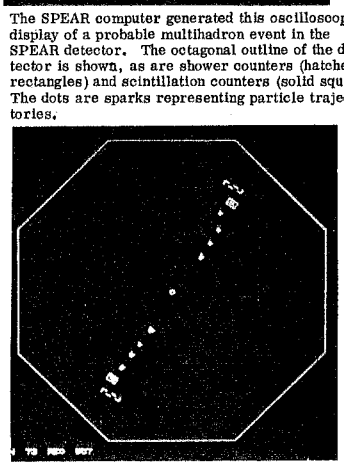
The skills of a number of groups within Herm Zaiss' Fabrication Shops were relied upon to actually build the device. These groups include Stan Butler and the Heavy Machine Shop, Larry Didier and the Magnet Assembly Shop, Dick Messimer and the Precision Assembly Shop, and George Cruickshank and the Assembly (Welding) Shop.

SLAC collaborated with the Lawrence Berkeley Laboratory on the building of the 24 large shower counter assemblies, while the 48 trigger counters were handled by Group E technicians.

Al Gallagher (Mechanical Engineering) and Jim Nolan and the Rigging Crew moved tons of equipment around while plumbers, electricians, and carpenters from the Crafts Shop worked side-by-side to get the detector ready.



The SPEAR computer generated this oscilloscope display of a probable multihadron event in the SPEAR detector. The octagonal outline of the detector is shown, as are shower counters (hatched rectangles) and scintillation counters (solid squares). The dots are sparks representing particle trajectories.



A probable cosmic ray shooting through the chamber.

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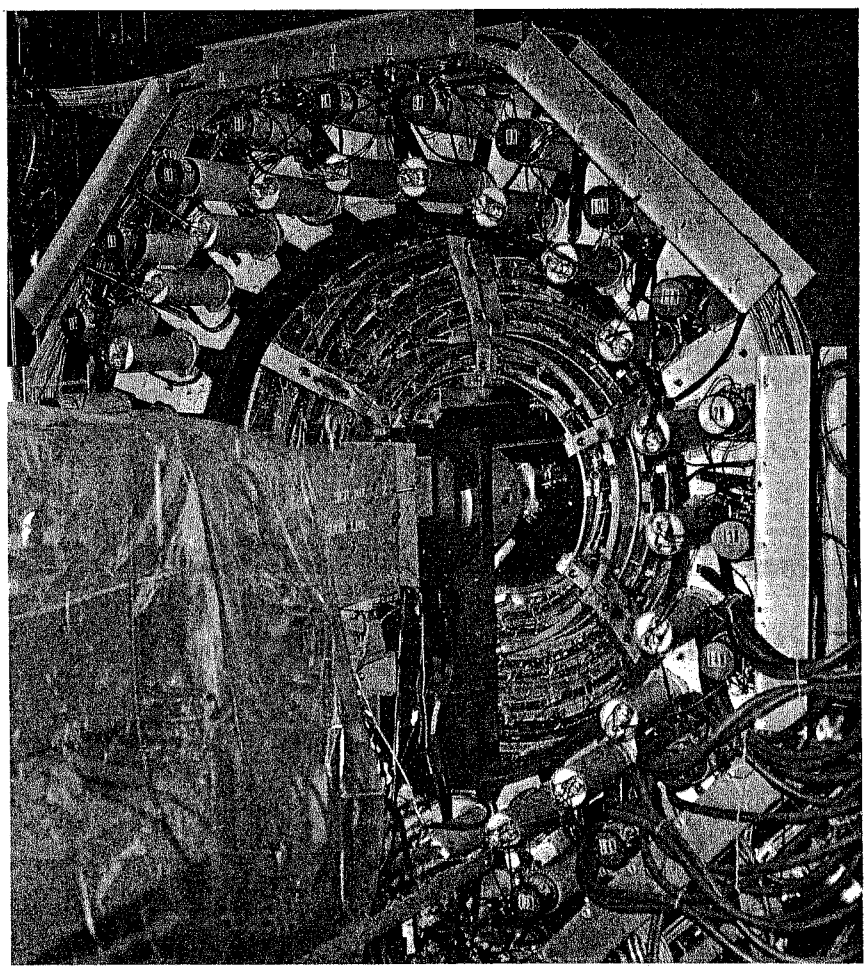


Looking into the interaction region of the SPEAR detector, one can see (from the center out) the cylindrical array of wire chambers, a ring of scintillation counters serving as trigger counters, the magnet coil, and a cylindrical array of scintillator-shower counters.

Ralph Nelson Receives Ph. D.

For the last 9 years, Ralph Nelson has worked full-time in Health Physics at SLAC, during which time he whittled away steadily at the requirements for a long-ranging view toward a Ph.D., taking a few units each semester at Stanford. Recently Ralph graduated from Mr. to Dr. in an interdepartmental Ph.D. titled "Health Physics and Dosimetry" in the areas of radiology, nuclear engineering, and SLAC-related physics.

Tuition Refund Policy

Ralph was able to obtain his degree under SLAC's Tuition Refund Policy, the purpose of which is "to encourage employees to further their education in fields related to their employment at the Center and to stipulate the conditions under which employees may be partially reimbursed for costs of tuition and certain fees." A number of SLAC employees have attended Stanford under this policy and in several cases have received an M.S. degree in their field. For more information on this policy call Gerry Renner in Personnel, extension 2351.

Ralph's Background

Back in 1963, just after receiving his B.S. degree from the University of California at Berkeley in physics, Ralph co-authored a paper on "Shielding of High Energy Accelerators" which led him to switch to health physics where he personally felt more opportunity. From Berkeley he went to the University of Washington and received his M.S. in Physics and then came directly to SLAC in 1964. Almost immediately he enrolled at Stanford in the department of Nuclear Engineering under SLAC's Tuition Refund Policy and continued to take related courses for several years. Then about 4 years ago he switched to a "Graduate Special Program" which enabled him (with the help of 5 faculty sponsors) to span three different departments in his pursuit of a wider-based Ph.D. than is normally sought. His was the first Health Physics Ph.D. ever given at Stanford.

continued on back page

Ralph Nelson at his home-away-from-home in his Health Physics office.

Job Openings at SLAC

Physical Science and Engineering Technician II
Under general supervision performs work in Electronics such as install, terminate and check-out multiconductor and coaxial cable; fabricate, assemble, and wire electronic chassis, panels and distribution frames. Qualifications: Knowledge and skill such as are usually acquired through completion of technical college courses and related field experience in electronics. Day shift - $730-$932. No. 6117.

Physical Science and Engineering Technician II
The work primarily involves the operation of complex research apparatus, includes fabrication assembly, modification, installation or check-out of research equipment. Qualifications: Two years of technical college courses and extensive experience in related fields of work. Rotating shift - $730-$932. No. 6503.

Mathematician
Scientific oriented programmer to work with physicists, engineers and other programmers in designing, writing and maintaining an operating system; applicant must be familiar with the following systems: PDP-11 IBM 1800, System 7, 360/91, 370/168; proficiency in machine and assembly language, and competence in FORTRAN. Qualifications: Mathematical ability to handle kinematics and other relevant physics calculations. Experience should include familiarity with I/O handling at state of art data rates and some degree of mathematical programming. Day shift. Salary - open. No. 5902.

Mathematician
Position involves programming, both in FORTRAN and assembly languages, of a medium sized computer for scientific and largely real-time application. Qualifications: Applicant should have B. S. Degree or equivalent experience in physics, mathematics or related field. Experience in FORTRAN and/or assembly language programming. Day shift. Salary - open. No. 7465.

Physical Science and Engineering Technician I
Assist in assembly of ultra-high-vacuum components, pumps, valves, gauges, pumping devices; testing of UHV components; assist in preparing ultra-high-vacuum chambers for pumpdown and bakeout and installation into the SPEAR ring; provide leak-detection service and maintenance of machines associated with aforementioned equipment. Qualifications: Applicant should have some knowledge of vacuum components, leak detection, pumps, etc.; should have familiarity with hand tools, measuring instruments, micrometers, Vernier calipers; should be prepared to spend some time learning any additional skills required for the position of Mechanical Technician (Vacuum). Salary - $630-$804. No. 7756.

Office Assistant III
Type technical manuscripts according to publishers' required formats. Prepare camera-ready copy involving mathematical equations and non-standard symbols. Use proportional-spacing IBM Executive typewriter with changeable keys. Use pressure transfers. Responsible for proofreading for accuracy. Some responsibility for mechanical editing for grammar, punctuation, and spelling. Qualifications: Must be able to type clean copy at 60 wpm for extended periods. Must be able to work on specialized material for long periods with continuous attention to detail and accuracy. Must be experienced on the typewriter to be used. Must be able to exercise good judgement in planning layout and typing graphs, charts, and equations. Must be able to assume complete control of the publications typing function: receiving, scheduling, and production, working directly with the authors. Salary - $572-$730. No. 5059.

In addition to the above positions available at SLAC, a complete listing of open positions on the Stanford campus and the Stanford Hospital are posted outside of the Employee Relations Office, Room 238, A&E Building, and in the Employee's Canteen in the Research Yard.

Contact the Employee Relations Office (phone extension 2355) if you are interested in any of these positions.

SPEAR Detector...

continued from front page

Joe Cobb and the Magnetic Measurements Group provided crucial and accurate maps of the detector's solenoidal field, powered by a three megawatt surplus power supply modified by Martin Berndt and the Power Supply Operations Group.

The Electronics Instrumentation Group, headed by Ray Larsen, contributed to the design and development of the complete detector electronics system. Ken Johnson's Electrical Installation Group had responsibility for the cable plant design and installation; Bob Baker was the chief coordinator of this effort. Don Telles of Accelerator Electronics engineered the thyratron pulser system. All told, some 50 miles of cable were needed to wire in the detector's electronics and triggering systems.

Norm Dean of Physical Electronics and his vacuum technicians built and installed a complicated vacuum chamber made of stainless steel only six thousandths of an inch thick.

An example of how well things went was the successful operation of the inner spark chamber system which furnishes momentum measurements of the particles produced by collisions in the interaction region. This system is by far the most original and complicated (and expensive!) part of the detector. It consists of 16 cylindrical chambers totaling over 100,000 wires, forming a completely cylindrical array with no dead spots. Of the 100,000 wires, only three broke, and this was discovered and repaired before the cycle began. The detector's solenoidal magnetic field was so uniform that it didn't adversely affect the magnetostrictive readout system of the chambers, but instead it turned out that the magnetostrictive readout wands worked better when the four kilogauss magnetic field was on!

One worry that seems to have been laid to rest was that the detector might seriously perturb the orbits of the particles in the SPEAR ring itself. It was found that the perturbation was very small, good news indeed.

One very important outcome of SP-1, besides the fact that the detector worked so well, was that it turned out to be relatively easy to distinguish between unwanted (background) triggers of the detector and multihadron events, which are the topic of SP-2, to run in July (SP-1 continues during the May-June cycle). The experimenters hooked up an oscilloscope in such a way that the information fed by the detector into SPEAR's Sigma 5 computer appeared pictorially on the scope face. Pictures were taken of the scope displays, and an example of what is believed to be a multihadron event is shown. The tracks can be seen to emanate from the interaction region. Spurious background and cosmic ray events occurred a few times per second, while the interesting events occurred at a rate of one or two per minute.

No attempt has been made to obtain any "hard" experimental data from the run -- the important thing was that the detector itself worked so well. But the results, when they are in, appear certain to be very interesting. For example, the cross section for $e^+ + e^- \longrightarrow$ hadrons may say something about whether partons, constituents of the proton and neutron whose existence was first suggested by experiments here in End Station A, may themselves be inhabited, rather than point-like.

So, thanks to all the people involved in the design, construction and testing of SPEAR, very exciting days lie ahead for the high energy physics community with SLAC remaining at the forefront.

Theorist DRELL Wins Engineering (!) AWARD

Yes, you did read the headline correctly. SLAC Deputy Director Sidney Drell was awarded a University of Illinois College of Engineering Alumni Honor Award for Distinguished Service in Engineering at a convocation held at the University's Urbana campus on May 4, 1973.

According to the University of Illinois, the award is given to alumni or former staff members who have distinguished themselves by "outstanding leadership in planning and direction of engineering work, by fostering professional development of young engineers, or by their contributions to knowledge in the field of engineering."

But what, you might be wondering, does this have to do with our Dr. Drell, a theoretical physicist, who candidly admitted at the award ceremony that his highest engineering achievement was in rebuilding a regulated power supply he had burned out while doing a student experiment!

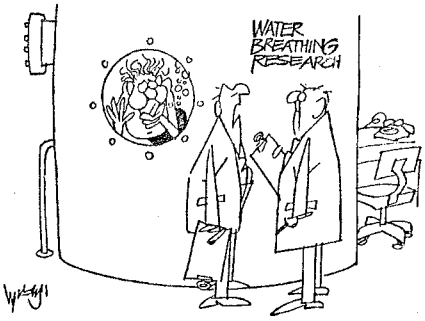
The answer is that at Illinois the Physics Department is contained with the Engineering College, so the award makes sense after all.

So, we'd like also to congratulate Distinguished Engineer Drell!

Kactus Kulprits Kaught

In the May 7, 1973, BEAM LINE we showed a picture of a cactus not far from the A/E Building, but didn't know who planted it.

Raymond Robello of the Plant Office called us to say he had planted the cactus, which had been brought in originally by Manuel Gutierrez, and that an even bigger cactus can be found south of sector 27.



"... He says it's a lot like drowning."

Ralph Nelson...

continued from front page

The different areas Ralph needed to study in the course of getting his Ph.D. were particle and nuclear physics, applied mathematics, radiation biology and cancer therapy (at the Medical School), nuclear instrumentation, and dosimetry. Simply in trying to learn more about dosimetry, Ralph prepared a seminar series in 1970 (with Ken Kase of SLAC) to give at the Medical School since there was no dosimetry course in existence at the time. Over 40 persons enrolled from around the Bay Area, most of whom held Ph.D. or M.D. degrees. The notes on "Concepts of Radiation Dosimetry" that Ralph and Ken prepared for the series had such positive response that they were published in SLAC Report 153 which is now being used as a textbook at UC Berkeley for biological physics courses.

Physics in Medicine

Ralph's interest in Health Physics reaches through many technical avenues and encompasses branches of physics which are directly related to people, for instance radiological physics in medicine, where radiation fields are used in cancer therapy. Though his main emphasis has been in the shielding of high energy radiation fields, a seemingly technical type of pursuit, his knowledge inevitably leads back around to human beings. His dosimetry studies on energy deposition in human tissues and the prediction and measurement of energy deposits in the human body are part of why Health Physics exists at SLAC -- to protect people on site from radiation fields.

Health Physics

The most "people-oriented" division of physics at SLAC, Health Physics knowledge applies not only to shielding of experiments, but more importantly, provides a biological link from physics to people. The by-products of the beam are studied to see what applications might exist for medical physics in light of relative importance to society.

Some of the disciplines called upon for the purposes of Health Physics are: geology, nuclear and high-energy physics, meteorology, radiobiology, chemistry, and computer programming.

Health Physics also has provided much meat for the Skills Training Program. Nearly all of the staff there have at one time or another served as tutors for trainees.

In short, Health Physics encompasses a variety of disciplines which in the final analysis have a direct relationship to society.

BJORKEN Elected to NAS

SLAC Professor James D. Bjorken was one of five Stanford faculty members elected to the nation's most distinguished scientific organization, the National Academy of Sciences.

Bjorken has been a key figure among theorists seeking to explain the results of the inelastic electron scattering experiments done at SLAC.

Election to the academy is considered one of the highest honors accorded to an American scientist or engineer. Its membership is limited to approximately 1,000.

Second Annual Long Distance Race

SLAC employees interested in jogging are once again invited to take part in the 3.8-mile Long Distance Race around the accelerator which is scheduled for Friday, August 31, 1973 at 12 noon. Last year 21 enthusiastic runners made it all the way around and this year we are hoping for an even better turnout.

A number of "conditioning" jogs have been held since the last race to prepare runners for the big one in August. Two more are scheduled, one on Friday May 25 and another on Tuesday July 3. These jogs start at the Highway 280 overpass on the south side of the gallery at 12 noon. We welcome you to join the group.

New Added Attraction by Special Request

Several bicycle enthusiasts have requested that we hold an annual event for them also.

The Bicycle Race will be held just prior to the Long Distance Race, starting a few minutes ahead to avoid any congestion with the runners at the starting line. Bicyclists will ride over the same course as the runners, but separate timers will record each race. The number of bicyclists is limited to the first 15 who sign up.

In the interests of safety, arrangements will be made to post guards at Sectors 0, 10, and 20 to halt all vehicle traffic during the time the Bicycle Race is in progress, and we would appreciate it if the personnel working in these areas would avoid using their vehicles during the time that the race is in progress.

Bring your 10-speed bicycles (complete with a safety check, correct tire pressure, and proper lubrication) to Sector 30 at 12 noon, and be ready to "pedal!"

The races will be further advertised as the time approaches. Call Public Information any day before 11:00 a.m. (ext. 2204) if you wish to sign up for the Bicycle Race.

Ken Moore
Crafts Shop

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