



# The Beam Line



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## Current SPEAR Status

SLAC's electron-positron colliding beam facility, SPEAR, is the highest luminosity storage ring now operating, reported Burt Richter for the SPEAR Storage Ring Group at the Third All-Union Conference for Scientific Problems of Charged Particle Accelerators held in Moscow last October. The Storage Ring Group, consisting of P. Morton, R. McConnell, J. Rees, B. Richter, A. Sabersky, R. Scholl, J. Voss, H. Wiedemann (DESY, Hamburg), M. Allen, J. E. Augustin (University of Paris), A. Boyarski, W. Davies-White, N. Dean, G. Fischer, J. Haisinski (University of Paris), J. L. Harris, L. Karvonen, R. R. Larsen, and M. J. Lee, managed this after only 12 weeks of testing time following SPEAR's completion last April.

The "luminosity" of a storage ring is a measure of the copiousness with which interactions are produced by collisions between the particles in the counter-rotating beams. The reaction rate for a particular process (the interactions of the particular type which occur per second at a given beam energy) is proportional to the ring's luminosity. Thus, the higher the luminosity the better.

The group in the near future expects to attain luminosities 50 times greater than that already achieved.

Electrons and positrons from the accelerator are injected into SPEAR at 20 pulses per second and 1.5 GeV. Since even 1.5 GeV electrons (or positrons) are traveling at speeds close to that of light, the counter-rotating beams meet at the west interaction region every 780 billionths of a second (this is, essentially, obtained by dividing the one-seventh mile circumference of the ring by the speed of light, 186,000 miles per second).

So far, single beam energies of 2.7 GeV have been attained, although most of the beam behavior studies have been carried out at the injection energy, 1.5 GeV. Filling rates of 50 milliamperes per minute have been attained.

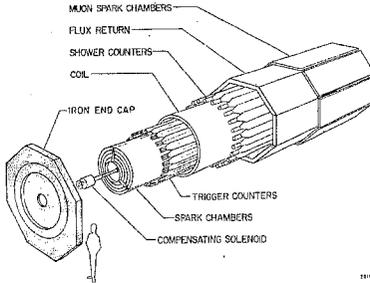
The beams cannot be stored forever - a beam's "lifetime" depends on its current. Relatively low-current beams (on the order of 10 milliamperes) take about an hour to decay to 37% of their initial value, while 50-60 ma beams take only about one-half hour.

A number of studies are underway to understand and overcome certain beam instabilities and an improvement program is planned to increase the maximum operating energy to 4.5 GeV.

Meanwhile, a large magnetic detector for SPEAR has been largely completed and the experimental program using the new facility is scheduled to begin during the March operating cycle after installation of the detector in February. Design and construction of the detector are a joint SLAC-Berkeley venture.

The detector, shown in the diagram, is in the form of a 15-foot diameter octagon. It is 15 feet long, as well, and weighs about 150 tons. The detector will surround the west interaction region and has been designed to study in particular strongly-interacting particles (particles interacting via the nuclear force) produced after electrons and positrons annihilate each other.

The device is characterized by its ability to register particles produced over a wide range of angles, a magnetic field to help in particle identification,



Schematic of SPEAR detector.

counters to help track and identify particles and separate unwanted and background events, and its ability to discriminate between strongly and electromagnetically interacting particles.

The drawing shows what a particle produced in the interaction region will encounter, provided its production angle is between 45 degrees and 135 degrees with respect to the beam direction.

First the particle traverses the beam vacuum chamber, then, in order: a cylindrical multiwire proportional chamber used as part of the detector's triggering system and eight gaps of cylindrical wire spark chambers furnishing momentum measurements; a cylindrical array of scintillation counters providing the basic trigger and also information on the flight time of the particle to establish its velocity; the aluminum magnet coil; a cylindrical array of level-scintillator shower counters; eight inches of iron serving as the magnetic field's "flux return;" and two gaps of wire chambers to identify muons.

Although production angles of less than 45 degrees will not trigger the detector, it is planned to place spark chambers near the ends of the cylindrical spark chambers so that information can be obtained on particles produced between 15 degrees and 45 degrees.

The first experiment scheduled for SPEAR, SP-1, is a SLAC-Berkeley collaboration formed to check out the operation of the detector. With the help of an on-line XDS Sigma 5 Computer, information on the angle and momentum distribution of a number of final states will be investigated. These include positive and negative muon and pion events.

Experiment SP-4, to be done by a Stanford group from HEPL, will use a different detector in the east interaction region to investigate electron-positron annihilation resulting in two photons and the "Compton" reaction in which the final state consists of an electron, a positron, and one photon. Among other things, this experiment will test the theory of quantum electrodynamics.

At present, three other experiments have been approved for SPEAR, involving groups from SLAC, University of Pennsylvania, University of Wisconsin, Princeton, and the University of Maryland.

## Ten-Year Awards Presented

In April, 1962 a contract was initiated between the AEC and Stanford University providing for the design and construction of SLAC. To accomplish this major contractual undertaking which was scheduled for completion in a little over four years, an immediate staffing increase was necessary. A busy Personnel Department initiated a recruitment and hiring activity that doubled the SLAC staff in that one year period.

Of the employees added to the staff in 1962, 100 of these "old timers" observed their tenth year of service with SLAC during 1972. In recognition of their service with SLAC during which time the accelerator was successfully made operational, these employees were honored at the third annual Ten-year service award presentation held at SLAC on December 15, 1972.

Dr. Panofsky presented a service award to each employee. Shown receiving a service award is Axel Golde from the Experimental Facilities Department.

The service awards were personally engraved desk pen sets with walnut and brass bases, fabricated in the Crafts Shop and assembled by Art Barron.



Dr. Panofsky congratulates Axel Golde.

## Gearhart Champion

On the first Thursday of December we held our last session for 1972, and Roger Gearhart of EFD emerged champion for the year. A player's ranking is determined by his best 9 out of 12 performances during the calendar year and Roger just barely beat out the team of Ed and Connie Logg from Group A. Last year's Top Dog, Finn Halbo (EFD) slipped to 4th this year, rounding out the list of prize-winners.

The SLAC Bridge Club meets the first Thursday of each month, at 7:30 p.m. in the Orange Room of Central Lab. All SLAC'ers, Stanfordites, spouses and friends are welcome to come and join in the fun (occasionally referred to as the Thursday Night Fights).

How about you? Players of every degree of ability and experience are in the club now, so if you're interested in learning and playing Duplicate Bridge, get on our mailing list by calling Finn Halbo on 2491.

## Minority and Women's Committee

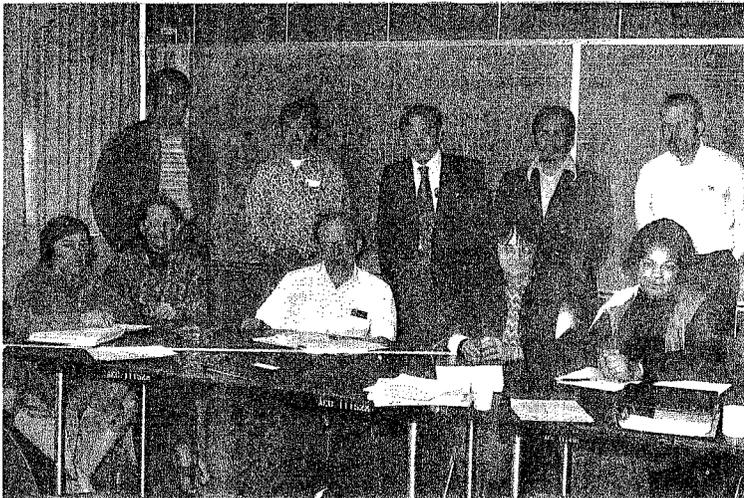
The Minority and Women's Committee has been in operation since June, 1970, and is formally an advisory body operating within the Director's Office.

One of the major functions of the MWC is to intercede in a situation where there is a presumption of discriminatory practices, and to help reach a solution before the formal grievance procedure has to be utilized.

There are three ways that the committee becomes involved in these problems: 1. when they are brought to its attention externally; 2. when the MWC decides on its own that a situation has arisen which it believes merits inquiry; 3. when the Director requests the MWC to investigate a problem on his behalf.

Committee members are: Mary Anne Fisher-keller, Glenna Owens, Cornell Watson, Maria Wallace, Frankie McLaughlin, Alex Tseng, Jim Ketcher, Joe Sodja, Anthony Tighman, John Brown, Viola Belton, Charles Leon, John Valverde.

Please contact any of the above members if you feel that the MWC can be of any service to you.



Dr. Panofsky and the MWC. Seated (left to right) are M. Fisher-keller, M. Wallace, Dr. Panofsky, Fr. McLaughlin, Glenna Owens. Standing (l. to r.) are C. Watson, J. Ketcher, A. Tseng, C. Leon, J. Brown.

# RLA Task Force Formed

The recently formed RLA Task Force, a group of about a dozen SLAC people, has just moved into offices on the south side of the second floor of the A&E Building. The purpose of the group is to concentrate the R&D and general planning work that will be needed to carry out the proposed RLA construction project at SLAC. Since people at SLAC are likely to be hearing a lot about RLA -- and many will be participating in it during the next few years -- we'd like to give a brief summary here of what RLA is, of where the work on RLA stands now, and of who is doing what.

The initials RLA stand for "Recirculating Linear Accelerator." The RLA Proposal that SLAC has submitted to the AEC calls for a major construction project that would increase the research capabilities of the SLAC accelerator in two important ways. In one mode of operation RLA would provide electron beam energies up to approximately 45 GeV, which is about double the present maximum energy. In the second, alternate, mode of operation the beam energy would be the same as that of the present SLAC accelerator, but the duty cycle (the fraction of the total time that the beam is actually on) would be about 100 times larger than the present 0.06%. These goals would be achieved by constructing an elaborate double-loop beam-recirculating system and connecting it to both ends of the present accelerator. The beam which is stored in this recirculating system can either be sent back through the accelerator to double the energy, or else it can gradually be "spilled" into the experimental areas to increase the duty cycle.

SLAC's Proposal for the RLA construction project has not yet been authorized. It is quite possible that authorization will be delayed beyond the proposed FY1975 starting date. Even so, there are several good reasons for concentrating on the RLA work now. One reason is that the RLA Proposal has a good deal of support within both the physics community and the government, so that the chances of authorization seem reasonably good. A second reason is that the recirculating system we hope to build will be a complicated beast, with many problems that will have to be solved before we can be confident of a workable

and economical design. A third, more general reason concerns RLA's potential importance both to SLAC and to the whole field of high-energy physics research. RLA would be the next "big step" in electron accelerators, and as such it would open up significant research possibilities that do not now exist.

The RLA Task Force has been set up as an ad hoc or informal group at SLAC in recognition of the fact that RLA does not fit into the existing SLAC structure of Divisions, Departments, and Groups, but is rather a laboratory-wide project that will potentially involve nearly all groups. At this stage of the project, the idea is that the SLAC people who are working full-time on RLA will get whatever help they need by drawing on the part-time services of a much larger number of people. The RLA Task Force is headed by John Rees, who reports directly to Dick Neal, Associate Director, Technical Division. Within RLA, responsibility for the various technical aspects of the work is divided among the members of the RLA Steering Committee: Bill Herrmannsfeldt, Dave Coward, Al Lisin, Dick Scholl, and Perry Wilson. The following list shows the people presently in the RLA Task Force headquarters and indicates briefly what each does.

John Rees, Head; Sue Hanke, Secretary; Bill Herrmannsfeldt, Deputy head, Beam dynamics, accelerator systems; Dave Coward, Beam switchyard, exper. areas; Al Lisin, Mech. engineering; Dick Scholl, Electronics and instrumentation; Perry Wilson, RF systems; Dick Helm, Beam dynamics; Bill Kirk, Administration.

Many other members of the Task Force are working in different locations; these include six people on a full-time basis and about fifteen on a part-time basis.

The main point of all this is simply to announce that the RLA office is now open for business. Our main phone number is ext. 2451, and our coffee pot will arrive soon. If you come to visit us, you'll be welcomed, and with a little luck we'll find something useful for you to do before you escape.

## Social Security Changes

As you may know, a new rate schedule for social security payroll deductions goes into effect with the first wages paid in January 1973. The Social Security Administration has prepared a leaflet explaining this increase and the new benefits which have been added to the program. Copies of this leaflet are available in the Benefits Office, Room 238 A&E Building.

Your social security contribution rates for 1973 total 5.85% of your wages up to \$10,800. (In 1972 the contribution rate was 5.2% of your wages up to \$9,000).

The leaflet points out that this increase in contributions will benefit not only those now getting social security checks but also for those who are contributing to the program. For example, men who reach 62 and retire early will have their social security benefits figured in the same way as they have been for women, meaning higher checks for male workers and their dependents. Also, a widow who starts getting social security at age 65 will get the same amount her husband would have received instead of a lesser amount as in the past. New regulations will also extend to Medicare protection (hospital and medical insurance) to disabled workers of any age who have received social security disability benefits for more than two years. In addition, Medicare is extended to people who need blood dialysis or kidney transplants.

Know what you are paying for... come and pick up this informative brochure!

## Job Openings

The following positions are available at SLAC as of January 15, 1973:

**Office Assistant II.** Two positions for the day-shift are available in this classification which has a salary range from \$494 to \$630. The Purchasing Department needs a fast accurate typist to handle purchase orders, quotation requests, correspondence and other material as assigned. This Department receives over 1000 Purchase Requisitions a month and the job involves lots of phone work in addition to typing. The Printing Coordinator in the Publications Department, Central Laboratory Building, needs someone to mail out SLAC publications and assist in ordering and receiving prints and slides. Position requires good typing and filing ability along with other clerical skills. Position also involves phone and personal contacts with outside vendors and SLAC employees.

**Physical Science and Engineering Technician II or III.** Experimental Research Group A has a day shift opening for a Mechanical Technician to work with Physicists in designing, building, checking out, installation, and maintenance of equipment for high energy physics experiments. Equipment includes scintillation counters, spark chambers, and various control devices which incorporate mechanical, electrical, electronic, vacuum, high pressure and optical techniques. Duties will include precision machining and liaison duties with machine shops. Depending on the degree of mechanical design and fabrication experience presented, the position will be filled at the II level (salary range \$730 to \$932) or the III level (\$894 to \$1075). The position offers an opportunity for the independent application of judgement and responsibility for the mechanical aspects of fairly large projects.

In addition to the above positions available at SLAC, a complete listing of 114 open positions on the Stanford campus and the Stanford Hospital are posted outside of the Employee Relations Office, Room 238, A&E Building.

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

## Jack Good

It is with deep regret that we announce the death of Jack Good, January 5, 1973. Jack had been a long-term employee in the Light Machine Shop, MFS. He retired as SLAC's first retiree in May, 1970. Jack had been living in Grass Valley with his wife to whom he had been married for 45 years.

Services were held Tuesday, January 9, in San Carlos.

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## Jogging Anyone?

Ken Moore from Crafts Shop, winner of the first annual SLAC long distance run, has announced the 1973 jogging schedule for those employees who would like to keep in shape for the annual event. Group jogs around the accelerator will be held: Friday, February 16, 1973; Friday, May 26, 1973; Tuesday, July 3, 1973, and Friday, December 21, 1973.

Interested employees should meet under the Hwy 280 overpass on the south side of the Klystron Gallery. The jog will start at 12PM sharp. The jogs are not intended to be competitive. All SLAC employees are invited to participate, but Ken points out that if you are out of shape you should talk to the SLAC Medical Department before attempting this form of exercise.

The second annual SLAC long distance run is scheduled for August 30, 1973. This is the only competitive event held during the year. The starting point for this event is Sector 30 and follows the accelerator around for 3.8 miles.

## Transcendental Meditation

Transcendental meditation, according to Walter Bellin who was trained by Maharishi Mahesh Yogi and who spoke on the subject at SLAC in mid-December, is an almost effortless way to approach a "higher state of consciousness". In such a state, one's faculties are more acutely aware of the latent resources within oneself, partly through the more effective assistance of a deeply relaxed physiological state which accompanies meditation. The following is a brief summary of Mr. Bellin's talk.

"During the normal 24-hour cycle there are generally 3 accepted states in which a person's mind operates -- (1) waking, (2) dreaming, and (3) deep sleep. A 4th state, or "enlightened" state is referred to in both Eastern and Western literature as one in which clarity of thought and creative insight are drawn forth to the conscious state from deep within an individual.

Each of us in our daily life operates in (1) an outer (or objective) existence -- our personality, our work or projects, how other people view us, and (2) an inner (subjective) existence -- how we think and feel within ourselves, our hopes, and our unique perception of the world. The quality of our subjective experience is inseparable from the "outside" world we experience. Because our thoughts affect our daily life, any improvement in the quality of our thinking will manifest in our outer experience, daily work, or relationships with others. Meditation can release locked-up potential for creative thought and activity in each person. It is a state of "restful alertness" where one can experience profound rest of body and mind, thus providing stimulation to be more creative in everyday life, which is the goal of transcendental meditation.

Many people who have practiced meditation find new strength in the vital contact with their innermost capacities. Old negative patterns of thought



## Grow Your Own!

The SLAC Garden Club is preparing for a new season. A few garden plots will be available in February. If you're interested in applying for one, call Sharon Jensen, ext. 2266.

## Many Thanks

The 1972 United Fund Drive at SLAC was recently completed thanks to the assistance of departmental secretaries who coordinated the solicitation. The results of these efforts are that a total of \$6,546 was collected in the form of contributions and payroll deduction pledges from 477 employees. This money will go directly to support agencies and services in the local communities.

which inhibit and bind individuals can drop away under the increasing fluidity and flexibility of thoughts they find within themselves. During meditation, measurements show an electrical activity which begins in the back of the brain in wave patterns and gradually moves forward to the front of the brain, the portion where man's highest creative faculties exist."

### Health benefits?

"Stanford Research Institute and Harvard, only two institutions among many who are doing research on meditation, have conducted experiments on the effects of transcendental meditation on blood pressure - it is found that there is a significant drop in blood pressure during the meditation state. Chemical changes occur in the bloodstream, particularly as indicated in the drop in the level of blood lactate, a chemical present in states of anxiety or neurosis. In a study of blood lactate levels (Ref: Scientific American, Feb., 1972, Wallace, Benson/USA), during the first 20 minutes of meditation, the lactate level dropped approximately 30%. In addition, the oxygen consumption and metabolic rate markedly decreased, indicating a deep state of rest. Meditation is also known as a "wakeful, hypo-(or low) metabolic state." Medical researchers are particularly interested in effects of meditation on psychiatric patients, and on treatment of drug abuse."

Leonard A. Sagan, physician at SLAC, is organizing a program here at SLAC for employees who wish to participate in a routine of meditation in order to further medical research being done on its effects on health in an "industrial" atmosphere. Details of this program are still being formulated; however, Dr. Sagan (x. 2281) will be happy to discuss his plans with interested individuals. For further information on outside-study courses in TM, contact Alex Hankey (x. 2266).