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portions of West Menlo Park.

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Dirt piles will be gone by Christmas

If all goes according to schedule, the massive piles of dirt visible from Sand Hill and Alpine Roads should dwindle by Christmas and be replaced by rolling, carefully landscaped hills.

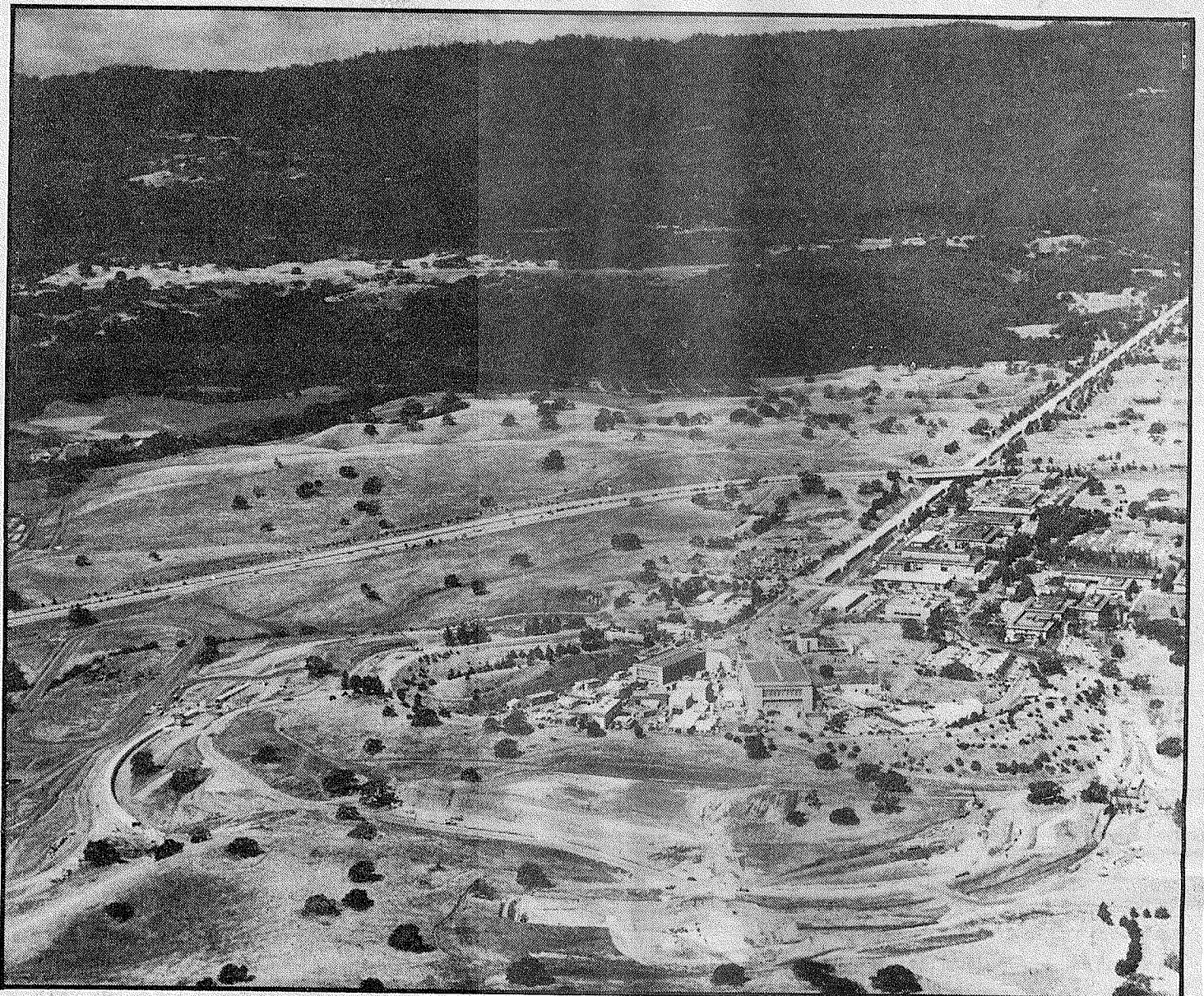
The construction is part of the "Positron-Electron Project", a large underground ring being constructed at the end of the Stanford Linear Accelerator to increase its ability to probe for the innermost secrets of the structure of matter. "I hope that by the summer of 1979 we'll be doing physics," said center spokesman Doug Dupen of Sharon Heights.

When PEP, as the project is called, is complete it will take electrons which have been speeded to almost the velocity of light down the two-mile linear accelerator and divide them into beams of electrons and positrons. These will rotate in opposite directions around an underground ring 700 meters in diameter.

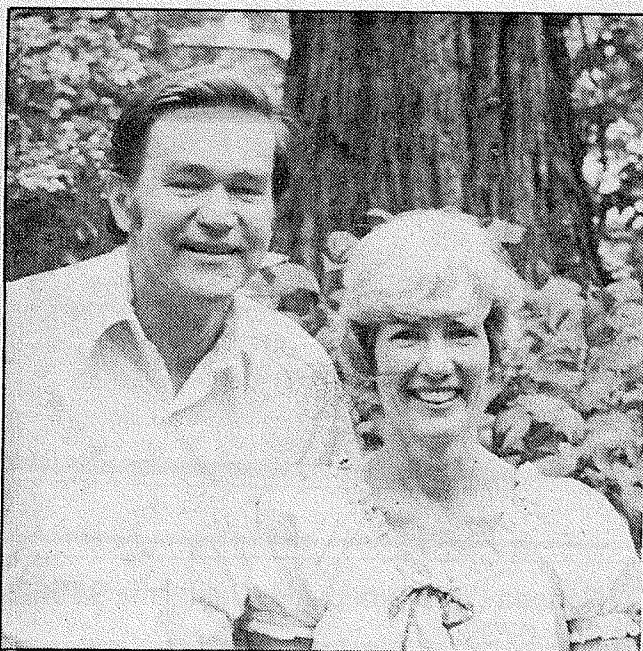
At five experiment stations the two beams can be made to collide; there scientists will be able to study what happens when electrons and positrons hit head-on and annihilate each other at energies up to 36 billion electron volts.

Accelerator scientists hope that observations at the higher energies will enable them to learn even more about the forces and particles that make up matter. (See related article on theoretical physicist James Bjorken). According to Mr. Dupen, the new project will give collision energies nine times as high as those from the smaller colliding-ring project, which helped center physicist Burton Richter win the Nobel Prize in 1976.

The dirt piles are the result of excavating for the ring. In the lower areas near Stanford Hills and Alpine Road, the ring is being excavated from the surface, while in the areas of higher land tunnels are being drilled. When it is complete, the earth will be replaced and the surface re-landscaped. There will be five experiment stations, and otherwise the land will be made to look as natural as possible.



View of the Positron-Electron Project under construction: Sand Hill Rd. to the right; Alpine Rd. and the Portola Valley Training Center on the left; Route 280 and the Linear Accelerator to the top. The accelerator will fire a beam of high energy electrons which will be divided into beams of positrons and electrons which will circulate around the storage ring under construction. Additional photo on page 2.



Mr. and Mrs. James Bjorken relax on their Woodside deck after their visit to Leningrad and the White House.

When the summons from the White House arrived, Professor James Bjorken of Woodside was scouring the shops of Leningrad—unsuccessfully—for milk for his family.

And when Dr. Bjorken returned to Washington to receive the E. O. Lawrence Memorial Award for his contributions to the understanding of elementary particle physics, the occasion seemed almost "anticlimactic" in contrast to the previous month.

A Professor of Physics at the Stanford Linear Accelerator Center, Dr. Bjorken

had just spent three and a half weeks with his wife and two small daughters housekeeping in a palace suite next door to Leningrad's famed Winter Palace while he probed the latest theories of sub-nuclear physics with his counterparts from the Leningrad Institute of Nuclear Physics.

Mrs. Bjorken and his stepson, Peter Nauenberg, a senior at Woodside High School, joined Dr. Bjorken in the Roosevelt Room of the White House for the ceremony. The E. O. Lawrence Award, named for the late Ernest O. Lawrence, inventor of the cyclotron, is given each year to five

To Russia with physics: Mixing science with housekeeping in the Soviet Union

scientists in recognition of their outstanding contributions to the field of atomic energy.

Mr. Bjorken was cited for his contributions to the understanding of the structure of elementary particles, in particular a "scaling law from inelastic electron scattering." This work involves the highly abstruse and mathematical world of pure science and the effort to interpret the bewildering data on elementary particles which emerge from high powered atom smashers such as the Stanford Linear Accelerator. There, electrons are speeded up to nearly the velocity of light in the two-mile long tunnel which parallels Sand Hill Road in the local foothills. The results of their collisions with other particles are studied by theoretical physicists, including Mr. Bjorken, to try to penetrate the mysteries of how matter is put together.

Mr. Bjorken explained what he describes as "a terrible clutter of concepts." "We are involved in theoretical interpretation and prediction. We are progressing toward some sort of more

fundamental level of structural simplicity." His work focusses on trying to understand the structure of the proton—a particle once thought to be one of the fundamental constituents of matter. Working with the data produced from the accelerator system, Mr. Bjorken and his colleagues are developing theories of matter as being made up of six—so far—"particles" called quarks which are endowed with properties such as "up," "down," "strange," "charm," "top" and "bottom."

"It is much like chemistry," Mr. Bjorken said. "We are trying to collect as many building blocks as possible and make sense out of them."

The Bjorkens' sojourn in Leningrad was part of a continuing effort to keep scientific lines of communication open across political and international barriers.

"From the point of view of science, it's important to keep contacts. There is only one way to do it—that's to go in, because they can't get out," Mr. Bjorken said.

Actually, this was just the latest of several trips Mr. Bjorken has made to the Soviet Union to compare work with Soviet scientists who for years have been at the forefront of theoretical physics and mathematics. "I learned from them. There is work being done there which is well in advance of the state of the art in the West," Mr. Bjorken said. He felt there was tremendous "mutual benefit" from

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Physics in Russia

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working directly with the scientists there, particularly because of the bureaucratic delays and difficulties of getting research published and distributed across the Iron Curtain.

Reminiscing on their redwood shaded terrace in Woodside, the Bjorkens kept harking back to certain recurring themes: the overwhelming warmth and hospitality of their Soviet friends; the difficulties of shopping and the "terrible distribution system"; the beauties of the Hermitas Museum; the bleak monotony of everyday life; and the ominous and pervasive presence of politics.

When the Bjorkens arrived in Leningrad with their seven and eight year-old daughters, Eliza and Johanna, they did not know where they were going to stay. Imagine their surprise when they were escorted to a regal suite in the "Czar's Brother's Palace" adjacent to Peter the Great's legendary Winter Palace. Faced with two fireplaces, an enormous bedroom with 16-foot ceilings adorned in intricate gold metalwork, and an enormous hallway that invited rollerskates, "We just giggled," Mrs. Bjorken recalls.

After World War II, ten families lived in the flat, but now it is reserved for visiting dignitaries and academicians. Even the street used to have the suggestive name, "Millionaires Row"; now it goes by the more egalitarian name of Ulitsa Khalturina.

The Bjorkens never ate in a restaurant while they were in the Soviet Union this spring—it was "too much hassle," particularly with small children. Instead, they kept house with the help of a housekeeper (who spoke no English), "survival Russian," and lots of help from friends. "Joan talked English, and it worked ... Mothers can communicate," Mr. Bjorken commented.

The physicists who would come almost every day for informal seminars in the unaccustomed luxury of a czarist palace would bring gifts in their pockets—onions, carrots or a cucumber.

One of the fascinations was the eccentric layout of the flat. The hot water was in the bathroom; the kitchen had cold water and a "stove that sometimes worked"; the refrigerator was by the front door; and it was a constant challenge to get the food to the dining room before it got cold.

Shopping was another challenge. Meat, bread, vegetables, juices are all bought at different stores. And at each one, there are three lines: one to pick out the purchase, one to pay for it, and one to pick it up.

"I couldn't cope with shopping," Mrs. Bjorken said. But somehow they made out. Mr. Bjorken would go out every day to get staples during the off-peak hours when the Russians were at work and lines were shorter. Their Russian friends also helped.

Shortages were a recurring problem. "Sometimes things were not available. Normally you don't get fruit at all," Mr. Bjorken commented. "The distribution system is terrible. There is too much or too

little. Leningrad was glutted with lemons, but there were no oranges."

One of the greatest pleasures for Mrs. Bjorken and the girls was to have the great Hermitage Museum as an extension of their home. Located next door in the Winter Palace, "It must be the greatest art gallery in the world," Mrs. Bjorken said.

The Bjorkens went almost every day, and they never exhausted it. Catherine the Great's ball gowns, lapis lazuli vases five feet high, superb chandeliers, and endless stairs—part of the attraction of the Hermitage is that it is not just an art gallery; it is still like a palace.

If one of the girls asked, "What's so good about Rembrandt?," Mrs. Bjorken could take them to the bedroom where 27 Rembrandts are on display.

The miracle is not only how the palace and museum survived the 1917 Revolution, but how they got through World War II. Mrs. Bjorken commented, "It's a funny feeling to have such opulence in a land where people live so simply. They feel it's theirs."

Both Mr. and Mrs. Bjorken spoke repeatedly about the warmth and kindness—sometimes almost overpowering—of the Russians. Most of their friends lived fairly well with four or five room apartments and a car. But when they served an elegant meal, Mrs. Bjorken would be reminded of the three days of shopping to prepare for it.

The daily grind is oppressive and boring and monotonous," Mr. Bjorken said. "The wives bear the brunt of the shopping and housework and have a job too."

The group of theoretical physicists who were the Bjorkens' friends might have vacations in the Crimea, but for the most part they are unable to leave the country and travel abroad, Mr. Bjorken explained. He feels their work does not get the recognition it deserves, and he gave several reasons: bureaucratic delays, censorship, hold-ups in permission and even slow mails delay dissemination of research results.

In addition, many of the physicists at the Leningrad Institute of Nuclear Physics, followers of the still-revered theoretical physicist Lev Landau, are Jews, Mr. Bjorken noted. They do not carry the weight in the internal rivalries among Soviet research institutes as other institutes full of Communist Party members. "People from institutes with better party status have more opportunity to travel abroad; however, they also tend not to have as high average quality since people are doing more politics than physics, and you can't do both," Mr. Bjorken said.

"It's never easy to pinpoint anything in the Soviet Union; you never know the reason for 'nyet'," said Mr. Bjorken. He added, "In any bureaucracy it's easier to say no than yes."

In Mr. Bjorken's view, the system is far more than just inefficient and frustrating. "Underneath it's brutal as well." He is particularly disturbed at the worsening treatment of scientists in the Soviet Union as demonstrated by the trial and sentencing of



Stanford Professor James Bjorken of Woodside receives the E.O. Lawrence Memorial Award in the White House from presidential Science Adviser Frank Press.

physicist Yuri Orlov. If this had happened before his most recent invitation, Mr. Bjorken feels he might not have gone, even though a refusal would have been a wrenching decision for him. "I like to keep science and politics apart. By not going I would hurt many people I respect greatly."

However, on June 1, Mr. Bjorken wired A. A. Logunov, vice president of the

Academy of Sciences of the USSR as follows, "As frequent visitor to the USSR and friend of Soviet science, I communicate my deep concern regarding effect on US-USSR scientific exchange of imprisonment of our colleague Orlov. Under present circumstances I would not visit USSR and also urge my colleagues not to visit."

By Marion Softky

SUBJECT NEWS