



J. R. SANFORD DISCUSSES FERMILAB

A group of college journalism students from the Argonne semester in science program recently interviewed James R. Sanford, Associate Director for Program Planning at Fermilab. The hour-long session covered a number of topics of general interest and the essence of the interview is reproduced below.

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Q: When the psi and J discoveries were made in the fall of 1974 at Brookhaven and SLAC there was little or no participation by Fermilab in the announcement of the discoveries. Did you suspect that Psi/J existed?

Dr. Sanford: There was a supposition that something was there, but there was no way to identify precisely what it was. What we were seeing at Fermilab was an unusual production of muons and electrons at large transverse momenta. The production spectrum of such particles was expected to drop off steeply with the increasing momenta of the produced particles. This is characteristic of the distribution for ordinary particles such as protons and pions. Early measurements at Fermilab indicated that muons and electrons were more plentiful at high momentum than expected. We think this is related to the psi/J particles, but at higher energies. Now that we are doing experiments with additional detectors, the psi/J particles are readily seen.

Q: Does this tie in in any way to quarks?

Sanford: If there is granularity in the proton as the quark theory requires, then unfamiliar distribution patterns will develop as we probe new regions. This could account for the broader spectrum of particles seen since there would be concentrated scattering centers. There are several things that could account for the things we are seeing at Fermilab: (1) We could be uncovering a granular structure of the proton; (2) We could be seeing a new particle of higher mass; (3) We could be seeing the decay of massive objects such as the vector bosons that we have been seeking for a long time.

Q: The Soviets now have the second highest energy accelerator. Do you know of any plans for them to build a machine of higher energy?

Sanford: There are rumors, but we will probably not have any confirmation of these until the International Conference to be held in Russia in the summer of 1976.

Q: The CHICAGO TRIBUNE had a story a while ago about a Soviet-American collaboration to build a new accelerator. Is this true?

Sanford: The Nixon-Brezhnev accord in 1973 contained many broad statements about collaborations -- in superconductivity, material science, and high energy physics. As a result, a conference was held in New Orleans in March of 1975 with delegates attending from the Soviet Union, Western Europe and Japan as well as the United States and there was a thorough exchange about what might be done in areas such as an international



...J. R. Sanford, Associate Director for Program Planning...

cooperation leading to a project. It was an open discussion; no one there was authorizing or committing any specific projects, but it was a great opportunity to put a lot of ideas together. This group will meet again early in 1976 and present more details of what one might build.

There are many projects of a lesser nature that could be considered. There is some fear that an accelerator is too large a project to cope with internationally because of different methods of production, differences in technology, manufacturing processes, tolerances, etc. At Fermilab we have met some of these problems. We have coped with individual experiments and we have become quite well acquainted with the range of possibilities that might be considered in international cooperation. But it does seem to me that in the near future an inter-continental accelerator is too extensive a project.

Q: Did the Nixon-Brezhnev talks give commitments in high energy physics?

Sanford: The talks covered a full spectrum of possibilities. At the level of increased collaboration in experiments, the commitments are now in effect. But our most difficult problem is in communication. I think it would help if the groups from Russia could repeat their visits. There is nothing like going back after a first visit with an improved idea because you are more familiar with the institution and with the people. I think we will see some of this repetition developing in the next few months.

Q: Why do you consider repeat visiting so important?

Sanford: It is a matter of general familiarity with the Laboratory. This is very important. First experiments just don't go as well as second and third. This is partly for technical reasons, but it is partly knowing people at the Laboratory, what they do, where they can be found. Although it is frequently said that high energy physics is a cold, impersonal business, it is really a very personal art. Experimenters need to know how to get their targets filled, how the computer system functions; all things that are done best when people know each other.

Q: Are you saying that scientists who come frequently have better results?

Sanford: Yes. Then too, the Laboratory changes. The accelerator is not the same machine it was six months ago and it is changing further all the time. The official literature gives the depth of experimental results but it is the on-site experience coupled with those ideas that you get in the middle of the night that gives quick turnaround in experimental work.

Q: Is it true that there is no secret work at Fermilab? How accommodating are you to all nations, including, for instance, the Chinese?

Sanford: There are no restrictions on visiting our laboratory. The Chinese have been here several times and they would be welcome any time they want to come again. This is an open laboratory, our work is published in the open literature. Because the laboratory is so large, any visiting group can only see part of it in a short time and only specialists see nitty gritty details in specific areas. Most visiting groups just see the general features.

Q: Did satellite flights lead to any results at Fermilab?

Sanford: Experiments in cosmic rays are always intriguing. There have been events that occur on such flights that we have found later to be related to the work we are doing. But when you do experiments in less than controlled situations your experimental results are thin. But certainly the higher energies in cosmic rays lead to some very interesting things.

Q: There was a lot of political overtone in the selection of the Fermilab site, wasn't there?

Sanford: There was perhaps a feeling that this accelerator should be where scientists wanted it to be. The politicians didn't see it that way. Where you put a large institution such as this does have large political implications. There are

important matters of the distribution of national resources and state prestige involved. It was clear that the government intended to decide where this laboratory was to go and I believe that is right. Otherwise, the selection might look like a put-up job and would reflect unfavorably on either the scientific or the political community. Ours was a valuable scientific project with great scientific merit and good site selection was important. It is interesting to note that this project had the support of two presidents. It was started by President Johnson and when Nixon succeeded him, he extended the funds that Johnson had appropriated. It was unheard of at that time for a project to have such broad commitment and it helped to keep it moving to reality.

Q: Is the political climate still healthy?

Sanford: It is getting more difficult. National needs have changed. Serious questions are being raised about just how much basic research the country can afford. Basic research has been a good bargain; it has kept our technology in the forefront. Now there is great interest in energy resources and money is going in different directions. At this laboratory we tend to be consumers of energy rather than producers; however we are into energy transmission and superconductivity research.

Scientists are not very articulate about their accomplishments. High energy physicists in particular are so intent on their work that it is hard to take time to talk about it. I think we don't stop long enough to take a breath and tell groups of citizens what we are doing. We are not doing enough in this direction.

Q: How much money will it cost to go to 1000 GeV at Fermilab?

Sanford: We couldn't afford to do this with conventional technology. We must use superconducting magnets. They are smaller and cheaper to build and use less energy. We estimate that it will cost \$35 to \$50 million to add on the so-called energy doubler feature to our existing accelerator.

Q: What are the applications that will come from the discovery of new particles?

Sanford: There are no direct applications in the first order of results; applications always come in the second order, after ten to twenty years' time has elapsed. Some of these applications have in the past been: (1) Devices for the production of energy -- that is, nuclear reactors; (2) The production and transmission of electrical energy; (3) The use of particles for medical purposes; (4) The use of radiation for industrial applications such as for sterilization and preservation.

In the current field of high energy, we see advances in materials engineering, in computer technology, in electronics developed to give us the high event rate capability that we must have here, and in medical applications such as the treatment center that will open here next year.

Q: How much electricity will you use at 1000 BeV?

Sanford: With the superconducting accelerator, about 1/2 of what we use now.

Q: What are the advantages in research that you will have at 1000 BeV?

Sanford: We will be able to extend by 60% the mass region of the production of particles. We will make beams at our present energies more plentifully and then we can extend the limits of our present findings.

The key in our research is usually to notice departures. We see now that there are departures in our results from predictions made at low energies. Now our theorists are extending their ideas to reconcile our results with new predictions. Something must happen - perhaps new findings.

The 1000 GeV accelerator will be an efficient addition to the research facilities of the United States because we will use the existing experimental areas.

NALREC DINNER-THEATER PARTY

Sunday, November 23

Pheasant Run - St. Charles

Dinner: 5:30 p.m.
Choice of four menus

Play - 7:30 p.m.
Musical - "Godspell"

This production of "Godspell" is directed by Patrick Henry, well-known for his direction of the Free Street Theater. Many performers are from the suburban area. Tickets available from Denise Tober, Ext. 3934. \$10 per person.

BASKETBALL SEASON OPENS

Fermilab will sponsor three basketball teams in the Batavia Park District League this winter. The Protons and the Hustlers teams will be joined this year by the Visitors, a team of Fermilab visiting experimenters. Nelson Sample is captain of the Hustlers, Jerry Bunce, the Visitors, Roy Justice, the Protons.

All games will be played at the Batavia Junior High School located at the corner of Rt. 31 (Batavia Avenue) and Wilson Street in Batavia. Games will be played on Tuesday and Thursday nights at 7:15, 8:15, and 9:15 p.m. A complete schedule of games is available from Jane Theis, CL-1W., Ext. 3560.

Opening games will be played by the Hustlers on Tuesday, November 18, 7:15; the Protons at 7:15 on Tuesday, November 25; the Visitors at 9:15 on Tuesday, November 25.

QST - CALLING ALL RADIO AMATEURS... There will be an important meeting of the Fermilab Amateur Radio Club on Friday, November 21, 5 p.m. in the Central Laboratory cafeteria, west side. It is important that all amateurs be present! Please call Greg Chartrand, Ext. 3140 if you cannot attend.

FERMILAB FILM FESTIVAL SCHEDULE

<u>Thursday, November 13</u>	8:00 p.m.	Science films - No charge
<u>Friday, November 14</u>	7:00 p.m.	Short subjects - \$1.00 admission
<u>Saturday, November 15</u>	10:00 a.m.	Repeat of science films - No charge
	7:00 p.m.	Films produced by students - \$1.00
	9:30 p.m.	Feature film - \$1.00, or included in 7:00 p.m. admission
<u>Sunday, November 16</u>	2:00 p.m.	Children's films - Adults \$1.00; Children, 50¢

All films will be shown in the Central Laboratory Auditorium

DON'T FORGET... Two meetings will be held on Friday, November 14 at 11 a.m. and 1 p.m. to explain the changes in the FTS telephone system that will go into effect December 1. Be there. New FTS directories will be distributed at the meetings.

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CONGRATULATIONS... to Jon and Patricia Sauer on the birth of their daughter, Alexis Fay, on Wednesday, October 15.

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DOUBLER ON SALE HERE... Food Services Department recently developed a new sandwich called the "DOUBLER". It was named by Mark Kibilko of PREP and consists of two hamburgers, melted cheese, lettuce and our own special sauce. They're at the grill.

FLAVOR OF THE MONTH - "Think Prunes" November 19. Try some of our home-made prune desserts. Remember prunes are the laughing food.

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