

The Village Courier



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FERMILAB EXPERIMENT ANNOUNCES PARTICLE DISCOVERY

A team of scientists from the United States and six European nations has announced that their experiment, run at Fermilab, has produced evidence of the production and subsequent breakup of a new subnuclear particle. Their observation becomes the first visible identification of a "charmed" particle. It was recorded through the use of a special detection system exposed to a beam of high energy neutrinos in the Neutrino Area at Fermilab. The detectors included six thick stacks of photographic emulsion specially prepared for such use. By processing the emulsion in somewhat the same manner as an ordinary photograph, a printed record of an interaction occurring in the stack became available for analysis by microscope scanning. One of these interactions, and a schematic explanation, is shown at the bottom of page 2.

A great deal of attention to charmed particles has been given at Fermilab and at other high energy physics research centers since the discovery of neutral currents at Fermilab and CERN. With the discovery of the psi-J particles in November, 1974 the search has become even more intense. If charm could be firmly established as the property of a family of particles of which psi-J and other recently-uncovered particles are members, a new era in understanding the nature of matter would open. Convincing evidence for the existence of charm has been obtained in several experiments carried out at Fermilab and other accelerator centers around the world. However, a vital piece of evidence was still lacking, since those experiments did not actually observe the tracks of charmed particles, but only the decay of the particles into other particles. Because the lifetime of charmed particles was predicted to be only a few ten-million-millionths of a second and its distance of travel only that equivalent to the thickness of a few sheets of paper, instruments of great sensitivity are required to detect the travel of a charmed particle, before it decays.

The emulsion used by the Fermilab team is a highly sensitive version of the material used for ordinary photographic film. It has the property that when subatomic particles pass through it their paths show up as trails of tiny black grains. Even a charmed particle will travel a distance long enough



...Dr. A. L. Read presented results at Fermilab seminar..



...Detection equipment used by Exp. #247. Emulsion stacks were inserted at the point indicated by the arrow...



...An aerial view of the Neutrino Area at Fermilab. E-247 located in portable building indicated by arrow...

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PARTICLE DISCOVERY ANNOUNCED (Continued)

for its trail in the photographic emulsion to be seen under a microscope before it breaks up.

However, looking for such a particle track in photographic emulsion stacks is like looking for a needle in a haystack. To help in the search, the blocks of emulsion were surrounded by other types of detectors which were capable of seeing the fragments from the particle breakup. From a study of these, the scientists were guided as to where to look in the emulsion. This unique combination of detectors has made possible the experimental break-through which has led to the direct observation of the track of the short-lived particle.

The E-247 collaboration represents the international participation in high energy physics at its utmost. Scientists from Great Britain, Belgium, Ireland, Switzerland, France, and Italy participated. E.H.S. Burhop of University College, London, is the spokesman for the group. A. Lincoln Read, Fermilab physicist, once a student of Burhop's in London, is deputy spokesman for the experiment.

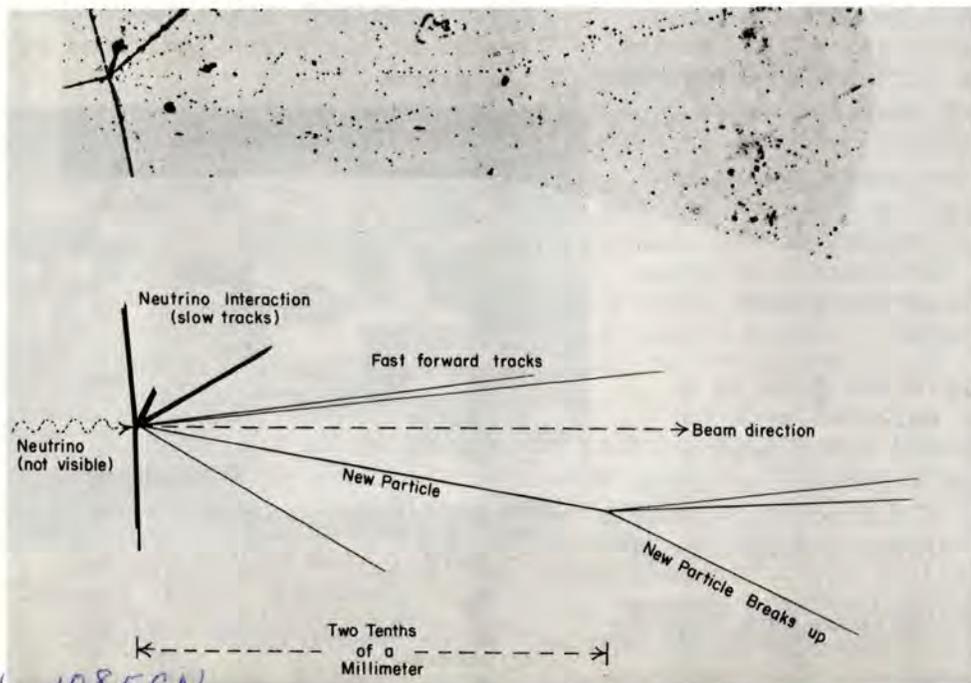
The experiment, set up in a porta-camp in front of Lab C in the Neutrino Area, was carried out between March and May, 1976. At the end of the run, the emulsions were "developed" and "fixed" at CERN, and were then parceled out among the participants for scanning. A tedious task, this scanning is slow and is traditionally carried out over extended periods of time at the home institutions of experimenters.

The emulsion technique played a prominent role in the discovery of new particles and high energy phenomena in cosmic ray and accelerator experiments in the decade between 1947 and 1957.

A weary lab worker scanning for Prof. J. Sacton at the Inter-University Institute for High Energies at Brussels last July called his attention to the single event seen on the left side of what has become an historic micrograph. Sacton quickly went to the microscope himself and within a very few minutes he noticed the travel, and subsequently the breakup of one of the particles which emerged from the collision of a neutrino with the emulsion target. Other members of the collaboration have travelled to Brussels to study that unusual event and to verify Sacton's interpretation of the event.

E-247 is a follow-up of an experiment conducted at CERN in 1965 by Prof. Burhop. He observed then that the 1965 experimental data were inconclusive, but he noted that it "should be renewed" when a higher energy, higher intensity accelerator became available. A proposal for E-247 was submitted in 1973 and approved in 1975. Most of the experimental equipment was built and tested at CERN.

Where does this latest piece of information fit into the charmed particle puzzle? "The emulsion technique gives us a spatial resolution about 100 times finer than a bubble chamber photo," Dr. Read states, "so that this is the first time we have observed directly the decay of a charmed particle, in this case some 10^{-13} seconds after its birth."



...AT BOTTOM...The schematic diagram depicts a neutrino interaction producing a number of slow tracks -- the black tracks -- and a number of relatively fast tracks moving in a generally forward direction. One of these fast tracks is seen to break up into three other tracks after .2 millimeters. This could be the breakup of a new particle into three charged particles plus at least one unseen neutral particle.

AT THE TOP...A photomicrograph of the actual emulsion, illustrating this same event...

TRAFFIC SAFETY CONTROL POLICIES RE-STATED

Among the duties of the employees of Management Safeguards Inc. under its contract with Fermilab is the traffic safety responsibilities carried out by the Site Patrol. Probably the greatest risk to which people are exposed at Fermilab is related to traffic problems. It is in an effort to minimize this risk that a set of reasonable traffic regulations has been established to be followed by everyone driving on site. The Site Patrol has been instructed to enforce those regulations, temperately, politely, but firmly. Recognizing that controversies are bound to arise in situations of this kind, a Laboratory Traffic Committee has been appointed to hear special complaints or grievances.

It has come to the Committee's attention that some employees have been abusive to guards when they have been stopped for traffic violations. Such actions not only undermine the morale of members of the guard service but in so doing these offenders jeopardize the safety of every staff member and visitor to the Fermilab site. Director R. R. Wilson has asked that all members of the Fermilab staff make their best effort to cooperate with the guard service in performance of their traffic control duties. Disciplinary action will be taken against those who purposefully ignore rules or who are uncooperative with the guards or with the Laboratory Committee which has been assigned responsibility in this area.

Procedures for the administration of Traffic Safety Rules at Fermilab are set forth below as a reminder.

"Fermilab traffic regulations conform to those of the State of Illinois, as set forth in the publication Rules of the Road. The placement of stop signs and speed limits reflect the recommendations of a consulting traffic engineer and changing traffic conditions. The Fermilab Site Patrol has the responsibility for monitoring compliance with traffic regulations on the site and for the issuance of citations to violators. The Traffic Safety Subcommittee plays a major role in the enforcement program.

"It is the Laboratory's policy that willful or flagrant disregard of safety regulations and procedures (including traffic regulations) is subject to disciplinary action. The enforcement procedures that have been developed include disciplinary action as follows:

"Warning Citations (issued by the Site Patrol) will be reviewed by the Traffic Safety Subcommittee. Most first offense moving violations will result in a warning letter from the Chairman of the Traffic Safety Subcommittee with copies forwarded to the driver's immediate supervisor and personnel file. Second violations, and serious flagrant first violations, will require the driver's appearance before the Traffic Safety Committee. In such cases, some form of disciplinary action may be imposed. If the driver is a visiting scientist, the procedure will be similar but letters will be sent by the Director's Office. Copies of the letter will go to the spokesman of the driver's experimental group and, in some cases, to the chairman of the Physics Department of his home university.

"Disciplinary actions for traffic violations will be graduated and may include the following:

1. A warning letter
2. Required attendance at the Defensive Driving Course
3. Denial of driving privileges on site or suspension of Government Vehicle Operator's Permit for an appropriate period
4. Suspension without pay for an appropriate period
5. In extreme cases, termination of employment or denial of the use of Laboratory facilities."

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NOTE TO EMPLOYEES...

Those employees needing to see the optician, who is on site every Tuesday, must call in advance for an appointment. The Safety Office will make every effort to accommodate work schedules and to handle emergency repairs. Those employees who "walk in" without an appointment are taking time already allotted to someone else. Call Ext. 3580 on Wednesday, Thursday, Friday or Monday for a Tuesday appointment. A phone call will help us all save time as well as our sight.

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EMPLOYEE NEWS & NOTES

The first anniversary of the Supplement Retirement Annuity (SRA) program is nearing. The SRA program began January 1, 1976. Changes can be made to SRA any time after one year. You may want to consider several options.

1. Increasing the amount now being remitted to your SRA. The amount can be increased up to the "maximum exclusion" allowance under Internal Revenue Regulations.
2. Decreasing the amount now being remitted to your SRA. You may have found the amount you designated last year was too much. The minimum is \$10 a month per contract.
3. Changing the allocation of SRA premiums to your SRA accounts. For example, if your SRA contribution was 50% to TIAA and 50% to CREF last year you might decide to put 100% to CREF this year. Partial cash withdrawals of no less than \$1,000 once every six months are allowed from CREF SRA's.
4. Closing the contract you have and starting a new one. The advantage of this is that it allows you more flexibility in arranging the return of income from SRA accounts.
5. You may want to cash your SRA contract. If you do this, the amount of money received is taxable as income in the year in which the money is received.

An SRA account may be started at any time. All employees enrolled in the retirement plan are eligible to participate in the SRA plan and can do so on a deferred income basis.

If you have any questions, please contact the Employee Benefits Office, Ext. 3395.

COLD WEATHER CAR STARTS are available at Fermilab until 6 p.m. on inclement work days. Call Ext. 3307; if no answer, call Site Patrol, Ext. 3414.

CHILDREN'S CHRISTMAS PARTY, Sunday, December 12 will be held in the Central Laboratory Building from 1-4 p.m., for kids from 1-8 years of age. Cartoons will be shown in the Auditorium at 1 p.m., then punch, cookies and coffee will be served in the Cafeteria. Santa and Mrs. Klaus will have a gift for each child. Call Denise Tober, Ext. 3934, CL-8 Cross-over, or return the slip below to tell her how many children you are bringing.

(Detach and mail to Denise Tober, CL-8)

I will bring _____ children to the Christmas Party
on December 12 (ages 1-8).



SNOWBALL '76, sponsored by NALREC, will be held this year on Friday, December 17, at St. Andrews Country Club in West Chicago. Fermilab employees and experimenters, employees of Management Safeguards and Mutual Management, and ERDA employees and their spouses are invited to attend.

The holiday event, always one of the most popular on the Fermilab social calendar, will start at 6:30 p.m. with a cocktail hour. Dinner (New York strip steak) will be served at 7:30 p.m. Dancing to "Freshwater" will continue from 9 p.m. to 1:00 a.m.

Tickets at \$8.50 per person include two free cocktails and dinner. Tickets will be sold to employees on the above list from December 2nd through the 10th. After December 9, remaining tickets will be available to friends or relatives of eligible Fermilab people. In addition to the representatives listed in the November 18 Village Crier, tickets are being sold by: John Stoffel, Meson Detector Building; Denise Tober, Computing, 8N; Linda Freund, Architectural Services, 5W; Diane Kowalski, Accelerator, Cross Gallery; and Denise Augustine, Neutrino, 12N.