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FERMILAB SCANNERS UNCOVER SECRETS ON FILM

Glimpses of the unique regions of high energy physics explored in the Fermilab 15-Foot Bubble Chamber's first experimental runs are beginning to emerge from the Film Analysis Facility on the 9th floor of the Central Laboratory. In the hands of a group of twelve specially-skilled employees lie the clues to this vast reservoir of new knowledge. In their darkened headquarters, the scanners of the Film Analysis Facility combine their visual observations with electronic techniques to analyze film produced by the 15-Foot Chamber when two major experiments ran there, and the film of two experiments run in the 30" Bubble Chamber, in the latter half of 1974.

FAF's present scanning staff consists of Karen Carew, Steve Condon, Barbara Cox, Diana Dixon-Davis, Diane Garcia, Scott Meyer, Geri Palmer, Sue Poll, Beatrice Rohde, Annette Roy, Nancy Svejda, Georgia Sykes. Ray Hanft directs the work of the Scanning Group.

In the bubble chambers, each pulse of beam from the accelerator sends a shot of particles into the liquid hydrogen in the chamber. Cameras mounted in the top of the chambers photograph the interactions that occur as the beam passes through the hydrogen. About 10,000 pictures of the interactions are taken each good day of an experimental run in the 15-Foot Chamber, and nearly triple that number in the 30" Chamber. It is this film that is analyzed by the FAF.

One of the major experiments in the 15-Foot Chamber (Experiment 45, a collaboration of Fermilab, Soviet visitors, and the University of Michigan), captured the first neutrino-hydrogen interactions at Fermilab energies in which every charged track can be seen and recorded by the chamber's cameras. Another experiment (Experiment 234, a collaboration of Fermilab and Florida State experimenters) produced the first hadron



...Steve Condon..Georgia Sykes..Sue Poll...



...Diane Garcia (L), Diana Dixon-Davis...



...Geri Palmer (L), Karen Carew...



...Annette Roy (L), Nancy Svejda...

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exposure in the Fermilab 15-Foot Chamber, demonstrating the chamber as a tool for studying the strong interaction force. The two 30" Chamber exposures also being analyzed in FAF are a study of hadron-deuteron interactions (Experiment 194 -- Fermilab, Stony Brook, Carnegie-Mellon University and the University of Michigan) and the first exposure of the 30" Chamber at Fermilab to an enriched anti-proton beam (Experiment 311 -- Fermilab, Michigan State University, and Oxford University). In all experiments, the permanent unbiased filmed records of the experimental results have produced enough material for months and years of study.



...Scott Meyer...

...Beatrice Rohde (L), Barbara Cox...

The 15-Foot film is so rich and complex that no completely automated method can be devised to study it. The scanning procedure at Fermilab begins with the sharp observations of the scanners, as the film is run across a lighted table at the scanner's direction, magnified first at 12 times, then 66 times to examine fine details. A beginning scanner is provided a basic set of instructions -- how to identify the interactions and then to record the location and a number of characteristics of the tracks. This is pure scanning, or reviewing, of the film, resembling the assembly of a library catalog of the film's contents. When the interactions have been identified, the scanner must measure the position of about ten points on each track, with a precision digitizing plane. These points are fed by the scanner into the PDP-9/L computer by tapping a foot-controlled device. Eventually, these points are analyzed by sophisticated PDP-10 programs to produce values for the momentum and direction of each track.

There is nothing in any other working community that prepares a scanner for this unusual work. It is precise work, but requires flexibility and good judgment. High energy particles are supposed to do this and that, scanners are told. But if they don't, decisions must be made quickly so that an unusual interaction or an apparent exception will be pointed out to experimenters. The diversity of the interactions is so large that even after a number of years of scanning things will be seen that have never been seen before.

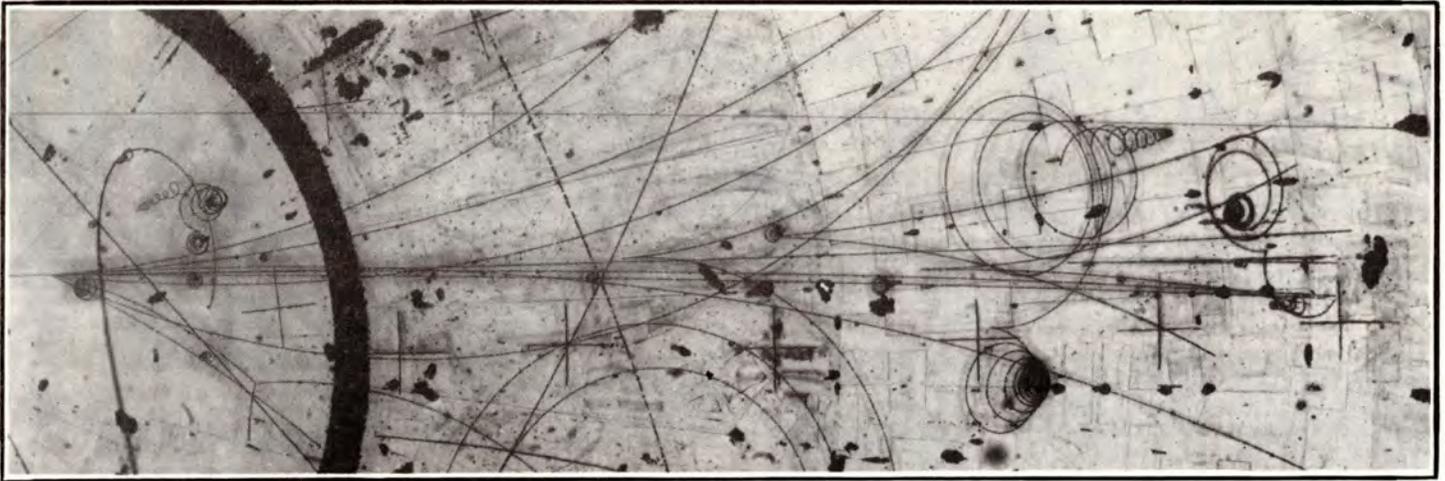
Annette Roy, Scanning Supervisor, points out that a lively pace has been set for the scanners with the influx of work to be done on the new film from the 15-Foot Chamber. "It makes our job more involved and more interesting," she says. "The 15-Foot film takes more time and requires more scanning."

Scanners' reports are studied by the scientists of the experiments. The film is shared by the institutions that collaborate in the experiment; observations are compared frequently.

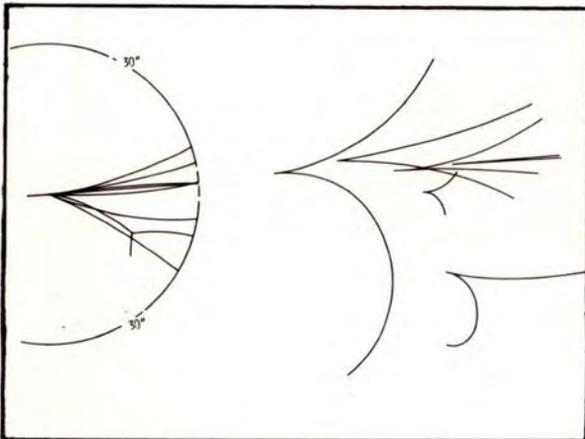
Meanwhile, Fermilab scanners move from one to another of the scanning assignments at Fermilab's three MOMM's and four Micrometric tables. In this variation of their work, their individual abilities assure that the high points of the films will be captured and that monotony does not set in.

And what might emerge from these studies? According to Thornton Murphy, physicist currently serving as Chairman of the FAF Committee, an exciting possibility would be that Experiment 234 might find pairs of charmed particles. "If it doesn't," he says, "the detailed investigation of strange particle production at the highest energies in the world is a unique feature of the experiment. Experiment 45 is unique in that it is the one Fermilab neutrino experiment that can explore the full details of every charged track, and many of the neutral particles, in the final state of a neutrino interaction. And, naturally, they are looking for charm too -- with neutrino interactions where there is a possibility of producing single charmed particles instead of pairs."

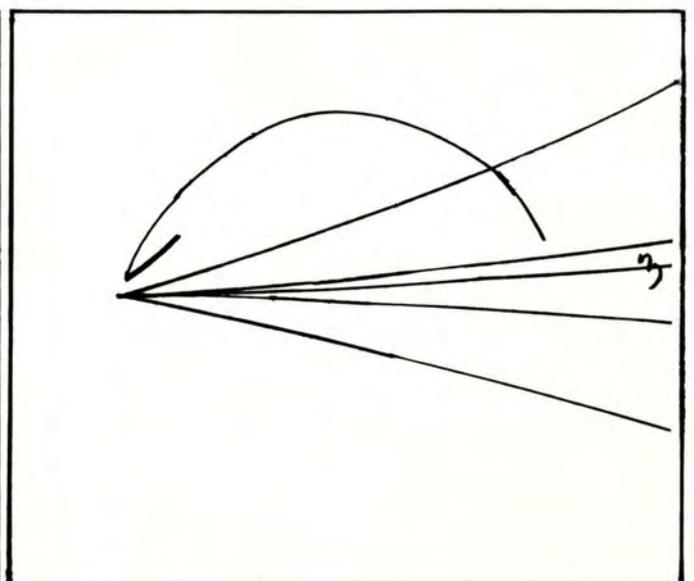
It will be the careful work of the FAF scanners that will have set up these observations for Fermilab experimenters.



...An example of the type of interaction being studied by Experiment 234 in the Fermilab 15-Foot Bubble Chamber...



..(Left) A line drawing reconstructing from the above event the particular points of interest to experimenters. The dotted circle labelled 30" represents the boundary of what would be seen of a similar event in the 30" bubble chamber, sharply illustrating the new horizons available with the 15-Foot Chamber. In addition to the eight charged prongs, the large chamber volume allows the detection of two "vees" and four $e^+ e^-$ pairs...



...An example of a rare neutrino event taken by Experiment 45 in the Fermilab 15-Foot Bubble Chamber. The neutrino (not visible) enters from the left and produces 5 charged prongs. In addition, the decay of a neutral lambda hyperon to a vee is observed just above the interaction point...

THIS WEEK AT FERMILAB

Friday, March 14 - *The Gospel According to St. Matthew* will be shown in the Fermilab Auditorium at 8:00 p.m. The film is the first in the Fermilab International Film Society's Spring-Summer 1975 series. The public is invited. Admission is \$1.00 for adults; 50¢ for children.

The film portrays the Gospel according to the writings of St. Matthew, and critics have said that this version, dedicated to the memory of Pope John XXIII, presents a realistic portrayal of the life of Jesus. The director of the film, Italian Pier Passolini, has included the music of Bach, Mozart, as well as black spirituals and the Congolese Missa Luba to expand the scope of the story. His unconventional approach is also reflected in the use of rugged Italian landscapes, costumes of coarse material and faces without make up.

Friday, March 14 - Nalrec St. Patrick's Dance, 9 p.m. - 1 a.m. - Village Barn - no admission charge. Dancing to music by the Mellotones starring Fermilab's Norb Lesneski.
Sandwiches, Snacks - Green Eggs & Shandygaff - Cash Bar

Wednesday, March 19 - Happy Hour - Village Barn - 5-7 p.m. Juke box and snacks.

DANCE PROGRAM MARCH 21

Choreographers' Showcase, an evening of dance, will be presented by the Fermilab Auditorium Arts Series on Friday, March 21, at 8:30 p.m. in the Fermilab Auditorium.

The program will include performances by Chicago-based dancers Judy Joseph and Ken Brelsfoard, Pascual Olivera, the Gus Giordano Company, and Nina Shineflug's Chicago Moving Company.

Joseph and Brelsfoard have performed their sophisticated choreography internationally, including the International Ballet Competitions in 1974 in Bulgaria. Olivera, known as one of the finest Spanish dancers in the U.S., was at one time a member of the Jose Greco Spanish Ballet. The Gus Giordano Dance Company specializes in jazz dance style that appeals to all dance as well as jazz fans. Contemporary dances by Nina Shineflug's Chicago Moving Company will complete the program.

The dance program is one of a continuing series of cultural presentations of the Fermilab Auditorium Arts Series. Reservations may be made in advance of the concert by calling Ext. 3091, or Ext. 3082. Tickets are \$3.00 for adults, \$1.50 for children, and student group rates are available. Tickets will also be sold at the door. The public is invited.

CONGRATULATIONS to Janice & John Rossetto (Neutrino) on the birth of their daughter, Lynn Marie.

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CLASSIFIED ADS

FOR SALE - 1970 Olds 4 dr. HT, \$1500. 1968 Olds Vista Cruiser 3 seat wagon, \$1200. Call Earl Nordmeyer, Ext. 3712 or 741-0972.

FOR SALE - '74 Tradesman 100 Dodge Van, auto., custom inside, A/C, 2 porthole windows. \$4200. Call Bob Pucci, Ext. 3330.

FOR SALE - 1969 Buick LeSabre, P/S/B, auto. trans., w/new studded snow tires, new battery. \$500. or best offer. Candy Jierre, 76-2165 or 964-2436.

FREE - Old Rider Mower, needs work. Yours if you take it away. Frank Cole, Ext. 3728.

FOR SALE - '71 Toyota Corolla, 1600 cc's, 4 speed, A/C, 8-track tape player. Jenny, Ext. 3324.

FOR SALE - 2 6:50x13 Snow Tires. Good for most small cars. Can be used as spares in summer. Price \$15 or highest bid. Call Ernie, Ext. 3210.

FOR SALE - 1974 Kawasaki 500 cc, Green, 1600 actual miles. Call Ralph Ovitt, Ext. 3759, or 851-6027 after 5:30. Must sell, \$1100.

WANTED - Photo enlarger. Carl Ohrn, Ext. 3719.