

# The Village Courier



fermi national accelerator laboratory

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## 1,000,000TH BUBBLE CHAMBER PHOTO

Neutrino's 15-foot Bubble Chamber has become Fermilab's most prolific picture taker, hitting the one million exposure mark during a run for Experiment-31A (Purdue, Argonne, Carnegie-Mellon collaboration).

"Breaking into seven figures, three years after the first physics picture was produced, isn't a record, but doing it at a big accelerator repetition rate and 400 Gev, is," said George Mulholland, group leader. "Every member of the operating team can be proud of his contribution to this milestone." Acting group leader at the time of the achievement was Hans Kautzky.

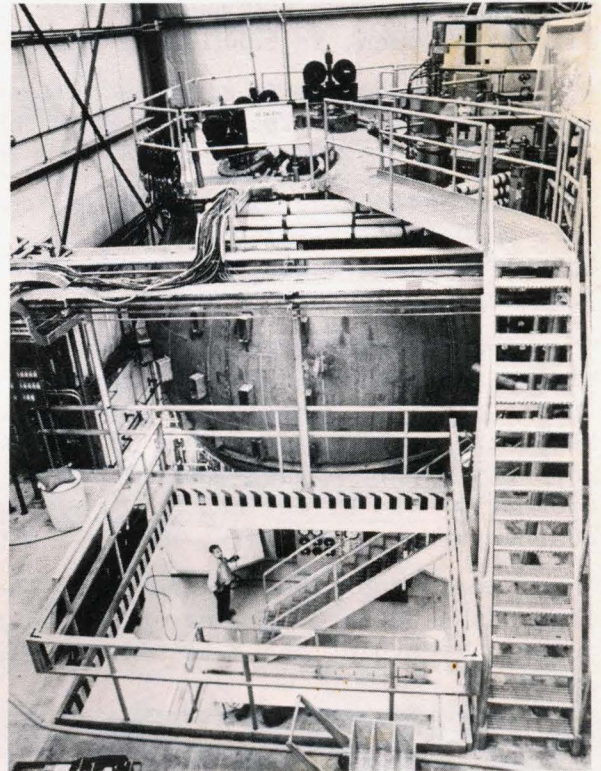
The Bubble Chamber, Mulholland explained, is a major user of accelerator protons and plays a key role in Fermilab's experimental program.

Invented by Donald Glaser (Univ. of Michigan, 1952) in a glass dewar measured in inches, bubble chambers have grown to be huge stainless steel high-energy particle detectors, 20,000,000 times the volume of the original. A Bubble Chamber is a physics photo studio in which charged particles, traveling virtually at the speed of light, have their "foot prints" captured on film in the form of bubbles developed along the path. These trails or "tracks" can then be analyzed with the help of one of the world's largest superconducting magnets for particle charge, momenta, production angle and interaction.

"Our 15-foot chamber is called the world's largest by the Guinness Book of Records, and I'll settle for that," Mulholland noted. He added, "The particles being supplied to this chamber are of greater energy and number, resulting in unsurpassed event rates."

In operation since July, 1973, the first experiments began in July, 1974. The chamber has been used to explore the weak interaction with neutrino exposures.

The chamber vacuum tank is a 22 ft. diameter sphere raised to a height of 39 ft. above a special foundation. The chamber itself, a 12.5 ft. diameter sphere with 2.5 ft. long entry window, is nestled inside a superconducting magnet that is housed in the vacuum sphere. The entire installation weighs 250,000 pounds.



...15-foot Bubble Chamber as pictured in Guinness Book of World Records...



...G. Mulholland, BC group leader, with photo recording four proton events...

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## 1,000,000TH PHOTO (Continued)

The chamber holds 34,000 liters of cryogen (liquefied gas), hydrogen or hydrogen/neon, that serves as the target nuclei and detector at once, at a temperature of  $-415^{\circ}\text{F}$ . It is surrounded by a superconducting magnet generating a field of 3 Tesla (30 kilogauss) at its geometric center - that's 60,000 times the earth's magnetic field.

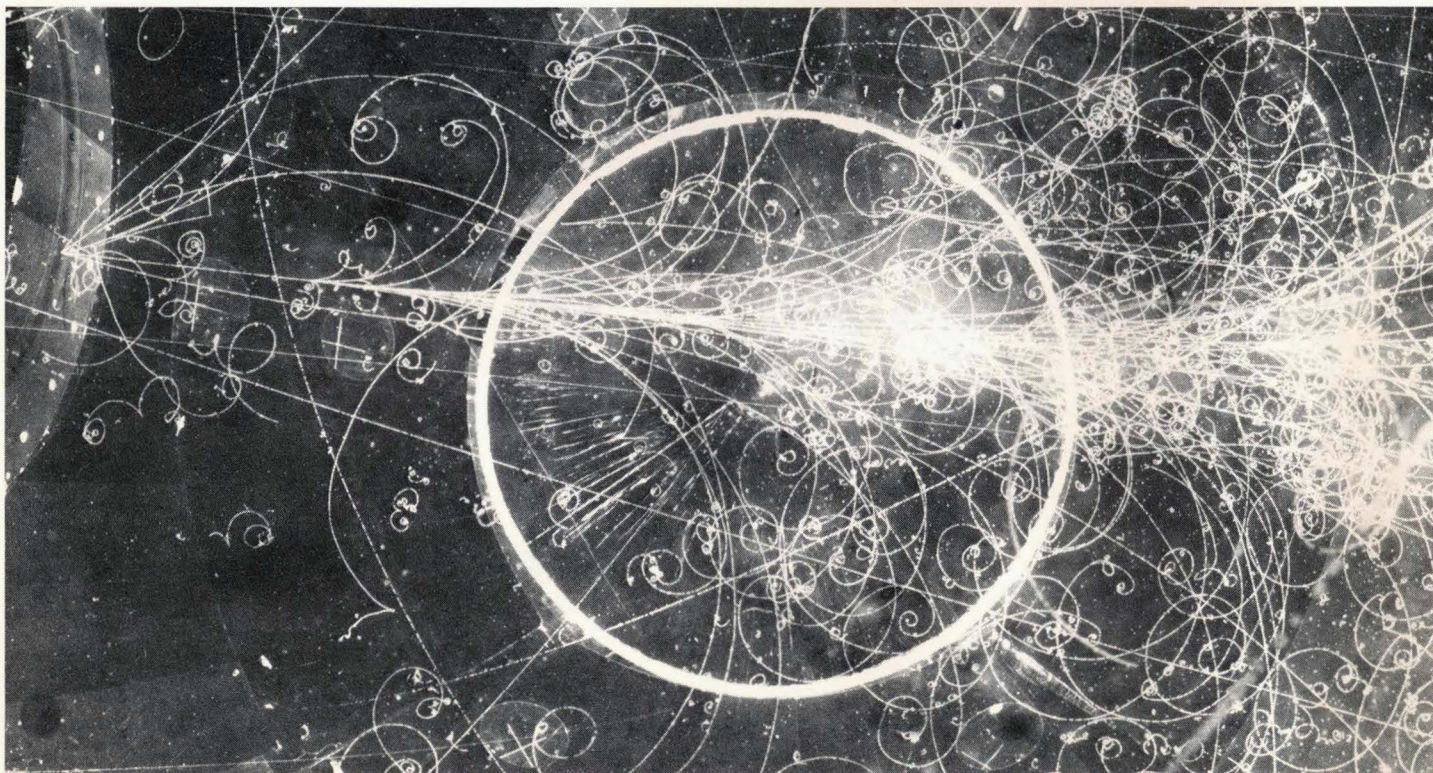
Particle tracks are photographed simultaneously by one of two sets of three cameras: the neutrino and hadron cameras. Three views are taken of each event in order to reconstruct a precise model. Each camera is fed by a 2000' roll of 70 m.m. black and white film that yields 8,000 photos. Pictures are taken at the rate of typically 6,000 per day. Film development is handled at Argonne National Laboratory.

Developed film is analyzed (scanned) for events in film analysis or at the experimenter's home university. At Fermilab, computer-assisted scanning crews work around the clock inspecting each frame for interesting interactions.

The basic operating cycle -- expansion, flash and photograph, recompression -- occurs once each accelerator cycle, but the 15-foot chamber can, and has, multi-pulsed. That is, it can repeat its own operation up to three times during a single accelerator flat-top - tripling the picture rate.

The process is directed from a control room 200 feet away from the chamber by specially trained engineers and technicians. They carefully monitor the major systems of the Bubble Chamber. The recent achievement, Mulholland said, is a tribute to the staff which keeps the machine operating. "Through their efforts, the Bubble Chamber is becoming ever more efficient -- last month 122,000 pictures were taken by team leaders Harry Carter, Jim Early, Jim Kilmer and Jon Woodworth. The next million pictures can be expected in months rather than years, Mulholland predicted.

The 15-foot Bubble Chamber is one of two used at Fermilab since its founding. The other is a 30-inch Chamber, also located at Lab "A". The 30-inch Chamber is another performer, recording about 24 million pictures at Fermilab, as many as 8 per accelerator cycle.



*...Particle interactions recorded by Experiment #53A in the 15-foot Bubble Chamber at Fermilab...*

### A HOLIDAY REMINDER

For most people, the holiday season is a host of happy happenings: family gatherings, exchanging gifts, mini-vacations from work. For Dr. Lincoln Read, Research Services head, the holidays have a somber tone. Last Dec. 30, about 5 p.m., an auto crossed the center line on Road D, just east of the Industrial Area, and struck Dr. Read's auto. After 11 months of recuperation, he is still recovering from injuries suffered in the crash. They included internal and upper body injuries, plus wounds that left both legs in casts. In a note to the Laboratory Director, Read notes that, "As the holiday season approaches, I would like to suggest to you that you remind all employees of the Laboratory policy concerning such matters as drinking on-site during working hours in order to minimize the risk of tragedies such as my accident of a year ago."

Employees are reminded that alcoholic beverages may not be consumed on site, unless at officially-sponsored functions, in Village residences, or at the User's Center. Official Laboratory yuletide observances are listed below and also were noted in an all-employee memo of Dec. 5 issued by John McCook, Associate Director for Administration.

### CHRISTMAS PARTY CHECKLIST

Don't forget, NALREC is sponsoring yule parties for employees/visitors and their children. Employees, experimenters, Advance Security, Mutual Maintenance, Fermilab-Department of Energy personnel are invited. Mark these events on your calendar:

CHILDREN--Sunday (Dec. 11) kids 1-8 years of age will have their party from 1-4 p.m. in the Central Laboratory cafeteria. Santa will distribute gifts with movies and refreshments also planned. For information, contact Sharon Lackey, Ext. 4422/3721.

ADULTS--Tuesday, Dec. 13, is the deadline to buy tickets for the "Red Ribbon," 1977 all-laboratory Christmas dinner-dance. The event for employees and spouses will be held Friday, Dec. 16, at St. Andrews Country Club, West Chicago. Cocktails at 6:30 p.m.; dinner (prime rib) at 7:30 p.m.; dancing until midnight to the music of "Frank K and Company." Tickets at \$8 per person provide two free cocktails and dinner. For tickets, contact Sherry Nila or Dominick Carullo, Magnet Facility; Jesse Guerra, Proton, CL-GF; Ed Lavallie, 11-W or any other NALREC committee member.

An "End-of-Year" celebration is set for Tuesday, Dec. 20, at the Kuhn Barn. A band, food, and cash bar will be featured from 6 to 10 p.m. Free admission.

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### THE PHYSICS OF VIOLINS



Scientific violin-making, using physics principles and computers, was outlined for a Fermilab audience Nov. 29. "We guarantee an excellent product . . . maybe," said Marvin Camras. The speaker, senior science advisor to IIT Research Institute, was sponsored by the Amoco Research Center club of Sigma Xi, Scientific Research Society of North America. In "The Tone Quality of Old Violins--Science Examines a Lost Art," a slide-lecture, Camras told how physicists can duplicate 300-year-old violins crafted by old masters such as Stradivarius, Amati or Guanarri. According to Camras, frequency, spectral, transient and other tone responses can be computer-correlated to determine ideal wood, varnish, strings, and structural features to duplicate old masters' violins. Much research remains to be conducted, he concluded. Coordinating arrangements was James MacLachlan, Operations. Amoco's Sigma Xi club members represent Fermilab, Wheaton College and Amoco Research Center. Sigma Xi's purpose is to encourage original investigation in science--pure and applied.

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WINTER F.A.S.T. CLASSES OFFERED

Two Fermilab Applied Skills Training (FAST) classes will be offered during the winter. They are:

BASIC ELECTRICAL CONTROLS FOR MECHANICAL TECHNICIANS -- Monday and Wednesday, 4-6 p.m. (Jan. 16 - Mar. 8). The class is designed to acquaint mechanical technicians with basic electrical control circuits for pumps, motors and other equipment. Instructor: Jim Garvey.

BASIC CRYOGENICS FOR TECHNICIANS -- Monday and Wednesday, 4-6 p.m. (Jan. 16 - Mar. 8). A broad introduction to the field of low temperature refrigeration from the technician's view, including history and terminology with an emphasis on practical aspects of low temperature techniques, will be offered. Instructor: Don Richied.

Free FAST classes are open to entry-level mechanical/electronic technicians. Deadline to enroll is Friday, Jan. 6. For application forms or more information, contact Ruth Christ, training officer in Personnel, CL-6E (Ext. 3324).

INTER/NATIONAL FILM SOCIETY

presents

"Wild Strawberries"

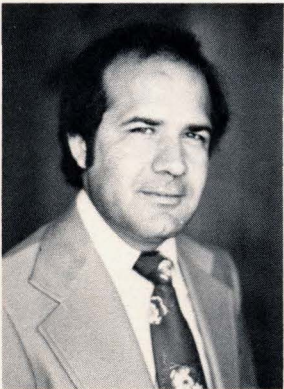
8 p.m.

Friday, Dec. 9

Fermilab Auditorium

Dr. Isak Borg awakens early on the day he is to receive an honorary degree, disturbed by a dream of his own death. Memories of the past mingle directly with scenes of the present. Dreams are employed to mystify and clarify. The old man comes in contact not only with places of his childhood, youth and manhood, but also with other travelers on a drive symbolizing his life's journey. Directed by Ingmar Bergman. Swedish, subtitled, 1957. Adults \$1.50, Children 75¢

JESSE GUERRA: NEW CITIZEN



...J. Guerra...

November 15, 1977, was a memorable day for Jesse Guerra (Proton) . . . and his wife, Mary. The Guerras were among 210 persons that became naturalized citizens in ceremonies held in Chicago. Forty-five nationalities--including Colombia, Hong Kong and the Philippines --were represented, Guerra said. Monterrey, Mexico, was home for the Guerras until eight years ago, when the couple emigrated to the U.S. They became permanent residents and shortly later, Jesse joined Fermilab. About six months of home study prepared the Guerras for an oral citizenship exam. Knowledge of English, history and government is tested. Naturalization ceremonies opened with the Nov. 15 class taking the oath of citizenship at the federal building. Afterwards, the new citizens were honored at a program held at Chicago Temple Fellowship Hall. Sponsor was the National Society of the Colonial Dames of America in the State of Illinois, in cooperation with the Citizenship Council of Metropolitan Chicago. Mementos of the occasion included a congratulatory letter from President Jimmy Carter. Jesse and Mary reside in Aurora with their children: Alexander, 7, and Edgar, 3.

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FLOATING HOLIDAY REMINDER

Employees: time is running out to take your 1977 floating holiday. The "floater," any regular workday selected by an employee with prior approval from the supervisor, must be taken during a calendar year. During 1977, the floating holiday is among nine paid holidays observed by the Laboratory (Friday, Dec. 23, will become a full holiday as a result of combining half-days for Christmas eve and New Year's eve--providing a four-day Christmas weekend. Since New Year's day also falls on Sunday, it will be observed by the Laboratory with a full holiday on Monday, Jan. 2.)

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