FERMINEWS

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BUBBLE CHAMBER BEGINS DEUTERIUM RUN

Fermilab's 15-ft. Bubble Chamber is marking many "firsts" this month.

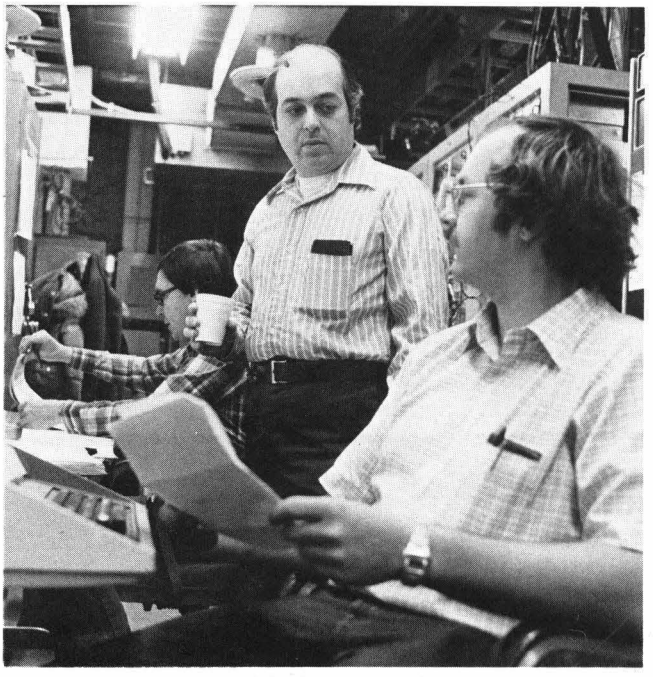
For the first time in its five-year history the chamber is operating with a liquid deuterium fill. The record for deuterium visible volume is increased, by about 25% to 27,000 liters. This is also the first deuterium bubble chamber exposure to Fermilab's 350 GeV 10^{13} protons per pulse, broad-energy band, neutrino horn beam. The previous record holder was the 12-ft. bubble chamber at the Argonne National Laboratory.

The Fermilab chamber also experienced a record picture-taking rate of 150,000 four-view pictures during the first month of the deuterium run. Excellent accelerator and chamber performance, especially during the long Thanksgiving weekend, led to the new record, according to George Mulholland, group leader. The current picture production is at a 1.8 million exposures/year rate.

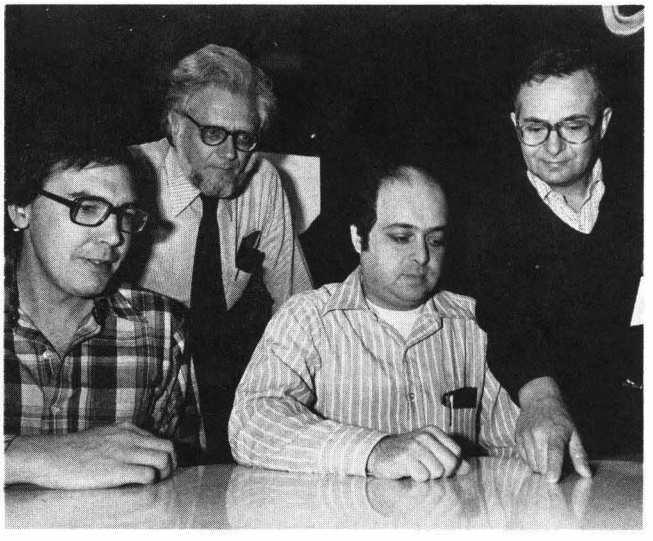
According to Mulholland, the deuterium nucleus, which contains one neutron and one proton, provides the simplest available target for studying neutrino-neutron interactions. Deuterium (H^2) is a rare isotope of hydrogen (H^1); one deuterium atom is found for about 5,000 ordinary hydrogen atoms. Using deuterium as a target will permit experimenters to compare neutrino-neutron and neutrino-proton interactions for the same number and energy spectrum of incident neutrinos.

The deuterium in use is "Bubble Chamber Grade" with a tritium (H^3) contamination of less than 10^{-14}. Decay of the radioactive tritium in larger concentrations would cause excessive bubbles and make operation of the Bubble Chamber impossible.

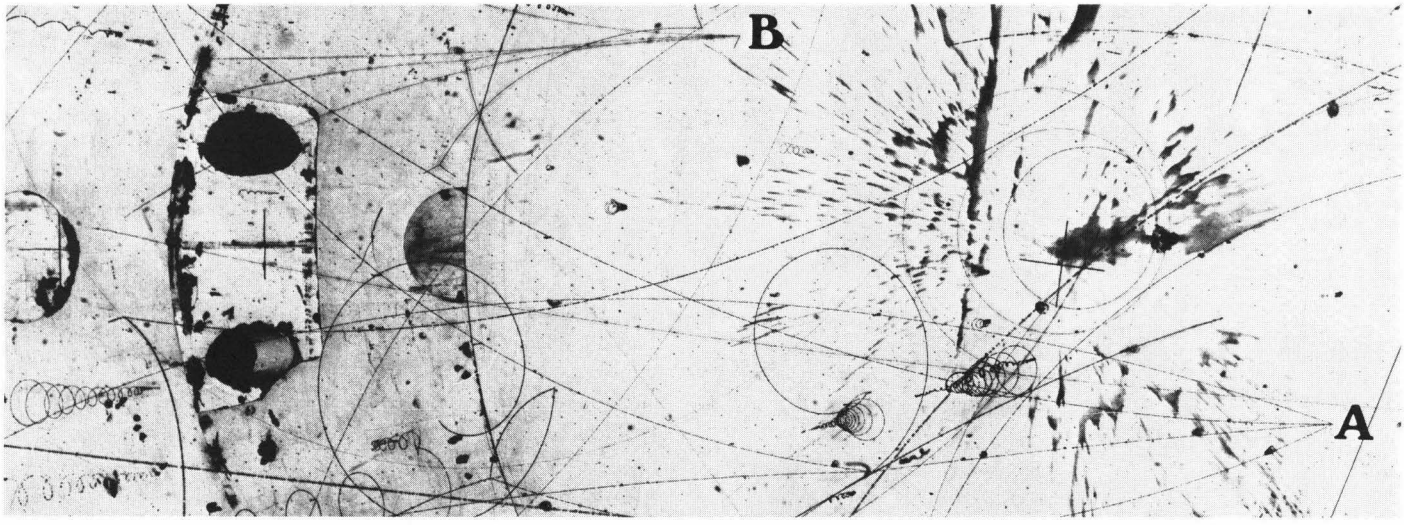
(Continued on Page 2)



...Experimenters (L-R) J. Hanlon, H. Rubin, S. Sommars of E545 during data taking in their historic experiment...



...Hanlon, G. Snow, Rubin, R. Burnstein, study film of their experiment on light table...



Two events (A & B) recorded on the film of E-545 in the current "deuterium run" in Fermilab 15 ft. bubble chamber. The events illustrate neutrino interactions with neutrons inside the deuteron nucleus. In A the charge balance of the four tracks is the signature of the neutrino-neutron interaction. In B, the additional decay of the strange particle may be a signature of "charmed particle" production. The simple, clean track images allow precise measurements of particle trajectories in deuterium...

BUBBLE CHAMBER DEUTERIUM RUN, Cont'd.

The present quantity of deuterium in the Fermilab Bubble Chamber is the largest in elemental form anywhere in the nation; its estimated value is $2,500,000.

The current supply was assembled from 29,000 liters in use for years at the Argonne National Laboratory and 8,500 liters provided by the recent electrolysis of "heavy water" at the Brookhaven National Laboratory under a gas-sharing agreement between Fermilab, ANL, and BNL. The heavy water source is the Savannah River supply that primarily serves the heavy water reactor program as a neutron moderator.

Experiment #545 will study neutrino interactions in deuterium at Fermilab. Collaborators on the experiment are from the Illinois Institute of Technology, University of Maryland, State University of New York at Stony Brook, Tohoku University and Tufts University. The planned 350,000 picture exposure of this experiment is expected to yield about 30,000 neutrino events with 1×10^{13} protons per pulse on the target.

Jim Hanlon, one of the collaborators, explains the experiment's goal, "Since deuterium presents an almost free neutron and an almost free proton as targets to the incident neutrino beam, it is the ideal target in which to compare neutrino-neutron interactions with neutrino-proton interactions. Simple quark models of the neutron and proton predict what this comparison should be. More sophisticated models using the recent theory called "quantum chromodynamics" makes more detailed predictions of the differences between neutrons and protons. This experiment can provide significant tests of the validity of this theory.

"In addition, the neutron is the best target for the production of a charmed baryon by neutrinos. (Just as a proton consists of three quarks -- u,u,d -- the lightest charmed baryon is made up of three quarks -- c,u,d)."

"One or two of such events have been reported, but we hope to obtain a considerable sample of charmed baryons in this experiment and to study some of their detailed properties," reports George Snow (U. Maryland), spokesman for the experiment.

An anti-neutrino-deuterium exposure, Experiment #390, with collaborators from Purdue University, Argonne National Laboratory and Carnegie-Mellon University will follow Experiment #545.

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NEW RESIDENTS ON THE RANGE

Fermilab's buffalo herd grew to 42 head recently with the purchase of ten cows from Custer State Park, S.D. The herd now has 24 mature cows, two mature bulls and sixteen young stock under two years old.

Herdsman Vic Kerkman reported the latest step in the program to eventually pasture 100 head of buffalo at Fermilab. A herd of that number will be self-supporting, maybe even profitable. Commercial herds of buffalo raised for their meat are now common in the Midwest and western states.

The new cows are believed pregnant so that a substantial number of new calves is expected next spring, according to Kerkman. The Laboratory will sell seven of the young bulls to keep the proper male-female ratio in the herd.

Kerkman says buffalo live to be 30 years old (domestic beef live 10-12 years). Some female buffalo have 30 calves in their life time.

During the winter Kerkman feeds the buffalo mixed alfalfa hay and a 14% pellet feed. They are outdoors most of the time, but take advantage of shelter in their pasture when the bad weather comes. In the summer their 85-acre pasture is more than adequate.

The menus being served to the buffalo appealed to a young doe a year ago. She visited the buffalo herd, then returned to stay the whole winter. In the spring she bore twin fawns;this winter, all three show up at the buffalo cafeteria. Ms. deer is not too secure about bringing her babies into the muscular arena of 42 hungry buffalo, so she chooses meal times carefully, then takes the youngsters back to a nearby grove of trees for safety. Leaping fences is no problem for this single parent and her children, but they have abandoned all ties with their ancestral family which lives in the "Big Woods" north of the Pine Street entrance road.

Kerkman reports that a big 4-point buck from Big Woods visited the lady

deer recently and he hopes that the deer population will continue to increase.

The deer and the buffalo live peacefully together.

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THE FERMILAB LIBRARY needs two issues of PHYSICAL REVIEW D to complete its collection: March 15 and May 1, 1978.

Can you help?

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DON'T WORRY ABOUT THE SWANS....Bob Kraft of Site Services is telling people who call him. All of the waterfowl in the ponds west of the Central Laboratory are safe because the water in those ponds is "warm" -- 45-50°. This is a safe and satisfactory environment, Kraft says. He reminds those who are concerned that the waterfowl at the Brookfield Zoo near Chicago also live in open water in the winter time. Freezing of their webbed feet is the only danger these birds face in the winter, Kraft says.

A REMINDER FOR FERMILAB EMPLOYEES

In the memo dated Nov. 21, you were advised that "For persons currently enrolled in dependent life insurance the procedure to sign up for additional dependent coverage is as follows:

For one month, through December 31, 1978, the additional coverage is available without proof of insurability. To sign up, a brief form must be filled out in the Benefits Office, CL-6E. After January 1, 1979, if additional coverage is requested, proof of insurability will be required."

If you have any questions about dependent life insurance, contact Ralph Wagner, Ext. 3395.

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LOST ON SITE: 6 pieces of steel sheet, 12'l x 8"w x 5/8"th, with 24 tapped 1/2" holes in 6 groups of 4, last seen in the Central Laboratory basement in late September. Anyone having information about this material please contact the Proton Department on Ext. 3152.

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POLLEY COSGROVE ON NATIONAL TV BROADCAST

On the New Year's Eve broadcast of the Boston Pops Symphony you'll be able to see Polley Cosgrove, daughter of Dave Cosgrove (Accelerator) dancing Ravel's "Bolero" with the Jose Greco Spanish dancing troupe. Tune in to Channel 11, Chicago. See your TV Guide for time.

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THERE ARE STILL OPENINGS....in the Family Day Tour to be conducted on December 28 at 2 p.m. by the Fermilab Public Information Office. If you have relatives or friends or students home from school for the holidays, this tour is for them. The tour will include a slide orientation and walk-through of the Linac Gallery, the Main Control Room, and the 15th floor of the Central Laboratory.

Call Patricia Zack in the Public Information Office, Ext. 3351, to make your reservations.

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CHRISTMASTIDE is today - - Thursday, December 21, 5:15 - 9:00 p.m., at the Village Barn. Start the holiday season with your Fermilab friends.....

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'78 AERIAL VIEW ON SALE

The Public Information office now has on sale copies of the 1978 aerial view of Fermilab made by the Sidwell Aerial Photo Company. The photos are 42" x 42" and are made by a blueprinting process with a protective finish. They are being sold for $1.90 each and may be purchased in the Public Information Office any time during normal working hours.

The Public Information Office also offers other photos of the Laboratory. Colored prints, 8" x 10", slides of the same prints, and some black and white pictures are available.

This office also sells the official Fermilab post cards at 10c each. A new aerial view of the Laboratory has recently been added, making a total of five cards now on sale. Proceeds of the post card sales benefit the National Accelerator Laboratory Women's Organization (NALWO).

The Public Information Office is located on the west side of the first floor of the Central Laboratory.

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Visitors to Fermilab during the holidays are reminded that on exhibit in the second floor lounge are the photographs of Marcel Bardon and the sumi-e paintings of Professor Motoharu Kimura. The exhibit is open to the public and will continue through December.

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HOLIDAY SHUTDOWN

Most Fermilab offices will be closed for the Christmas weekend; the accelerator will be in standby condition. Operations will resume on Tuesday, December 26.

* * HAPPY HOLIDAYS * *

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