

The Village Voice

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CAL TECH GROUP DETECTS NEUTRINOS

In 1971, NAL Director Robert R. Wilson told the Users' Organization that "one of the first aims of experiments on the NAL accelerator system will be the detection of a neutrino. I feel that we then will be in business to do experiments on our accelerator..."

Neutrinos, which have neither charge nor mass, are very difficult particles to detect experimentally. They play a very prominent role in the study of the weak interaction, because they only interact via the weak force, about which relatively little is known.

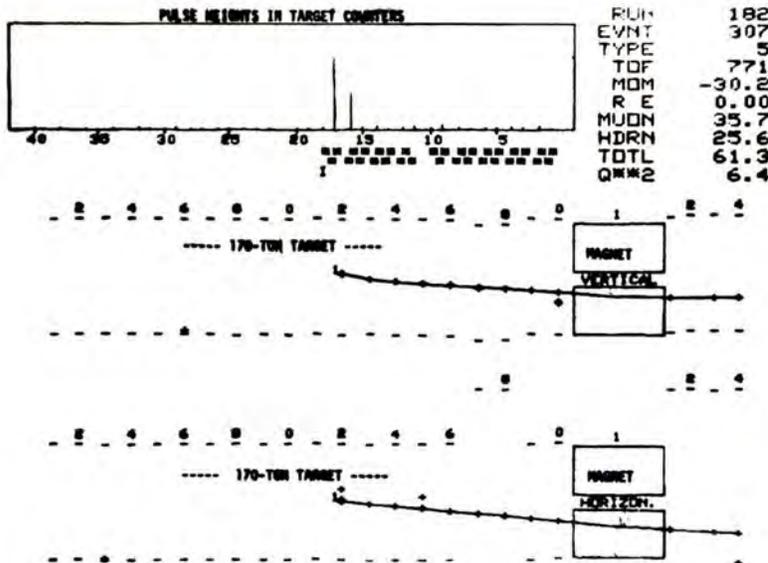
Months have passed since this comment was made, many long hours have been devoted to completing and refining the NAL accelerator, and Dr. Wilson's wish for the detection of a neutrino has been fulfilled. The Experiment 21 group, headed by Professors Barry Barish and Frank Sculli, from the California Institute of Technology, detected neutrinos in their apparatus last November. They are presently making tests in the neutrino beam in anticipation of measurements they hope to pursue this year. It has been an exciting time for all those connected with the experiment. At the February 7th Director's Meeting, Dr. Barish described recent developments in the Wonder Building:

"As most people know, in November we first saw neutrinos, which at that point wasn't much more than proving to us that the accelerator really existed and something came out. We were set up in a mode where all we could do was see neutrinos interact -- we couldn't even attempt to look at the properties of high energy neutrino interactions. We were over-constraining ourselves in as many ways as possible, in order to make sure that we could really detect neutrinos and believe it.

By January...fortunately the energy of the machine went up to 300 GeV and we got something like 3×10^{16} protons on our target, which gave us our first opportunity to obtain a reasonable number of events. Quite a few people who were around here at the time actually saw events coming in. At one time, for example, we had two events on successive pulses, which seems to be a record.

Since then we've been looking very hard at what we have. We have seen some examples

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Vertical (side) and horizontal (top) views of the 170-ton Cal Tech detector, as seen by the on-line computer. A 61 GeV neutrino interacts near the center of the target, resulting in a μ minus visible in the spark chambers located in the target and downstream of the magnet. Simultaneously, a hadron shower occurs, as evidenced by large pulse heights in the target counter (shown at the top of the picture).

CAL TECH (continued)

...(L-R) Dave Buchholz, Henri Suter and Dennis Shields stand at the downstream end of the 170-ton neutrino target. The neutrino beam enters the apparatus through the wall at the rear of the photo.

...In the foreground are large-area spark chambers, used for the detection of muons resulting from the neutrino interaction...



of neutrino interactions of over 100 GeV. Over half of our events are analyzable, and for a first attempt, that's encouraging. We know what we have to do to get at the rest, and we're just in the process of trying to understand and improve the apparatus, beam, and so forth. We have lots of tests to make, but I don't think it will be very long before we'll be able to say something. Right now, however, we remain very, very silent."

The Cal Tech group must now conduct more tests to be sure their apparatus is working properly and to determine which "pieces of physics" are sensible to pursue with it, and then finally, to complete an experiment.

Their experiment has been assembled with the help and support of the NAL Neutrino Section. The Cal Tech experimenters consist of a small, dedicated group. Dennis Shields built and installed much of the equipment one sees in the Wonder Building. The sophisticated ON-LINE data acquisition system used in the experiment was developed by Fritz Bartlett. George Krafczyk of NAL has made important contributions to almost every facet of the experiment. David Buchholz and Henri Suter, (a Cal Tech visitor from University of Geneva) have recently joined the experiment, adding both new stimulation and an international flavor to the group. Al Maschke, now at Brookhaven National Laboratory and Yori Nagashima, who has returned to Japan, have also contributed. Cal Tech thesis students, Tom Humphrey and Frank Merritt, are the real heart and soul of the experiment.

What the group hopes to investigate in the months ahead is the behavior of the weak interaction -- force -- at the very high energies possible with the NAL accelerator.

The weak interaction has been studied extensively in decays of unstable particles and radioactive nuclei, in which the energy released is in the range of approximately zero to 500 MeV. For a number of theoretical reasons, physicists expect that the picture of the weak interaction which has emerged from such particle decay experiments will change when higher energies are used, although the precise nature of the change remains conjecture. New phenomena, or even a new particle, may be discovered. No carrier of the force -- a field particle, so to speak -- has as yet been identified for the weak interaction, although the so-called W-particle or intermediate vector boson has been postulated. It just might be produced at higher energies. Nobody knows.

Experiments at CERN using neutrinos at energies up to 10 GeV showed no noticeable deviation from the known theory of weak interactions. Neutrino physics is so interesting and exciting that several other experiments have been approved, including those for the 15-foot Bubble Chamber.

Whether the NAL accelerator, which yields neutrino energies more than ten times greater than any studied to date, will provide enough energy to see any new phenomena or to prove the existence of the W-particle and thus, further explain this puzzling nuclear force, remains to be seen.

If it does, as Dr. Wilson enthusiastically remarked at that same Director's Meeting, "*just that one thing will make the whole Laboratory worthwhile.*"

ALL ABOUT MONEY -- THE 1974 BUDGET REQUESTS

Dr. John Teem, Director of the AEC Division of Physical Research, appeared before Congressional Joint Committee on Atomic Energy on February 22nd to discuss the allocation of funds for fiscal year 1974. The High Energy Physics program was not discussed in detail at the hearings, as it was reviewed fully just last year. The Presidential budget for 1974 includes for NAL, \$29.0 million for operating expenses, \$15.0 million for equipment obligations, and \$10.2 million for construction. This compares with the 1973 appropriation of \$19.2 million, \$16.5 million, and \$14.9 million for operations, equipment and construction, respectively. In addition, an increase of \$1.0 million has been requested for university user groups to carry out experiments at NAL. The total request for High Energy Physics was \$128.5 million.

NAL Director Robert R. Wilson was on hand, along with Dr. George Vineyard, the new Director of Brookhaven, and Dr. Louis Rosen, Director of the Clinton P. Anderson Meson Physics Facility, at Los Alamos, to answer questions about their own laboratories.

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...A new two-year contract agreement was reached late last fall between NAL and the International Association of Machinists and Aerospace Workers. Formally signing the agreement last week were: (Seated, L-R) Charles Marofske, Donald R. Getz, Victor J. Horvath (Directing Business Representative for Lodge No. 113 of the union), and Walter Ewer. (Standing, L-R) William R. Jones, Robert Maly, and Donald Szarsynski of the NAL Machine Shop. Ewer served as Steward, and Maly and Szarsynski as Committeemen during the contract negotiations...

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FIGHTING THE WINTER "BLAHS"

The enterprising women of NAL have brightened up this dull and dreary winter with several delightful activities. An International Tea, honoring all NAL ladies from foreign lands was held in the Village Barn on Valentine's day. Coffee, tea, cookies, and conversation were the order of the afternoon for those who attended.

A Russian menu was the theme of the Gourmet Group dinner held in the Village Cafeteria on Saturday, February 10th. About fifty people enjoyed Russian dishes prepared by group members. Some extra-special delicacies were prepared by NAL's visiting Russian ladies, the hostesses for the evening. Our photographer didn't make it to the Dinner-Theater party, Sing-A-Long, or official house cleaning of the White Farm, but we understand those were enjoyable also!

NALWO is open to all women of NAL, be they employees, wives, or visitors. Anyone interested in attending activities, or in starting new ones, should call the Activity Chairman, Mary Ann Ryk, 968-8651, or the President, Mary Lou Satti, 355-4430.



Coffee, tea, cookies, and conversation



Treats for the gourmet's taste

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NEWS FROM NALREC

An International Folk Dancing Group is NALREC's newest scheme for keeping you entertained. Expert dancers Jim Griffin, of the R.F. Section, and his wife Marilyn have offered their services as teachers. Neither experience nor a partner is necessary -- just come to the Village Barn on Friday, March 16th at 8:00 p.m. to join in the fun. Marilyn Paul, Ext. 3453, will answer any questions in the meantime....NALREC would like to sponsor a womens' softball team this summer. Plans are for the players to decide which of the local leagues they'd like to join, or if enough interest is aroused, to have more intramural competition - as the NAL men's teams do. Employees and wives are welcome. If you're interested, call Rita Underwood, Ext. 3210...DON'T FORGET -- to attend the 1973 NAL Arts and Crafts Exhibit, March 5th to 9th, in the Village Cafeteria.

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THANK YOU!!

The North Aurora Public Library wishes to thank all NAL employees who donated money for the purchase of books in memory of Rayeva Marie Howe, daughter of Bettie and Harry Howe.

Emeline S. Messenger, librarian, stated that in addition to a 14-volume set of Childcraft, they have also purchased the following books in Rayeva's memory: The Maude Reed Tale by Norah Lofts, Peanuts Treasury and Peanuts Classics by Charles M. Schultz, The Hundred and One Dalmations by Dodie Smith, and Little Women, Little Men, Eight Cousins, Jack and Jill, Joe's Boys, and Under the Lilacs, all by Louisa May Alcott.

In the front of each book is a seal reading "Presented by Employees of the National Accelerator Laboratory in Memory of Rayeva Marie Howe."

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A NOTE FOR SECRETARIES

The following is a list of books available for inspection in the library. Drop by sometime and take a look: Technical Typewriting, Kurtz-Phillips; A Handbook for Technical Typists, Dunford; Engineering Secretary's Complete Handbook, Laird; The Science-Engineering Secretary, Stafford; Complete Secretary's Handbook, Doris; Standard Handbook for Secretaries, Hutchinson; The Secretary's Handbook, Taintor; The Successful Secretary's Handbook, Becker.

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YOU AND YOUR CREDIT UNION

The Credit Union finished the 1972 year stronger than ever. Assets increased to \$6,510,076, a growth of almost ½ million dollars during 1972. Of this money, 4¼ million dollars are on loan to members, and over 2 million dollars are invested in government securities. These last 2 million are available to you for all types of low cost loans: car, vacation, home improvements, farming needs, mobile homes, boats, furniture, school expenses, medical bills, debt consolidation, insurance premiums, investments, funeral expenses, hobbies, etc.

The READI CREDIT program has started well. In the very first month of its existence 169 loans were made by phone for \$68,305. Could you too benefit from READI CASH?

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CLASSIFIED ADS

FOR RENT - By the week or month -- 2 bedroom air-conditioned house, on the waterfront of Pine Island, Florida, near Fort Meyers. Call Art Streccius, Ext. 3788 or 392-4905.

FOR SALE - Ford Galaxie (1972), 351 engine, automatic, p/s, p/b, air condition, AM radio, low mileage. Best offer \$3400. Call Jesse Guerra, Ext. 3271 or 898-4245.

FOR SALE - 150 Mystery Books by Agatha Christie or Mary Roberts Rhinehart @ 25¢ each. Call Alan C. Guthke, 892-7123.

FOR RENT - 1 bedroom apt. furnished; w-w carpeting, security building w/swimming pool near Aurora Ramada Inn. Call Alvin Adkins, Ext. 3315 or 898-3414.

FOR RENT - Large two bedroom apt. in Naperville, 2nd floor of house, furnished; avail. March 20 to June 30. Rent negotiable. Call H. Abarbanel, Ext. 3753 or 357-1699 or M. Einhorn, Ext. 3749.

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