The Village Crier

national accelerator laboratory

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...Ed Gray (standing) and Curt Owen at the console in the Linac Control Room...

...Ray Hren (seated) and Jim Wendt at the pre-accelerator control console in the basement of the Linac Building...

THE LINAC DOES WHAT IT WAS DESIGNED TO DO

Sixteen thousand hours, or 667 days. That is roughly how long the linear accelerator in the NAL accelerator system has run since it first reached its full design energy of 200 MeV on November 30, 1970. Since that time, the linac, as it is known, has been operational over 80 per cent of the time and has delivered a beam of protons to the booster synchrotron on demand over 90 per cent of the time.

That's quite a record -- the linac was the first portion of the NAL accelerator system to reach its design energy and intensity. It has been operating smoothly ever since, a tribute to the men who designed, built, and constantly work to improve the quality of the beam of protons it produces.

"Many persons who now have primary responsibilities elsewhere in the laboratory contributed greatly to the linac in its early days," group leader Curt Owen comments. "Although people from many groups still perform services that the Linac Group couldn't do without, only a few presently have the primary responsibility for the linac on a day-to-day basis." They include, in addition to Owen, physicists Cy Curtis, Ed Gray, and Ben Prichard, who joined the group in December.

The six electronics technicians who take care of maintenance and assist in the development of improvements for the components of the system are Gerry Erickson, Jim Falk, Wayne Ganger, Ray Hren, Don Mendenhall, and Jim Wendt.

Members of the Controls, Mechanical and Electrical Engineering, and Diagnostics groups are, of course, vital to the smooth operation of the linac, just as they are to the rest of the NAL machine.

The Linac Group is really responsible for two parts of the NAL system -- the Cockcroft

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...(L-R) Cy Curtis and Ben Prichard confer in the ion source test area...

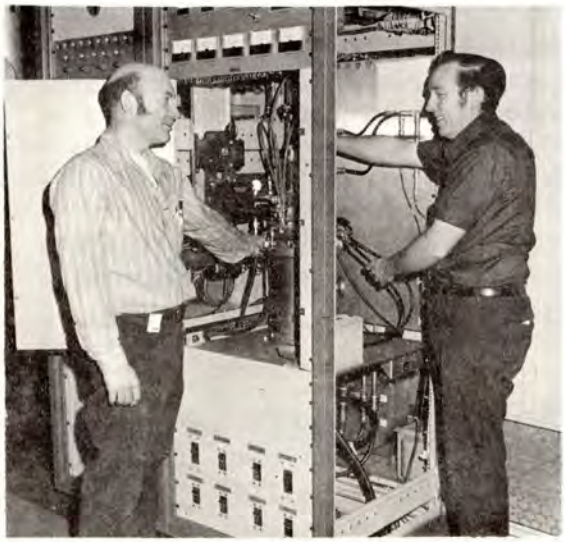
Walton pre-accelerator and the linac. In the pre-accelerator (which looks as though it belongs on the moon), there is a small chamber containing hydrogen gas - each atom of which is comprised of one electron (negatively charged) and one proton (positively charged). Striking an electrical discharge -- or arc -- in this gas causes the protons and electrons to separate. The protons pass into an accelerating column, and are propelled toward the linac by a series of electrically charged plates. These plates are charged by constant application of 750,000 volts divided through the column. By the time they enter the linac itself, the protons are traveling at a rate equal to 4 per cent of the speed of light.

The linac is actually comprised of nine separate accelerating cavities, each containing a series of copper drift tubes. An alternating force field exists throughout the cavities except inside these tubes. Protons are propelled forward by an electrical kick in the spaces between the tubes; then coast or drift through the tubes while the direction of the force field is wrong. This electrical force is applied using a power supply similar to those in ordinary TV transmitters. It takes about two millionths of a second for a proton to pass through the linac, at which time it is traveling at over half the speed of light.

Because the linac is really nine separate cavities, each cavity must be sychronized very accurately with the rest. "That's the tricky part of the operation," according to Cy Curtis. The beam of protons can be likened to the beam of light from a flashlight -- it spreads as it gets farther from its source. Keeping it all together -- focusing the beam -- is the job of quadrupole magnets, in the linac as elsewhere in the accelerator.

At the moment, the linac is used only to inject protons into the booster accelerator. "At the highest use we can anticipate now, only 25 per cent of the time the linac is running is required to provide protons for the rest of the accelerator system," says Curt Owen. The protons produced during the other 75 per cent of the linac's running time could, in principle, be used as has been proposed, for something such as radiotherapy research and treatment of cancer.

In the meantime, the Linac Group keeps refining their systems. "We're satisfied with the intensity of the beam" (for the past few weeks the linac has operated at 80 to 90 milliamperes; it was designed to run at an intensity of only 75 milliamperes), "and although it is near its design quality as well, we're still trying to improve it."



...(L-R) Don Mendenhall and Jim Falk adjust the output stage of one of the RF amplifier systems...

...(L-R) Wayne Ganger and Gerry Erickson examine an automatic frequency control module at the control system of one of the nine RF systems in the linac...

All Photos by NAL Photographers

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...NAL said farewell - for the time at least - to perhaps the best-known residents of the Village last Thursday. The sixteen Russian citizens who had been living on site, most of them for all of the past year, departed that day for their homeland. They expressed mixed feelings about leaving - they were quite excited at the prospect of reunions with their families and hard-earned vacations. At the same time, they were sorry to leave all of their American friends, and the interesting experiment on which they have been working. At a brief farewell meeting, they told Dr. Wilson of their tremendous gratitude for all of the kindnesses shown them during their stay here, and expressed the feeling that NAL is and always be their "second home." Some of them will undoubtedly be back, probably even soon -- in the world of science, you don't say "good-bye," only "so long"...

MOVIES ARE BETTER THAN EVER

"Really marvelous films that you may have missed elsewhere..." According to the NAL International Film Society, that's what you'll have a chance to view if you attend the Spring-Summer series that they've just announced. On the second Friday of each month, at 8:00 p.m. in the Village Barn, you will have the opportunity to see: *Hiroshima, Mon Amour (French), March 9; Bye Bye Braverman (USA), April 13; Impossible on Saturday (Israeli), May 11; The Exterminating Angel (Mexican), June 8; La Terra Trema (Italian), July 13; The Fabulous Baron Munchausen (Czech), August 10.*

The members of the selection committee - Dave Ritchie, Research Services; Henri Suter, Experiment 21; Janice Roberts, Visitors Center, and Isabel Walker, NALWO -- are all very enthusiastic about their final choices. All of the films have won awards, and their directors are unusually creative individuals. However, as Mrs. Walker pointed out: "In this particular series we've paid more attention to the story of each film, than just to the director. We're hoping to appeal to a larger audience."

Increasing interest has been shown in these monthly movies since their inception in November 1971. Paul Kunz, a visitor from Michigan State University, was instrumental in keeping it going. "The film society wouldn't be in existence now if it hadn't been for Paul's incredible enthusiasm and hard work," commented Mrs. Walker.

"The College of DuPage has also been very helpful," added Mrs. Roberts. "We've had full use of their film collection since we started."

Punch, cookies, and a chance to discuss each film -- a very pleasant way to end an informal evening -- are offered afterward, downstairs. Fran Pisarek, Visitor's Center, has prepared these refreshments regularly.

All NAL, DUSAF and AEC employees, visitors, and their guests are welcome to attend the films. Tickets for each performance are $1.00 for adults; 50¢ for children.

NAL EVENTS TO REMEMBER -- MARCH, 1973

INTERNATIONAL FILM SOCIETY - *"Hiroshima, Mon Amour,"* will be shown at 8:00 p.m. in the Village Barn on Friday, March 9. Directed by Alain Renais, this film tells the story of a French actress and a Japanese architect, both scarred by war experiences they can't forget, who meet in Hiroshima and fall in love. Join the rest of the audience for punch, cookies, and conversation afterwards, downstairs. Admission: adults, $1.00; children, 50¢.

NALWO BRIDGE GROUP - Will meet at 1:00 p.m. on Wednesday, March 14, at the White Farm. Call Mary Fray, 232-0724 for more information.

SING-ALONG GROUP - Will meet at the home of John and Mary Lou Satti, 44 Swift Lane, Naperville, on Friday, March 16 at 8:30 p.m. Telephone 355-4430 for more details.

FIVE O-CLOCK BREAK - On Friday, March 23 at 5:00 p.m., of course, in the Village Barn.

INTERNATIONAL FOLK DANCE GROUP - Will have their first meeting on Friday, March 30 in the Village Barn at 8:00 p.m. Jim and Marilyn Griffin will instruct, and neither a partner nor experience is necessary. Marilyn Paul, Ext. 3453, will answer any questions in the meantime.

NALREC'S REMINDER..This is the last call for those wishing to participate in something musical at NAL. The response thus far has been small, but very enthusiastic -- and interest in both rock and chamber music has been expressed. An organizational meeting will be held in the basement of the Personnel Office, 21 Sauk, on Wednesday, March 14 at 4:00 p.m. Call Eric Jarzab, Ext. 3396, for additional information.

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Librarian Roger Thompson peruses one of the announcements on the Professional Opportunities bulletin board in the corridor outside the library. Announcements of positions available for scientists and engineers at other laboratories throughout the world, notices of competitions for fellowships and special programs, and general job listings from the NAL Personnel Office are posted on this board.

Stop in and take a look. The library keeps it up to date.

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CLASSIFIED ADS

FOR SALE - 1969 VW bus. Very good condition - $1400. Call Donald Wastel, 898-6182.

FOR SALE - 1963 Econoline Van (Ford) - $250.00. Call M. Kampikas, Ext. 3377 or 231-2271.

FOR SALE - Reese model 34470 bolt-on tow bar (equalizing trailer-hitch platform) to fit 1969-73 Ford, Mercury, and Lincoln Sedans. 1000 lb. hitch weight capacity-$55. Call G. Tool, Ext. 3457 or 896-6518.

FOR SALE - 1969 700 cc's Moto Guzzi, Bates bags included. Low miles - many extras - runs perfect. $1200. Call Diane, Ext. 3724 or 653-6845.

FOR SALE - 2 pecan wood end tables and a cocktail table with marble inside table tops. In good condition. $75 for the three. Call Roger Braun, 584-2154.

FOR SALE - Danish style, walnut end table. Excellent condition-$20. Call Ed Brezina, Ext. 3580 or 323-0794.

FOR SALE - Yashicamat 124G TLR camera, coupled CDS meter, all black body with case-$85. Call Fred Krueger, Ext. 3461 or 859-2653.

FOR SALE - 1972 Century fiberglass boat, tri-hull, 188 hp Mercruiser I/O, fully equipped, 20 hr. on engine. Ideal for family fun or Lake Michigan fishing. Call Ron Fast, Ext. 3381.

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. Photos available.

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