

# The Village Courier



fermi national accelerator laboratory

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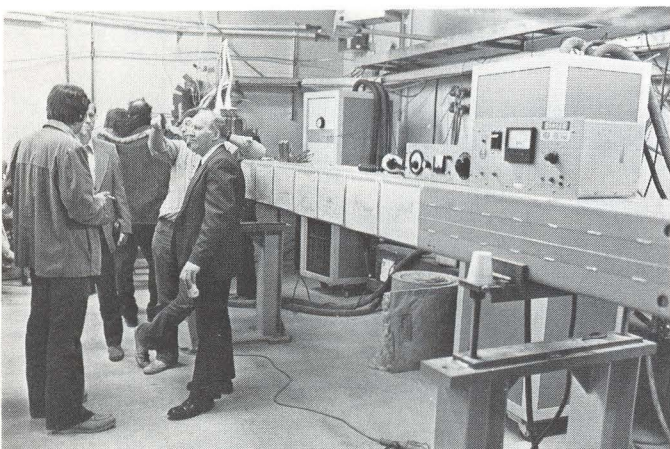
## ENERGY DOUBLER REACHES NEW MILESTONE

A major milestone in the development of the Fermilab Energy Doubler was reached at noon on Friday, April 8. A string of four superconducting magnets was energized for the first time and reached 4,300 amperes, the equivalent of 1,020 BeV beam energy in the eventual Doubler plan. The test demonstrated that these magnets, specially-developed for the Energy Doubler, can be successfully operated in series, an important consideration in building a superconducting accelerator. Designers of superconducting accelerators which use assemblies of multiple superconducting magnets have always been concerned about the protection of such a magnet system in case of the malfunction of one magnet. In these tests it has been demonstrated for the first time that a series connection of magnets can be protected from such a malfunction and that such a system can be operated successfully.

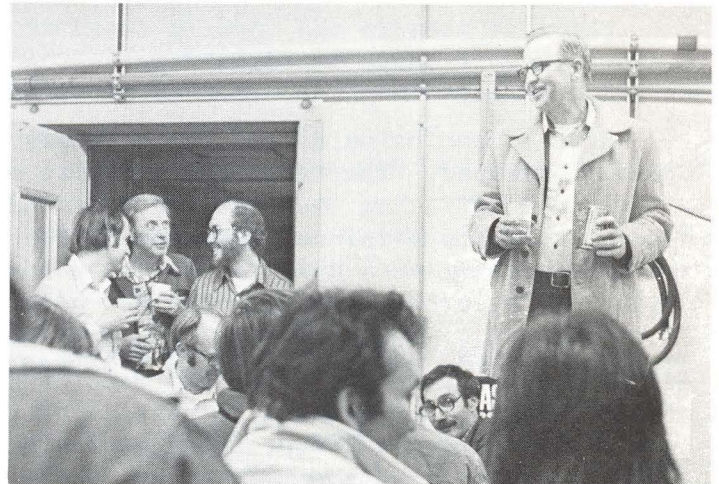
In the projected design of the Doubler, about 780 of these magnets, plus 250 quadrupole magnets, will be installed in a ring directly below the magnets of the present Main Ring. Beam of 100 BeV energy from the present accelerator will be injected into the superconducting ring and accelerated to 1,000 BeV, or "double" the present maximum energy of the Main Ring. The use of superconducting magnets instead of the conventional iron magnets will also make possible a substantial saving in the electrical power required to run the Main Accelerator.

Tests of these multiple magnets are being carried out at "The Awning," a small building on Main Ring Road between service buildings B-0 and B-1. The recent success is the result of almost one year of effort by the Energy Doubler group, the Magnet Facility, and other groups in the Accelerator Division. The major purposes of the tests are threefold: (1) to investigate the cryogenic properties of several magnets connected together (called "strings")--that is, to learn how these magnets perform at the  $-450^{\circ}\text{F}$ . temperature at which the Doubler will operate; (2) to test the various schemes for protecting the magnets if they undergo transition--called a "quench"--from a superconducting state to a state of normal conductivity; (3) to obtain installation and operating experience with Doubler magnets; (4) to develop hardware and software using the present accelerator control system to monitor the operation of superconducting magnets.

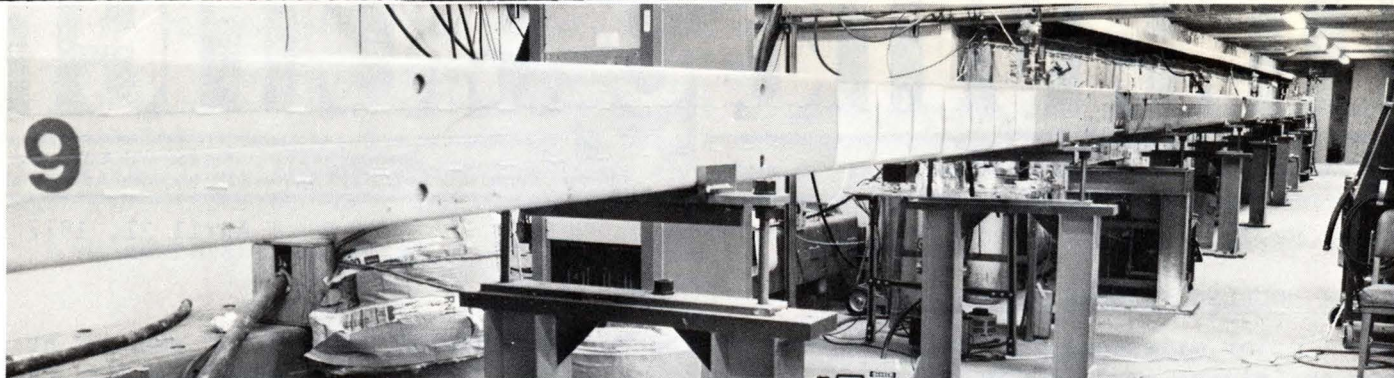
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...Visitors and doubler group members with one of four magnets tested recently...



...Phil Livdahl congratulates doubler associates on their achievement...



... Four-magnet "string" successfully energized in series April 8...

A superconducting magnet is made from wire that is much smaller than the copper bus used to make normal magnets. A superconducting magnet can sustain high currents because the wire, when cooled to liquid helium temperatures ( $-450^{\circ}\text{F.}$ ) by a super-refrigerator, exhibits the property of superconductivity--that is, it has no resistance, and it is not heated by the current going through it. If some part of the wire leaves the superconducting state, which can happen if the current is raised too high, the wire could be burned up, destroying the magnet. To prevent this, a resistor is switched into the energizing circuit to dissipate this magnetic field energy. When this is done, voltages as high as 1,800 volts are generated across the magnet and pressures as high as 100 psi are developed inside the helium vessel.

In the test just completed, the magnets "quenched" at 4,300 amperes. They have since been run to high current and have been quenched numerous times. The fact that the multiple magnet string behaves in a predictable fashion and can withstand quenches gives confidence that a superconducting accelerator is technically feasible. During the operation of the Energy Doubler, a "quench" will be a rare occurrence, but the Fermilab developers must know from the outset that the magnets can recover from quenches quickly and with no damage.

Developers of the Doubler, who work on the edge of a new field of technology, say they have now answered some important questions about their pioneering project: (1) If the quench occurs on one magnet, it does not, in general, start a quench in adjacent magnets; (2) The vessel which carries the liquid helium is able to withstand the high pressures developed during a quench; (3) Magnets can withstand the high voltages generated during a quench; (4) The electrical safety system designed for the Doubler system is sufficient to protect the magnets from self-destruction if the quench occurs; (5) The cryogenic system performs as predicted. It appears that long strings of magnets can be cooled and maintained at liquid helium temperatures.

The next step in the "Awning Test" program is to run the magnets continuously for a month to see if there is any change in their performance. After that, the string will be extended to eight magnets, then to sixteen magnets.

At the conclusion of the tests Friday, Phil Livdahl, Assistant Head of the Doubler Group, commented, "The tests are the most significant in the two years of development work in demonstrating that the whole Doubler can be built and that it will work." Livdahl told the personnel involved in the Doubler work, "When we have this entire test facility working as a unit we'll have gained an enormous amount of confidence in the system. I'm certain that we have the people here that can do it."

Peter Limon, physicist in charge of the test, said, "A project of this scope could not be done without the dedicated work of scores of people at Fermilab. The list is long of such people, but we want to particularly thank the people in the Doubler Group, the Accelerator Controls Group, the Electronics Group, and Mechanical Support Group, the Magnet Facility, and the many others who gave that little extra bit that made this success possible."

## PHYSICS SCRIBE VISITS FERMILAB

A self-styled "second-class scientist"--who has become the Horace Greeley of high-energy physics--brought his notebook to Fermilab.

Brian Southworth interviewed laboratory people while attending the 1977 Particle Accelerator Conference at Chicago. Southworth, 40, edits the Cern Courier, the world's only journal of high energy physics. The magazine is published monthly in English and French editions by the 12-nation European Organization for Nuclear Research (CERN) at Geneva, Switzerland. With 13,000 copies printed monthly, readership is estimated at 60,000 in more than 50 countries.

Dr. Richard Carrigan, Fermilab assistant head of the Research Division, is among 21 Courier correspondents reporting for laboratories around the world.

Southworth directs a staff of eight in Cern's publications section. In addition to producing 20,000 words monthly for the Courier, the department is responsible for brochures, tours, exhibits and films telling the organization's story. A unique project, literally on the drawing board, is a comic strip being created to run in a Geneva newspaper for eight weeks next fall.

Born near Liverpool, England (home of the Beatles rock group), Southworth took his degree in physics at Sheffield University. After a fusion research appointment fell through at Harwell Laboratory he switched to accelerator studies at neighboring Rutherford Laboratory. During six years there, he eventually came to edit "Orbit," a monthly journal.

He joined CERN in late 1965, producing his first Courier in January, 1966. The publication has evolved from an internal vehicle to the world voice of high-energy physics, Southworth noted with pride.

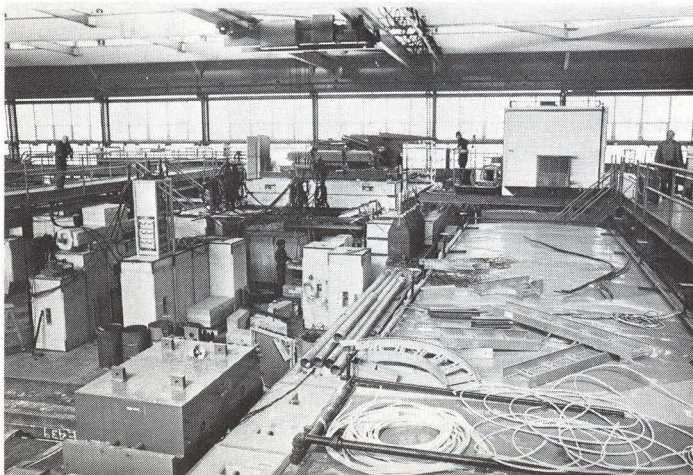
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....A Central Lab parking space has been set aside at the northeast basement entry for handicapped employees and visitors....

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## MESON ACHIEVES DESIGN INTENSITY

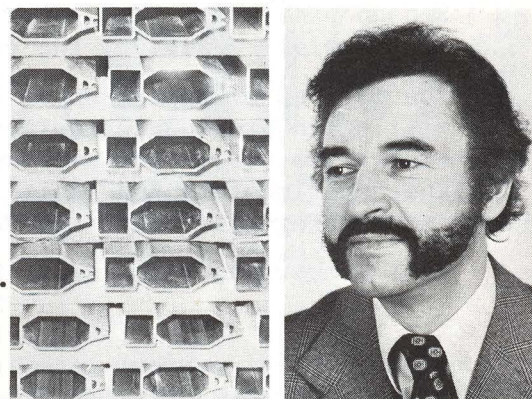
The Meson Experimental Area achieved an intensity of  $10^{10}$  protons per pulse on the M-2 beam line for the first time on Friday morning, April 15. The success follows several weeks of intense efforts in the Area to achieve this design intensity. Additional shielding and a new monitoring system were installed. The Switchyard group assisted in the test.



Looking past on six years of waiting for the diffracted proton beam, one of its designers, Rich Orr, comments, "Linc Read and I stated in the 'Meson Laboratory Preliminary Design Report' in March 1971 that the M2 Diffracted Proton Beam would deliver 'an intensity of about  $10^{10}$  diffracted protons/pulse.'

"Tim Toohig and the Meson Lab people have finally made honest men of us. At this intensity, the beam will be able to feed a much wider range of experiments than was previously possible."

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...Brian Southworth and his product...

## EVERYBODY INTO THE POOL

Season passes for Fermilab's swimming pool go on sale at 8:30 a.m. Friday, April 29. Memberships will be sold by the cashier, CL-4E, until 2 p.m. weekdays.

The 1977 swimming season at Fermilab will open on Saturday, May 28 at 9 a.m. The pool will again provide recreational and social opportunities for the Laboratory staff and visitors. This year, pool membership is open to the Fermilab staff, their guests and visiting experimenters and their families, the ERDA Office at Fermilab and employees of Management Safeguard, Inc., and Mutual Maintenance personnel working at Fermilab.

Pool membership rates are: Single Person \$15.00  
Married Couple \$25.00  
Family \$35.00

Daily admission fee will be \$1.50 per person.

Admission charges to the pool will be strictly enforced.

Pool hours will be: Weekdays: 6 a.m. - 8 a.m. - adults only/no lifeguard  
11 a.m. - 9 p.m. - family swimming/lifeguard on duty

Weekends and Holidays:

9 a.m. - 9 p.m. - family swimming/lifeguard on duty

The pool operation will be administered by Helen Ecker, Recreation Coordinator.

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CONGRATULATIONS ... to Johnny Green (Research Services) and his wife Charlotte on the arrival of Aischa Lawanda April 11. The new daughter weighed in at 8 lbs., 2 oz. at Edward Hospital, Naperville.

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## MOZART SET FOR SUNDAY

Jan Ryk, Accelerator Division electrical engineer, will be among Downers Grove Oratorio Society members presenting Mozart's "Requiem" Sunday. The program is set for 7:30 p.m. at Downers Grove North High School, Main and Grant in the suburb. A 36-piece orchestra will perform and Ryk, a bass vocalist, will lend his talent to the 100-voice chorus. Ryk, president-elect of the society, has tickets to the event. Contact him at Ext. 4056 or Page 168.

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## SITE CLEANUP REPORT!

Site Services annual site-wide cleanup efforts extended through last week. Results: over four tons of metal scrap picked up for recycling; over 260 cubic yards of wood, tree limbs, boxes and trash deposited on Meson Hill dump, and 300 bags of scrap paper picked up from the site. A temporary work force supplemented the Grounds Crew and regular Fermilab employees in the effort. Thanks to all Fermilab employees who helped!

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## PLEASE HELP KEEP FERMILAB SITE CLEAN!

For assistance in your cleanup efforts contact your Site Services Area Manager: G. Plant, 3824-Central Lab, G. Doyle, 3421-Village, and D. Smith, 3492-Accelerator and Research Areas - or Site Services Work Order 3434.

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## NANCY MEEHAN DANCERS HERE MAY 15

Modern dance will be featured in the finale of a three-program dance series sponsored by the Fermilab Art Series. Tickets are on sale for an appearance by the Nancy Meehan Dance Company on Sunday, May 15, at 7:30 p.m. in the Fermilab auditorium. A New York Times reviewer said, "She is one of the major and most serious talents in modern dance." Admission will be \$3. For tickets, call the Guest Office at Ext. 3440.

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