

DOUBLER DASHES DOUBT - DELIVERS 800 GeV



View along the tunnel. The Main-Ring magnets are above the superconducting magnets.

by Frank Turkot

The startup of the experimental program on Saturday, March 17, will mark the opening of a new energy frontier in the world of high-energy physics. The Tevatron era will begin in earnest with the raising of the operating energy from 400 GeV to 800 GeV. By this move, Fermilab will regain the lead as the highest energy fixed-target laboratory in the world, a title it earned in 1972 with first 200-GeV beam, but relinquished in 1983 when the CERN accelerator began operating at 450 GeV. (Note: this was more of a financial victory than a scientific one, as the Fermilab Main Ring demonstrated in 1977
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Excerpts from Main Control Room Log

[Editor's Note: During the week of February 13, 1984, the accelerator achieved 800 GeV (see companion article by Frank Turkot). The following excerpts are from the Main Control Room Logbook with emphasis on extraction and Switchyard.]

2-13	0600	Neutrino 400-GeV HEP ends. Begin ramping Switchyard (SY) Neutrino supplies to 800 GeV.
	0730	SY Neutrino 800 GeV supplies checkout successful.

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that it could run reliably at 450 GeV, but was not operated there for budgetary reasons.)

Operation of the fixed-target experiments at 800 GeV required three major accomplishments. The first, and most obvious, is acceleration of the proton beam in the Saver to 800 GeV, a feat which was achieved on February 15 and is chronicled in the excerpts from the Main Control Room Log for the week of February 13. These events will be described in more detail later. Second, the beam must be distributed with great care and precision to seven widely separated target stations through a complex underground network of tunnels filled with beam-transport devices; this "switchyard" system had to be strengthened to the 800-GeV level. Third, the experimental areas themselves needed extensive expansion to accommodate higher energy. Finally there is the ever-present consideration of safety; each of the multitude of new and revised systems had to be individually analyzed and reviewed to ensure safe operation at the 800-GeV level.

The first step in the push to 800 GeV, that of increasing the operating energy of the Saver from 400 GeV to 800 GeV, occurred over a three-day period starting at the end of the just completed (February 14) 400-GeV run. Excitation of the full superconducting ring began in June of 1983, so by now procedures for raising the excitation to higher levels are well established. Nonetheless, raising the energy usually has its anxious moments. At the 800-GeV level, each of the 1000 magnets in the ring has a substantial amount of energy stored in its field, enough to boil a quart of water. If for some reason the superconducting wire in the magnet coil loses its ability to carry the 3600 amp current without heating up (that is it "quenches"), the magnet will be damaged unless the quench is detected quickly and the stored energy is removed in a controlled way. Some of you may have heard the explosive shriek of helium gas escaping from the pressure relief valves on the refrigeration buildings atop the berm that accompanies a quench, and so have some feeling for the violent nature of a quench. The Energy Saver ring has a very sophisticated quench - protection system (QPM),

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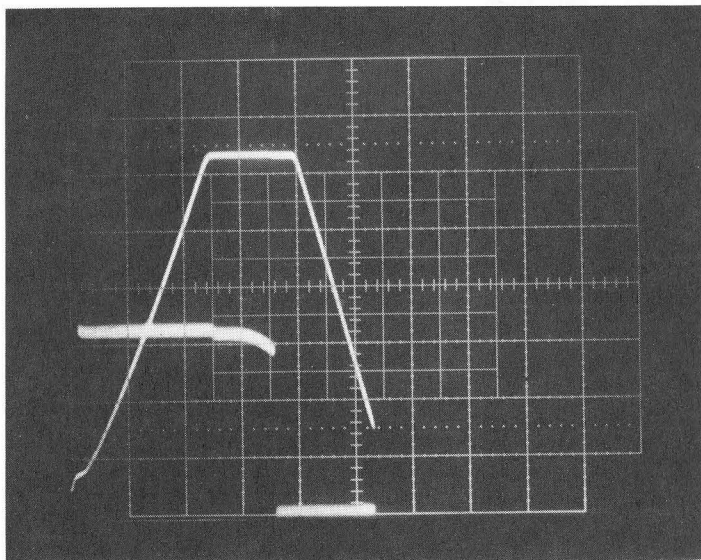
2-14	0600	400 GeV HEP era ends. Begin ramping SY Proton and Meson supplies to 800 GeV.
	0730	Conventional SY Proton and Meson supplies at 800 GeV.
	0755	Right Bends at 800 GeV for 5 minutes. Insufficient cooling water flow to the choke trips a klaxon and dumps the string.
	0800	Begin to raise the Doubler energy. Shutdown Right Bends in order to begin installation of new 1 TeV Left Bend quench protection dump rack.
	0900	SY dump line supplies running at 800 GeV.
	1530	750-GeV Doubler ramp.
	2048	750-GeV beam in Doubler.
	2049	750-GeV quench in Doubler.
	2211	750-GeV beam to end of flattop.
	2223	750-GeV beam extracted by operations crew to SY dump.

2-15	0058	750-GeV beam store for 56 seconds. Prepare to send beam to Proton.
	0211	Right Bend heater malfunction.
	0412	750-GeV current stable in Right Bends.
	0420	PSEP malfunction. Begin to tune up Doubler abort line.
	0539	Doubler abort line malfunction.
	0540	PSEP running on temporary supply.
	0703	Doubler abort line running. Begin to send 750-GeV beam to Proton.
	0735	750-GeV beam to end of SY proton line.
	0800	Shutdown Right Bends to finish installation of Left Bend dump rack and to improve water flow to choke. Tune up dump line.
	1312	First 800-GeV attempt in Doubler.

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- 2122 Quench during acceleration at 650 GeV.
- 2305 800 GeV beam re-established; tuning up extraction and beginning intensity push.



Oscilloscope trace of one cycle in the Energy Saver at 2054 (see Main Control Room Log entry) on February 15. The flat portion on the upper trace is the 800-GeV level.

- 2-16 0305 2E12 at 800-GeV extracted to SY dump.
- 0321 3.8E12 at 800 GeV extracted to SY dump.
- 0330 5.1E12 at 800 GeV extracted to SY dump.
- 0408 Excessive noise on new Left Bend current transducer prevents establishment of 400-GeV current; replacement required.
- 0412 Right Bends at 800 GeV. Cooling water problem is fixed.
- 0505 7.3E12 at 800 GeV extracted to SY dump.

CHAIN MAIL CONTRARY TO POLICY

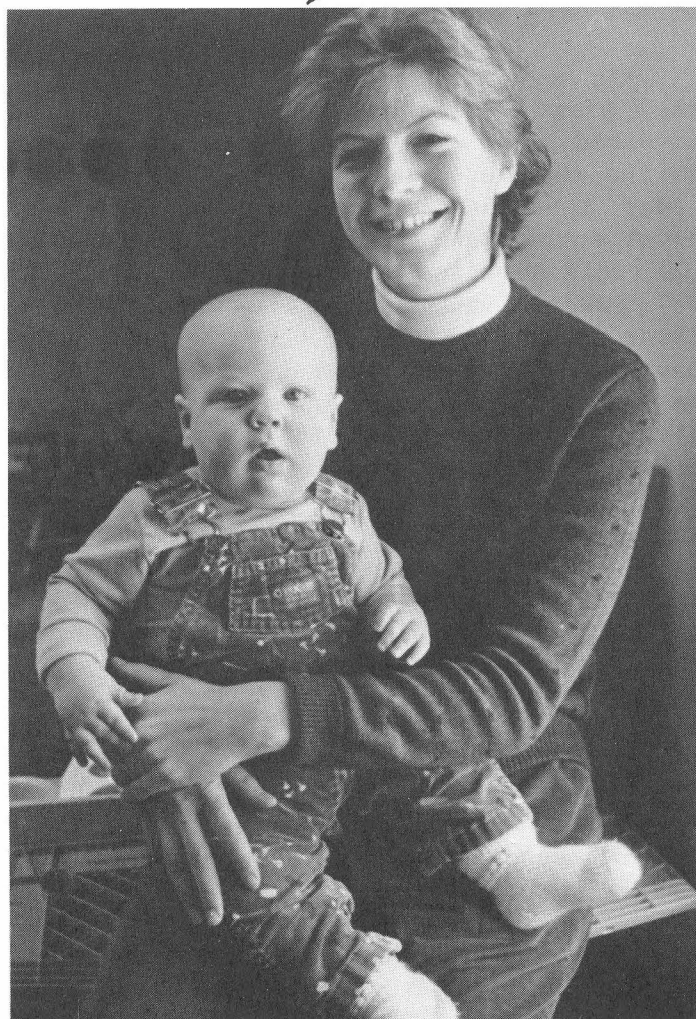
Once again chain letters are being received by employees through the internal mail system. Most individuals are opposed to such mail. The Business Services Section asks that chain letters not be sent to employees through interoffice mail. This is against Laboratory policy. As a reminder, it is illegal to use Laboratory copy machines for duplicating such items.

PETERSON WINS AWARD

The 1983 winner of the Luise Meyer-Schutzmeister Memorial Award is Priscilla Peterson, an experimental high-energy physicist who is a Ph.D. candidate at Rutgers University. Her thesis project, under the direction of Tom Devlin, is "The $\Sigma^0 \rightarrow \Lambda^0$ Transition, Magnetic Moment," Experiment 619 at Fermilab. Peterson has been a user at Fermilab since 1981.

Dr. Meyer-Schutzmeister was a Senior Physicist in the Physics Division of Argonne National Laboratory, a Fellow of the APS, and a world-renowned nuclear spectroscopist who died January 19, 1981, after a brief illness. The award honoring her was established through the Education Foundation of the Association for Women in Science, of which she was a member.

Eliot Peterson helps to congratulate his mother, Priscilla, on winning the Luise Meyer-Schutzmeister Memorial Award. Eliot is 11 months old.





Helium gas escaping as a result of a quench at service building A1.

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utilizing 24 microcomputers, that has worked very well.

As seen in the Main Control Room, in the Cross Gallery, the 800-GeV effort involved four teams of experts in addition to the regular Accelerator Operations Group under Bob Mau. They include: (1) main power supply and QPM team under Gerry Tool; (2) refrigeration team under Claus Rode; (3) Saver commissioning team under Helen Edwards; and (4) a switchyard team under Dave Finley. During the first 8-hour shift on Day One, the power supply and refrigeration teams succeeded in raising the ring current in two steps, first to the 600-GeV level and then to the 750-GeV level. On the second shift, the accelerator operators and commissioning team injected low-intensity beam, accelerated it to 750 GeV and then achieved slow extraction to the external beam dump. The previous beam energy record of 700 GeV achieved last August had been broken, giving rise to champagne and congratulations all around. Finally, on the third shift, the switchyard team with the help of the operators tuned the extracted beam through the Right Bend to the Proton Area.

Flushed with the success and champagne of Day One, it was decided to push for 800 GeV and make the "Energy Doubler," the

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- 1322 F4 quench at 775 GeV.
- 1400 New Left Bend dump rack installed; tests for re-establishing 400-GeV current initiated.
- 1619 Second 800-GeV attempt in Doubler. Quench at 790 GeV.
- 1830 **800-GeV ramp established in Doubler.**
- 2044 800-GeV beam in Doubler.
- 2054 **800-GeV beam extracted to SY dump by Operations Crew on first pulse.**

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original name for the Saver, a reality. Day Two started out similar to Day One with the power supply team working to raise the magnet excitation, now to the 800-GeV level. The first two attempts were terminated by quenches; finally on the third try, the goal was reached. Accelerated beam and extraction to the dump was achieved two hours later. The plan for Day Two would have the switchyard team tuning 800-GeV protons to Meson, but a technical problem with the Left Bend power supply interceded. During Day Three the Saver cycled continuously at 800 GeV while various aspects of the high-energy performance were studied; beam intensity as high as 7×10^{12} protons per cycle was obtained, which is more than adequate to supply the experimental needs for the upcoming run at 800 GeV.

If the success of the 36 hours of operation at 800 GeV is any indication, the Saver is ready for the opening of the Tevatron era. Historically, the availability of a proton beam of higher energy has often been accompanied by startling discoveries and dramatic advances in our understanding of the submicroscopic world of particles. One hopes that the Tevatron era will follow precedent and bring with it an abundant share of excitement and progress.

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ASTROPHYSICIST REVEALS RECIPE FOR QUARK SOUP

by Jane Green

Understanding the origin of the universe is a goal as old as humanity and an on-going challenge to scientists. Research has led to the general belief that the universe began with a "big bang." Our current understanding of this history of the universe will be examined by Michael S. Turner in the next Lecture Series program. His talk, "Big Bang Cosmology: From Quark Soup to the Expanding Universe," will be presented on Friday, March 16, at 8 p.m. in Ramsey Auditorium.



Michael Turner (right) and Megatest Engineer Robert J. Miller check a proposed site for the SSC.

Michael Turner received his doctorate from Stanford University and serves as co-leader of the Astrophysics Group at Fermilab. In addition, he is Associate Professor of Astronomy, Astrophysics and Physics and the University of Chicago.

In his talk, Turner will discuss what happened in the earliest moments of the universe. He will describe the "big bang" model and an account of the history of the universe from about a millionth of a second after "the bang." Then the universe was a hot, formless soup of quarks and other elementary particles—very different from today, some fifteen billion years later. Further, Turner will explain discoveries made at accelerator laboratories which are beginning to provide cosmologists with the knowledge to unravel what happened in the first millionth of a second after the "big bang."

Admission to the lecture is \$2, \$1 for senior citizens, and tickets are available at the Information Desk in the atrium of Wilson Hall, ext. 3353. Phone reservations are held for five days.

GET READY FOR SPRING CLEAN UP

Bob Kraft, Head of Roads and Grounds, asks everyone to get ready for a site-wide Spring Clean Up April 2-6. Any trash or excess materials that are set outside will be picked up and hauled away. These dates were chosen so that the Laboratory will look good for the Saver Dedication on April 28.

The following guidelines apply: separate recoverable copper, aluminum, and steel from the trash; place refuse in piles outside of buildings; materials from Accelerator and Experimental Areas should be monitored by a local Radiation Safety Officer. Other areas concerned about radiation should call Chuck Zonick, ext. 3458. For disposal of liquids, chemicals, and toxic substances, call Bob Allen, ext. 4498; to place materials in storage, call Fred Assell, ext. 3577; for questions or haul-away of trash or metals, call Bob Kraft, ext. 3303.

PUBLIC BUFFALO AUCTION TO ATTRACT 200 BIDDERS



A public auction of about 25 buffaloes is planned on Wednesday, March 28, at 11:30 a.m. at Site 52. According to the auctioneer, John W. Almburg, of Aurora, as many as 200 prospective bidders may turn out.

For the past several years, the Laboratory has sold small numbers of buffalo, by sealed bid, in order to maintain the balance and vigor of the herd. This year, with the herd size approaching the optimum number of 80, there are enough surplus buffaloes to justify a public auction. It is expected that a public auction will be held in future years as well.

Flyers mailed to prospective bidders point out that the buffaloes are property of the U. S. Government and have been tested for brucellosis and tuberculosis and will be available for inspection beginning March 19.

GARDENERS TO PLAN FOR SEASON

The annual spring Garden Club meeting will be held on Tuesday, March 20, at noon in Curia II on the second floor of Wilson Hall. Plot payments may be made at this meeting and identification cards will be issued at the time of plot payment. Fees are \$1 per plot.

There will be a spring clean-up on Thursday, April 12, at noon. It will help if everyone will try to clean up his own area before this date. The aisles between the garden plots should be free from old fence, stakes, etc. If every member will help on this date, the Garden Club can at least start the year with a clean garden area.

"LA PRIMAVERA" SPRINGS MARCH 16

NALREC'S spring dance welcoming "La Primavera" will be held on Friday, March 16. This event will take place in the Village Barn from 5 p.m. to 11 p.m. Food and beverages will be served at 5:15 and music featuring "Burgundy Road" will begin at 7 p.m.

"Burgundy Road," one of the best Chicago groups, will play contemporary as well as hits of the 50's, 60's, and 70's for your dancing pleasure--please come join us. For more information call Mary Fray, ext. 3711 or Marcia Patterson, ext. 4777.

MID-SEASON BOWLING RESULTS

At mid-season in the Fermilab Monday Night Mixed Bowling League, Thunder 'N Lightning is in First Place, Gary's Gang is in Second, with Channel Cats in Third. Angie Velasquez has high game (253) and high series (665) for women. Jack Jagger has high game, scratch, (288) for the men. Gary Smith bowled 235, 235, and 258 for a 728 series on Monday, January 16, to edge out Chuck Chizzo's 724.

Congratulations To...



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FOR SALE

OR RENT: TWO-THREE BEDROOM ATTACHED RANCH. Five min. from Fermilab, includes family room, living room, dining room, kitchen, refrig., dishwasher, oven/range, central air. \$500 per month. Call Henry Schram, ext. 3198, 3377, or 393-1711.

FOR SALE

HOUSE: THREE-BEDROOM RANCH IN CAROL STREAM. 2 baths, fireplace, oak parquet floors, patio, lg. yard; on a quiet street near parks and churches in good school dist. Below market value at \$62,000. Call Mike Roman, 690-7642.

AUTOS:

1981 PONTIAC T1000. 4-door, 4-spd., pulsing wipers, new brakes, and tune up. \$3,600. Call Mark Houser, ext. 4596 or 898-7360.

1979 BUICK REGAL LIMITED. Loaded, orig. owner, 34,000 miles, very clean. Call Tricia, ext. 3411 or 879-6389 after 5 p.m.

1972 4-DOOR TOYOTA. Good condition, 99,000 mi., \$750. Call ext. 4149 for more info.

TRUCKS:

1979 DODGE SNO COMMANDER 4x4 . Fiberglass cap w/split windows, Meyers snow plow, western mags white w/spare set of tires, vulcan starting unit, AM/FM, PS, PB, automatic, good cond., 56,000 mi. \$5,000 or best offer. Call Glenn, ext. 3725.

1973 INT 1610 TRUCK. Crew cap, 9-1/2 ft flat bed, runs good, no rust, 80,000 mi., dual wheels, \$1,800. Call Todd, ext. 3575.

1971 2WD 350 CHEVY PICK-UP. 4-speed, 350-engine, 45,000 mi., no rust, 1-ton suspension, \$1,700. Call Cindy, ext. 3452.

CYCLES:

1976 HONDA CB 400F STREET SCREAMER. 4,700 mi., \$1,100. Call Mark, ext. 4353 or 896-9204.

MISC:

For the following items call Harry Barber, ext. 3445. Westinghouse 6,000 BTU walnut-front air conditioner, excel. cond., fits min. 22-in. x 13-in. opening, \$145; 2 Whirlpool 5,000 BTU air conditioners, fit 21-in. x 13-1/2-in. window opening, \$35 ea.; croquet set, \$10; tubular steel chrome-plated clothing rack w/4 casters, bottom shelf, 64-in. high, \$10; 2 sets twin-size steel bed rails w/ casters, \$10 per set; twin-size white vinyl headboard, \$10; one set of 4 steel bench legs, \$6; pipe stock w/4 assorted dies, \$10; gasoline blow torch (brass), \$10; 1/2-in. thinwall tubing bender, \$5; 21-in. long pipe wrench, \$5; 2 sets large bulb outdoor Xmas lights, \$2 per set; dart board w/darts, \$3; and 4 badminton racquets w/birds and net, \$10.

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FOR SALE
MISC. cont.:

For the following items contact Rich Klecka, ext. 3868. Women's 5-speed bicycle, w/speedometer, fenders, rack, and 26-in. wheels, \$85; portable submersible sump pump, \$39; 40-gal. 5500 W electric water heater w/8-yr. tank, 2 yrs. old, \$69.

For the following items contact Cindy, ext. 3452. 4-place snowmobile trailer, \$600; Monarch lathe; and 1974 silver w/wood floor Chevy truck bed, \$200.

ANTIQUES. For the following items (pictures available) contact Carol Weissert, ext. 3470. No. 316 potbelly stove, \$275; walnut veneered china cabinet (as is) c. 1920-1930, \$175; oak spindle back rocker, \$250.

10-GALLON AQUARIUM. Stand, full hood, fluorescent light, under-gravel filter, air pump, heater, thermom., gravel, and tubing, \$35. Call Terry LaChance, ext. 3355.

ELECTROVOICE 12 TRXB HI-FI SPEAKERS. 12-in. woofer w/coaxial mid-range and tweeter, enclosure not incl., \$25 per speaker. Call R. C. Niemann, ext. 4896.

MICHELIN STEEL RADIALS MXL 175/70 R 13. New warranty, driven 350 mi., \$150/4. Call Bob Flora, ext. 3769 or 879-5079.

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