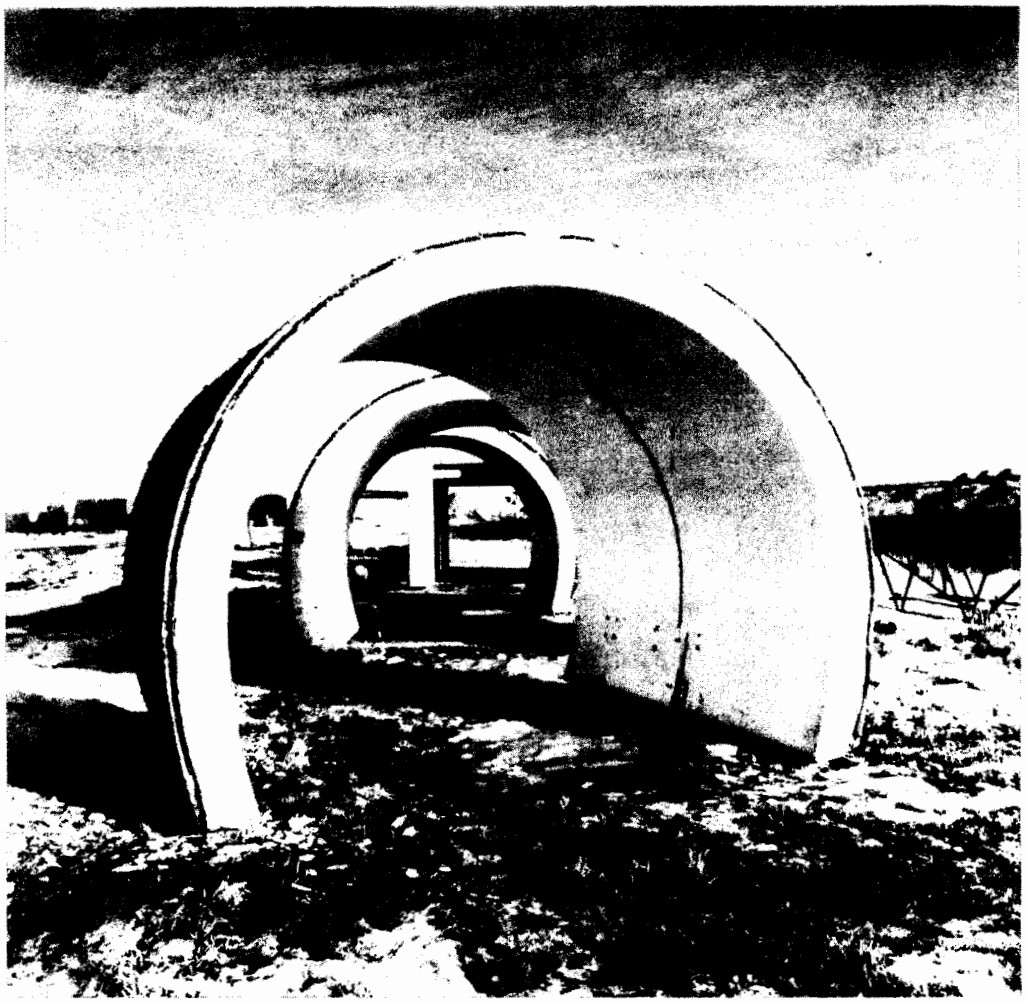
# fermilab report

Fermi National Accelerator Laboratory Monthly Report

February 1986



**fermilab report** is published monthly by the Fermi National Accelerator Laboratory, P. O. Box 500, Batavia, Illinois 60510 U.S.A.

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FERMILAB-86/2 **Fermi National Accelerator Laboratory** 0090.01

***THE COVER:*** *Old friends rediscovered! These are original Main Ring tunnel sections, built and buried in 1970 and 1971. They have been unearthed and replaced by larger precast sections to accommodate the B0 overpass. These old friends will all be reused in another part of B0 and in other new beam tunnels.* *(Fermilab photograph 86-37-2)*

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# BOOSTER TO DEBUNCHER LINE GOES INTO OPERATION AT FERMILAB

On January 23, 1986, proton beam was extracted from the Fermilab Booster and injected into the Antiproton Debuncher ring for the first time. This was a significant advance because it permits studies of the apertures, extraction, and stochastic cooling in the Antiproton Source complex while the Main Ring tunnel is open for construction projects during the current shutdown. The positive proton beam is injected into the complex in the same direction as antiprotons normally travel. To accomplish this, the magnet polarities are reversed in the source. Particles travel from the Booster to the Debuncher by way of the 750-ft AP-4 line. That beamline has been built entirely from spares and existing magnets. The whole beam has been installed since mid-October, after the first proton-antiproton collisions at 1600 GeV were achieved. The Booster came back into operation around the first of the year. Beam was through the AP-4 line in mid-January. Circulating beam was obtained in the Debuncher on January 25. Currently, aperture studies are underway in the Debuncher.

# 1.6-TeV COLLISIONS - THE ACCELERATOR PERSPECTIVE

Charles M. Ankenbrandt

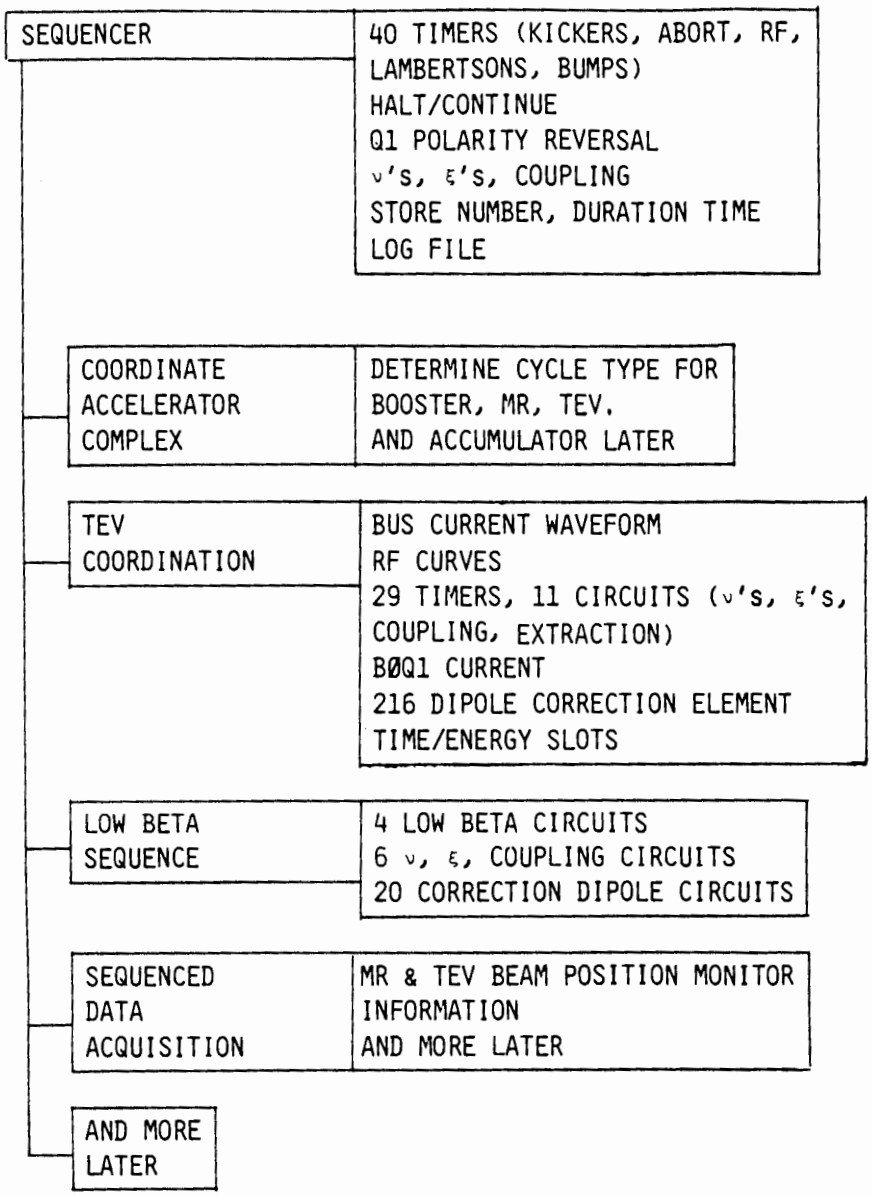
As a brand-new graduate student at the University of California in Berkeley in 1961, I was greatly impressed that my assigned advisor was to be Owen Chamberlain, who had won the Nobel Prize for collaborating on the discovery of the antiproton at the Bevatron in 1955. I was even more appreciative that Professor Chamberlain would spend a long time discussing academic plans with a green student from the Midwest. (In the midst of that conversation, the phone rang, and a frantic hunt for the source of the noise ensued amongst enormous stacks of papers and notebooks. My co-workers will avow that I have emulated Dr. Chamberlain at least in the matter of office clutter.)

Enrico Fermi is often credited with the suggestion that the Bevatron be built with a high enough energy to allow production of antiprotons, should they exist. As it was, in that first experiment of Chamberlain, Segre, Wiegand, and Ypsilantis, with the low intensity of a new accelerator and a beam energy barely above threshold, the antiprotons trickled in at a very slow rate. The candidate events were recorded in the form of photographs of oscilloscope traces showing pulses from velocity-sensitive detectors. In retrospect, the methods seem pretty crude, but I remember being impressed as a student with the complexity of the experiment.

Later, while working on my thesis experiment, I remember suggesting to Denis Keefe that antiprotons could be made to collide with the protons in the Bevatron. "The rate would be too low," he replied, and the speed of his response led me to believe that I was not the first person to have thought of the idea. Of course I did not know then that 20 years later, at a Midwestern lab named in Fermi's honor, I would be privileged to help make antiproton-proton collisions occur at beam energies more than 100 times those of the Bevatron. This is a personal account of some of the activities of many dedicated people in the Main Control Room and the RF Building at F0 that contributed to that achievement.

Chronologically, I suppose the story begins on August 28th, although a tremendous amount of preparatory work had already gone on before that date. To begin with, as the Design Report attests, the Tevatron had been designed and built with colliding beams in mind. Also, extensive modifications to the Main Ring and the Tevatron had already been accomplished on previous shutdowns, including the CDF Collision Hall and detector installation, the beam-squeezing quadrupoles at B0, the D0 overpass, the antiproton beam transfer system from the Main Ring to the Tevatron, and the system at F17 for extraction of protons to the production target and injection of antiprotons from the source. Furthermore, extensive studies related to the collider mode as

## SEQUENCING




*This flow chart (courtesy of Dave Finley) shows some of the steps necessary for Tevatron operation as a collider.*

well as Antiproton Source tests had been possible, many of them parasitic to the fixed-target program, thanks in part to a flexible time-line generator which allowed multiple Main Ring ramps of different types between Tevatron injection cycles. The number and type of Main Ring ramps were a subject of almost daily negotiation. The parasitic studies included sending protons backwards down the various beam transport lines to simulate the antiprotons that would eventually be carried, as well as optimizing the beam storage lifetimes in the Tevatron and testing the beam-squeezing techniques at B0.

Still, it was not until the 28th that our undivided attention could be devoted to the colliding-beams test. The demise of the fixed-target program a few days prematurely as a result of a Tevatron magnet problem was met with poorly-disguised glee in the Accelerator Division. People were clearly anxious to get on with the job.

In cognizance of the hyperbolic accounts of our forthcoming efforts that had appeared in the popular press, someone entitled the new commissioning log book the "Large-scale antimatter production log." Daily meetings were held in the Dungeon at 4:30 p.m. to discuss prospects, problems, plans, and priorities. Helen Edwards orchestrated the show, coordinating, cajoling, and convincing. She made it look easy. (I saw a man on TV once, juggling chain saws; he made it look easy, too.) I was impressed by the honesty with which people divulged their problems and the general spirit of cooperation which led people to adjust their plans in response to the setbacks of others. Equally striking was the rate of progress, the almost daily litany of new technical achievements. Still it was a race that was clearly going down to the wire. In fact, the present long shutdown was postponed more than once because of the anticipation of eventual success.

One concern was the antiproton accumulation rate. Despite our best efforts, the Booster would only produce about two trillion protons for antiproton production per cycle; worst yet, the Main Ring would only accelerate about half of them. This was about half the number called for in the Tevatron I design report; the Main Ring cycle rate was also set conservatively at half the value called for in the Tevatron I design. With the Antiproton Source falling further large factors below the design accumulation rate, it soon became apparent that special measures would be necessary to cope with the small numbers of antiprotons. Special high-gain detectors had been implemented to give information about the behavior of the antiproton beam in the rings. However, the antiproton-beam signals were still too small to control the feedback loops in the Main Ring low-level rf. At a memorable meeting, Helen Edwards suggested that we use protons in the Main Ring simultaneously with the antiprotons as "guide dogs" for the feeble antimatter beams. Hectic efforts ensued, soon successful,

to reconfigure the rf and recalculate a slower Main Ring ramp, since half the cavities would be used to accelerate each beam.

Many of the new beam gymnastics involved the rf and thus led to seemingly chaotic activity at F0. The necessary manipulations included "bunch rotation," whereby proton bunches are shortened before striking the antiproton production target; "cogging," which moves bunches azimuthally in the Main Ring so that, after transfer to the Tevatron, they will meet at the straight sections; "coalescing," or merging many bunches into a single intense bunch at 150 GeV in the Main Ring, and bidirectional acceleration in the Tevatron (and, as it turned out, in the Main Ring, too). Synchronization of the beams was aided by a new beam-sync lock.

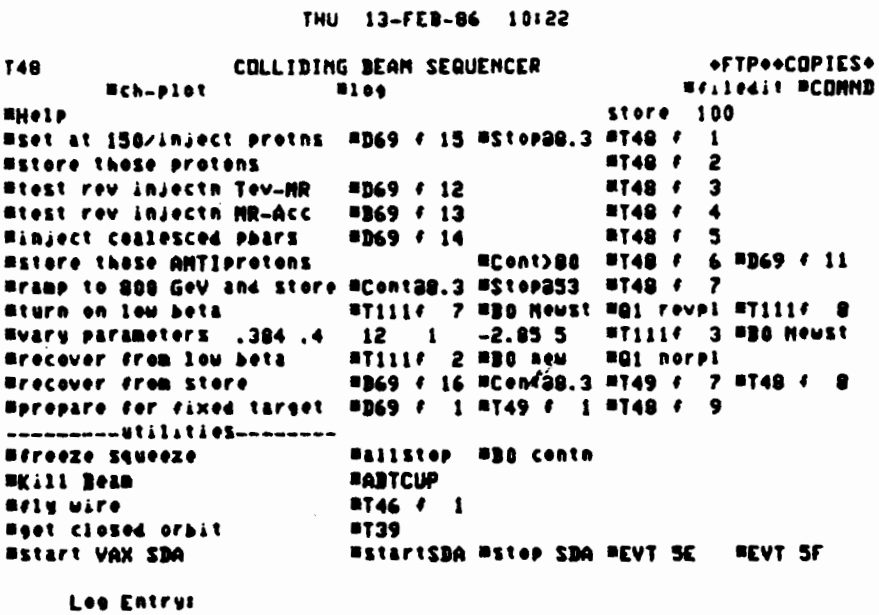
One modest contribution resulted from a request, months before, from John Elias to show him how to reduce the radiation dose to the CDF detector. I showed him how easy it was to move the beam around locally in the Main Ring with "three-bumps" to minimize losses. He was apparently so impressed that I became the unofficial defender of their multimillion dollar detector against radiation damage. Later, as the Main Ring intensity was coaxed higher, it became more difficult to control losses near B0. There were times when, as a last resort, I scraped the beam against the wall elsewhere to reduce losses where they mattered most. Finally, I accidentally discovered, while doing resonance corrections to improve the intensity, that the correctors for the half-integer tune lines could be used to make the beam smaller in the Main Ring at B0. Fortunately, this expertise will probably be rendered obsolete by the new B0 overpass.

Rol Johnson had written an application program which he called a "sequencer," shown on page 5. It looked like a wish list of all the things that needed to be done to accomplish colliding beams. Almost magically, interrupting under a line in the list invoked other programs to implement one of the many required beam manipulations. This process was supplemented with frequently refined recipes describing what to do at each step.

Activities in the Main Control Room alternated between long slow periods of antiproton production and frantic periods of attempting to inject and accelerate the antiprotons. During the antiproton production shifts we also ran cycles for testing the other acceleration modes. Beam was getting lost during the radial excursions necessary for cogging. The instability could be prevented by raising the current in the Main Ring chromaticity-correcting sextupoles, but that caused the sextupoles to drop like flies due to overheating. Finally, Howie Pfeffer found a ramp which cured the problem (rather than the sextupoles).

During the last production sequence on Saturday, October 12th, the antiproton stack had reached a record number of more

than ten billion pbars, which prompted a celebration featuring Dejan Trbojevic's Yugoslavian plum brandy.




*The console TV image of Rol Johnson's sequencer program, which implements the Tevatron colliding-beam mode.*

Another round of extracting the antiprotons from the source, in shots of less than a billion at a time, then commenced. Dave Finley orchestrated the operators manning the consoles, each assigned to perform particular operations and take specific scope pictures and hard copies of computer displays. An intense analysis of the pictures followed each shot to figure out how far the antiprotons had gotten and to calculate better settings and develop better strategies for the next shot. For example, the beam diagnostics for the pbars yielded immensely valuable information about how to correct transverse and longitudinal injection errors. Our poring over the pictures must have been a little like what happened in that first antiproton experiment thirty years ago. Through it all, the Director puffed on his pipe, patiently waiting and watching. The phones were abuzz with questions about what was observed at the RF Building and by the experimenters at CDF and elsewhere.

It seemed almost anticlimactic, or maybe just hard to believe, when Roy Schwitters finally called from CDF to say that they had observed a confirmed antiproton-proton collision event. Hard copies of the reconstructed event soon arrived in

the control room to convince us. More events trickled in later. Remarkably, the whole test run had used only about 25 shots and about 20 billion antiprotons, one fifth the number required in a single bunch to achieve the design luminosity. Nobody had to twist my arm when the invitation to B0 for champagne and sake appeared on channel 13. Facing a 4 a.m. to 4 p.m. shift without benefit of prior sleep, I was delighted when Leon decided to declare victory and begin the shutdown.

STATISTICS

| DATE | STORE | P-BARS USED (E8) | COMMENT |
|---|---|---|---|
| 5 OCT | - | 10 | MR SEM'S IN |
| " | - | 10 | ~1 TURN MR |
| " | - | 10 | ~100 TURNS MR |
| P-BARS CIRCULATED IN MAIN RING | | | |
| 8 OCT | 74-1 | 19 | BAD ACCUM. TO MR TRANSFER |
| " | 74-2 | 13 | ACCELERATED IN MR |
| P-BARS ACCELERATED IN MAIN RING | | | |
| 10 OCT | 80 | 8 | P-BARS IN TEV |
| " | 82 | 6 | NO GOOD |
| 11 OCT | 83 | 7 | " " |
| " | 84 | 2 | " " |
| 12 OCT | 88 | 6.8 | WRONG ACCUM. TO MR TIMING |
| " | 89 | 6.5 | BAD MR COGGING LOSS |
| P-BARS IN TEVATRON WITH MULTIPLE TURNS | | | |
| 12 OCT | 90 | 6.6 | TEV COGGING PROBLEM: Q1 TRIPS |
| P-BARS TO 800 GEV | | | |
| 12 OCT | 91 | 5.1 | MR COGGING PROBLEMS |
| " | 92 | 8.4 | DIED IN MR |
| " | 93 | 7.4 | NO PROTONS IN MR |
| " | 94 | 6.6 | TEV COGGING PROBLEMS |
| " | 95 | 5.6 | P-BARS AT LOW-BETA |
| CDF HAS P/P-BAR EVENTS | | | |
| 13 OCT | 97 | 8.0 | SHORT RUN: GO FOR MORE P-BARS |
| " | 98 | 6.7 | NO GOOD |
| " | 99 | 13.5 | LAST STORE |

TOTALS: 2E10 P-BARS USED
23 CDF EVENTS

*This list (also provided by Dave Finley) of the antiproton "shots" illustrates the rate of progress toward the goal of achieving collisions in the Tevatron.*

# FERMILAB COMPUTER COORDINATING COMMITTEE

Lee G. Pondrom
University of Wisconsin

The Report of the Ballam Committee (Fermilab TM-1230) entitled "Future Computing Needs for Fermilab," and dated December 1983, recommended in part that:

> "A standing computer coordinating group, with membership of experts from all the principal computer user constituents of the Laboratory, should be appointed by and report to the Director. This group should meet on a regularly scheduled basis and be charged with continually reviewing all aspects of the Laboratory computing environment."

The Fermilab Computer Coordinating Committee was established by the Laboratory director in the spring of 1985 in response to this recommendation. The present membership of the committee is given at the end of this article. Members include interested parties from all aspects of Laboratory computing needs: the fixed-target experimental program; the collider program; the university user community; accelerator and beamlines controls; the business office; and, of course, the Computing Department itself.

The first meeting of the committee was held on June 28, 1985, and it has met every month or so since then. It has heard formal presentations from the group responsible for the new computer acquisition and from the Fermilab Advanced Computer Program. The head of the Computing Department regularly discusses the problems and progress of the department with the committee. Informal discussion around the table among the various disciplines represented is one of the valuable functions of the committee.

Three subcommittees have been set up to study policy questions regarding Laboratory-wide standards and to make recommendations which may serve as guidelines. These subcommittees are: Word Processing, Networking, and Graphics and Workstations. Each of these questions is complex, and has several equally useful solutions depending on the requirements of the particular user and on the technology available. Broad policy guidelines on these problems are anticipated in the next few months which will free members to take up other matters. Small standing committees will still probably be needed, however, to adapt the policies to changing conditions.

This is a very interesting time in the computing field, with a trend away from large central-computing facilities and towards user-friendly computing for everyone, no matter where they may be. Full data analysis in parallel with data acquisition, even

at a hadron machine, appears to be an achievable goal. Computers are useful in all aspects of hardware design. These applications are moving targets - what can be done today pales in comparison with tomorrow.

The Laboratory community is encouraged to contact any member of the committee regarding Laboratory computing facilities or policies.

Membership of the Fermilab Computer Coordinating Committee:
Lee Pondrom (chairman), University of Wisconsin

Word Processing Subcommittee
Don Beatty (chair), Fermilab Business Section
John Cumulat, University of Colorado;
Keith Ellis, Fermilab Theory Group;
Jim Finks, Fermilab Business Section

Networking Subcommittee
Marvin Johnson (chair), Fermilab Accelerator Division
Stewart Loken, Lawrence Berkeley Laboratory
Robert Trendler, Fermilab Research Division
Steven Smith, Columbia University

Graphics and Workstations Subcommittee
David Quarrie, Fermilab/CDF (chair)
Jeff Appel, Fermilab Computing Department
Ray Brock, Michigan State University
Jim Hanlon, Fermilab Physics Department
Hugh Montgomery, Fermilab Computing Department
Jack Pfister, Fermilab Computing Department
Gerry Tool, Fermilab Accelerator Division

## THE ILLINOIS MATH-SCIENCE ACADEMY

Marguerite V. Cox

Gifted students from all over Illinois will be congregating in the Fox Valley next fall to form the first class of the Illinois Math-Science Academy. Designed for highly talented 10th through 12th graders, the residential school will be located in Aurora, Illinois. Assuming that further funding is approved by the state legislature, dormitory facilities will be constructed on the site formerly known as the north campus of Aurora West High School.

The Math-Science Academy was the brain child of Fermilab Director Leon Lederman. A feasibility study conducted in October of 1983 was sponsored by the Friends of Fermilab Association (FFLA) and the Corridor Partnership for Excellence in Education. Thirty-nine Illinois high-school teachers, administrators, industry representatives, Fermilab scientists, and college and university professors developed a proposal for Illinois Governor James Thompson, who presented it to the state legislature. That proposal led to the legislation in Senate Bill 730 which authorized the creation of the Academy.

Curriculum for the Math-Science Academy was recently designed by the state-wide Steering Committee which includes seven members of FFLA: Marguerite V. Cox, Stanka Jovanovic, Leon Lederman, Robert Marshall, Stephanie Marshall, Bill West, and George Zahrobsky. As proposed, the curriculum will offer rigorous and accelerated coursework in science, mathematics, the humanities, foreign language, and the arts. There will be opportunities for independent study and research with advisors from Illinois industries and research laboratories. Every student will participate in community service activities outside the classroom. In addition, a rich co-curricular program will be provided.

The Math-Science Academy will be a "flagship" for math and science education in Illinois. New curriculum materials will be developed and shared with teachers from other Illinois schools. In addition, summer workshops will be held to train teachers in current scientific and technological ideas. The Academy will also be of benefit to the state of Illinois. It will have close ties to Illinois colleges and universities and will, therefore, work to keep its graduates in Illinois for their university careers.

Funding for the Math-Science Academy is to be a joint venture between the state of Illinois and private industry, particularly firms located in the so-called High-Tech Corridor along Illinois' East-West Tollway. Operating costs are estimated at $6 - 9 million per year. It is expected that the final Academy enrollment of some 800 students will have a negligable effect on the student population of other Illinois high schools.

# A FEDERAL LABORATORY TECHNOLOGY EXHIBIT

Richard A. Carrigan, Jr.

Fermilab will participate in a technology exhibition entitled "The Federal Lab Fair," to be held at the Museum of Science and Industry in Chicago on March 13 and 14, 1986. The exhibition is being sponsored by the state of Illinois and the museum. The primary objective of the exhibition will be to facilitate technology transfer from the federal laboratories in the state. It is expected that several important federal and state officials will participate. The exhibition represents an outstanding opportunity to display some of the technologies at Fermilab to an audience with the tools to exploit them for wider use.

Other laboratories participating in the exhibition will be Argonne National Laboratory, the Construction Engineering Research Laboratory in Champaign, Illinois, operated by the U.S. Army; the U.S. Department of Agriculture Northern Regional Research Laboratories in Peoria, Illinois; and the NASA Aerospace Research Application Center in Indianapolis, Indiana. The exhibit will be located in the 6000-sq ft area recently used for an exhibition on the history of Chicago architecture. Attendance will be by invitation. Most of the invitees will be drawn from the Illinois business community.

Some of the current exhibits on the 15th floor at Wilson Hall will be used to show the tremendous impact Fermilab has had on large-scale superconductivity technology. Other exhibits will concentrate on instrumentation, including the "Halley's comet" image intensifier and processor system, Hans Jöstlein's and Ron Walker's IR-100 Award-winning systems, a liquid level controller, and FASTBUS. Industrial- and manufacturing- technology exhibits include interestingly modified industrial measuring machines, large-scale printed circuit technology, laminated tooling, and a clever interlocking-component system developed for drift chambers that was recently brainstormed by a design class at the University of Illinois-Chicago. In addition, medical-oriented exhibits will feature Laboratory work in the areas of proton and neutron therapy, and a novel application of drift-chamber technology to position emission tomography (PET). There will also be several exhibits of computer developments at Fermilab.

One interesting feature of the exhibit is the collaborative nature of much of Fermilab's work. Industrial participation or modifications are often accomplished in concert with Fermilab Industrial Affiliates such as Kinetic Systems, Plainfield Tool, and Omnibyte, or other companies like Sheffield and Gerber Scientific. Universities have been significant contributors to FASTBUS and the Halley's comet imaging system as well as some of the medical work. The state of Illinois has also become actively involved through the establishment of Technology Commercialization Centers.

## NOTES AND ANNOUNCEMENTS

**Continuation of the Director's Special Colloquia on Topics in High-Energy Physics...**

A series of colloquia designed for the non-specialist physicist will address areas of unusual interest in theoretical and experimental high-energy physics.

The following colloquia are to be presented in the Ramsey Auditorium in Fermilab's Wilson Hall.

"The Tevatron Collider - The Antiproton Source," by John Peoples (Fermilab), on March 6, 1986, at 4:00 p.m.

"Accelerators of the Future," by Andrew Sessler (Lawrence Berkeley Laboratory), on March 13, 1986, at 4:00 p.m.

"Linear Colliders," by Burton Richter (Stanford Linear Accelerator), on April 3, 1986, at 4:00 p.m.

(Title to be announced), by Israel Singer (Massachusetts Institute of Technology), on April 10, 1986, at 4:00 p.m.

"CP - Past, Present, and Future," by James Cronin (University of Chicago), on May 1, 1986, at 4:00 p.m.

**First Workshop on Antimatter Physics at Low Energy...**

A three-day workshop on antimatter physics at low energy will be held at Fermilab from April 10 through April 12, 1986. The goal of this workshop is to gauge the interest in physics that would be accessible by adding a variable-energy antiproton storage and cooling ring to the existing Accumulator at Fermilab. The range of possibilities include provision for an internal gas jet, extracted beams, trapping and cooling antiprotons, and a $\bar{p}p$ collider-mode spanning center-of-mass energies through bottomonium.

This workshop will bring together the interested physics community, accelerator physicists, Fermilab staff and management, and representatives of the funding agencies for discussion of these physics possibilities. The anticipated result of the workshop is a clear view of the physics arguments for proceeding with a formal design study and, eventually, a proposal for an intermediate-energy antiproton ring at Fermilab.

For further information, please contact Phyllis Hale, Fermilab Users Office, P.O. Box 500, M.S. 103, Batavia, Illinois, 60510. Telephone: (312) 840-3111; FTS: 370-3111.

**Summer Housing...**

The Fermilab Housing Office is now making plans and taking reservations for summer accommodations. Since there is always an influx of experimenters during the summer months, the Housing Office has established March 21, 1986, as the deadline for receipt of reservations for on-site housing.

An attempt will be made again this year to satisfy summer housing needs by a procedure of decision-making based upon individual needs and optimization for the Laboratory program. Even though the present schedule does not call for experimental physics during the summer, the Housing Office expects more requests than can be accommodated.

All requests should be in by March 21, and responses to housing requests will be mailed out by April 11. Requests can be for any period during the summer, and need not commence June 1. Current residents of Fermilab housing may request extensions into the summer, but are reminded that current occupancy does not guarantee placement.

All persons using housing for the summer will be asked to state that they will make steady use of the housing for the period they request. If the space will not be used for some portion of the visit, Housing should be notified. In accordance with recommendations from the Users Executive Committee, a fee equal to two weeks' rent will be charged to an individual or group if two weeks' notice of cancellation or postponement is not given prior to scheduled arrival.

Postponements are permitted on a one-time basis only, for a maximum period of two weeks. After that it may be necessary to reassign the accommodation.

Double occupancy will not be employed for dormitory rooms unless requested. The charge for the second person will be $4.00 per night.

Allocation priorities:

1. Theorists - six houses or apartments and five dorm rooms.

2. Long-term commitments (foreign experimenters at Fermilab under official exchange agreement).

3. Experimenters setting up for the fall.
   a) Families - at least one house or apartment per experiment in this category
   b) Individuals - at least one dormitory room per experiment in this category.
   c) Remaining dormitory rooms, houses, and apartments will be assigned until as many requests as possible from persons in this category can be met.

The starting dates for summer occupancy will be staggered during the week of June 1. In the event that the on-site housing facilities are filled, the Housing Office will assist in finding off-site accommodations. For further information, please contact the Housing Office at (312) 840-3777.

MANUSCRIPTS, NOTES, LECTURES, AND COLLOQUIA PREPARED
OR PRESENTED FROM JANUARY 27, 1986 TO FEBRUARY 23, 1986

Copies of preprints with Fermilab publication numbers can be obtained from the Publications Office or Theoretical Physics Department, 3rd floor east, Wilson Hall. Copies of some articles listed are on the reference shelf in the Fermilab library.

## Experimental Physics

| | |
|---|---|
| J. A. Crittenden<br>Experiment #605 | Inclusive Hadronic Production Cross Sections Measured in 400 GeV Proton-Nucleus Collisions (Ph.D. Thesis, Columbia University, New York, January 1986) |
| P. C. Petersen<br>Experiment #619 | The Sigma-Lambda Transition Magnetic Moment (Ph.D. Thesis, Rutgers, the State University of New Jersey, October 1985) |
| B. Cox, presentor<br>S. Aronson et al.<br>Experiment #740 | Uranium-Liquid Argon Calorimetry: Preliminary Results from the DO Tests (FERMILAB-Conf-86/14-E; presented at the DPF Meeting of the American Physical Society, University of Oregon, Eugene, Oregon, August 12-15, 1985.) |

## Theoretical Physics

| | |
|---|---|
| C. N. Leung | Higgs Boson Spectrum from Infrared Fixed Points (FERMILAB-Conf-85/129-T; presented at the DPF Meeting of the American Physical Society, University of Oregon, Eugene, Oregon, August 12-15, 1985; revised) |
| C. Quigg<br>and R. F. Schwitters | Elementary Particle Physics and the Superconducting Super Collider (FERMILAB-Pub-85/137-T; submitted to Science; revised) |
| C. H. Albright<br>and J. Oliensis | Mirror Lepton Phenomenology in a Left-Right Model with Ultralight Dirac Neutrinos (FERMILAB-Pub-85/171-T; submitted to Phys. Rev. D) |

**Astrophysics**

| | |
|---|---|
| J. Choloniewski and M. Panek | The Local Density and Morphology Dependence of the Galaxy Luminosity Function (FERMILAB-Pub-85/179-A; submitted to Astrophys. J.) |
| M. S. Turner | Probing the Structure of the Galactic Halo with Gamma Rays Produced by WIMP Annihilations (FERMILAB-Pub-86/17-A; submitted to Phys. Rev. D) |
| M. S. Turner | A Cosmologist's Tour Through the New Particle Zoo (Candy Shop?) [FERMILAB-Conf-86/18-A; to be published in **Dark Matter in the Universe**, eds. J. Knapp and J. Kormendy (Reidel, 1986), and the proceedings of the IAU Symposium 117, Princeton University, Princeton, New Jersey, June 24-28, 1985] |
| M. Panek | The Large Scale Microwave Background Fluctuations, Gauge-Invariant Formalism (FERMILAB-Pub-86/19-A; submitted to Phys. Rev. D) |
| L. G. Jensen and A. S. Szalay | N-Point Correlations for Biased Galaxy Formation (FERMILAB-Pub-86/23-A; submitted to Astrophys. J) |

**General**

| | |
|---|---|
| J. Krider and C. Hojvat | A Multiwire Secondary Emission Beam Profile Monitor with 20 Micron Resolution (FERMILAB-Pub-85/176; submitted to Nucl. Instrum. Methods A) |
| B. Cox, presentor C. Buchanan et al. | SSC Event Characteristics and Implications for Detector Design (FERMILAB-Conf-86/15; presented at the Supercollider Physics Topical Conference, University of Oregon, Eugene, Oregon, August 9 and 10, 1985.) |
| S. I. Baker et al. | Deflection of an 800 GeV Particle Beam Using Channeling (FERMILAB-Pub-86/20; submitted to Nucl. Instrum. Methods A) |

| | |
|---|---|
| J. D. Bjorken | Forward Spectrometers at the SSC (FERMILAB-Conf-86/22; submitted to the Proceedings of the Workshop on Triggering, Data Acquisition, and Computing for High Energy/High Luminosity Hadron-Hadron Colliders, Fermilab, Batavia, Illinois, November 11-14, 1985.) |

**Colloquia, Lectures, and Seminars**

| | |
|---|---|
| R. Thatcher | "Formatted Input and Output; Printer Carriage Control; Unformatted Input and Output" (Fermilab, January 28, 1986) |
| R. Johnson | "Selected Topics from CERN and DESY" (Fermilab, January 28, 1986) |
| G. Decker | "The Centrifugal Space Charge Force in Circular Accelerators" (Fermilab, January 30, 1986) |
| R. Thatcher | "Use of Data Types: CHARACTER, LOGICAL, DOUBLE PRECISION and COMPLEX; Issues of Precision and Word Size" (Fermilab, February 4, 1986) |
| R. Orr | "Accelerator Division Information Meeting" (Fermilab, February 4, 1986) |
| B. Wagner, M. Atac, and D. Christian | "Some Results from the Workshop on Aging in Wire Chambers" (Fermilab, February 6, 1986) |
| R. Thatcher | "File Control Statements, Direct Access READ and WRITE, INQUIRE Statement; Program Testing and Debugging" (Fermilab, February 11, 1986) |
| C. Ankenbrandt | "What's Wrong with the Fermilab Booster?" (Fermilab, February 11, 1986) |
| B. Kells | "Wide Band Pickups for the Accumulator and Their Use" (Fermilab, February 13, 1986) |
| D. Harding | "Status of the AP-4 Line Commissioning" (Fermilab, February 13, 1986) |

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| A. Baumbaugh | "Video Tape of Halley's Comet, Enhanced through Use of Video Data Acquisition System; VDAS Also Demonstrated with Scintillating Glass Fiber Optic Plates" (Fermilab, February 13, 1986) |
| S. Childress | "Switchyard for the Next Run" (Fermilab, February 13, 1986) |
| T. Toohig | "Updating the SSC" (Fermilab, February 18, 1986) |
| J. Marriner | "Status Aperture Studies in the Debuncher and Accumulator" (Fermilab, February 20, 1986) |
| R. Oberholtzer | "Electrical Work Associated with the A-50 Detector Enclosure" (Fermilab, February 20, 1986) |
| J. Satti | "Relocation of the LCW Pipes and Chilled Water Pipes Associated with the A-50 Detector Enclosure" (Fermilab, February 20, 1986) |
| B. Wagner, M. Atac, and D. Christian | "Some Results from the Workshop on Aging in Wire Chambers" (Fermilab, February 20, 1986) |

## DATES TO REMEMBER

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| March 10, 1986 | Deadline for receipt of material to be considered at the April Physics Advisory Committee Meeting |
| March 21, 1986 | Users Executive Committee Meeting Washington, D.C. |
| April 10-11, 1986 | Physics Advisory Committee Meeting |
| April 10-12, 1986 | First Workshop on Antimatter Physics at Low Energy; Fermilab; for more information, contact Phyllis Hale, Fermilab Users Office, MS #103, Fermilab, P.O. Box 500, Batavia, Illinois 60510; (312) 840-3111 or FTS 370-3111. |
| April 24-27, 1986 | Conference on the Teaching of Modern Physics; Fermilab; for more information, contact the American Association of Physics Teachers, 5110 Roanoke Place, Suite 101, College Park, Maryland 20740. |
| May 2 and 3, 1986 | Annual Users Meeting Fermilab, Batavia, Illinois 60510. |
| June 23 - July 11, 1986 | Summer Study on the Physics of the Superconducting Super Collider, Snowmass, Colorado; for information contact JoAnne Day, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439. |