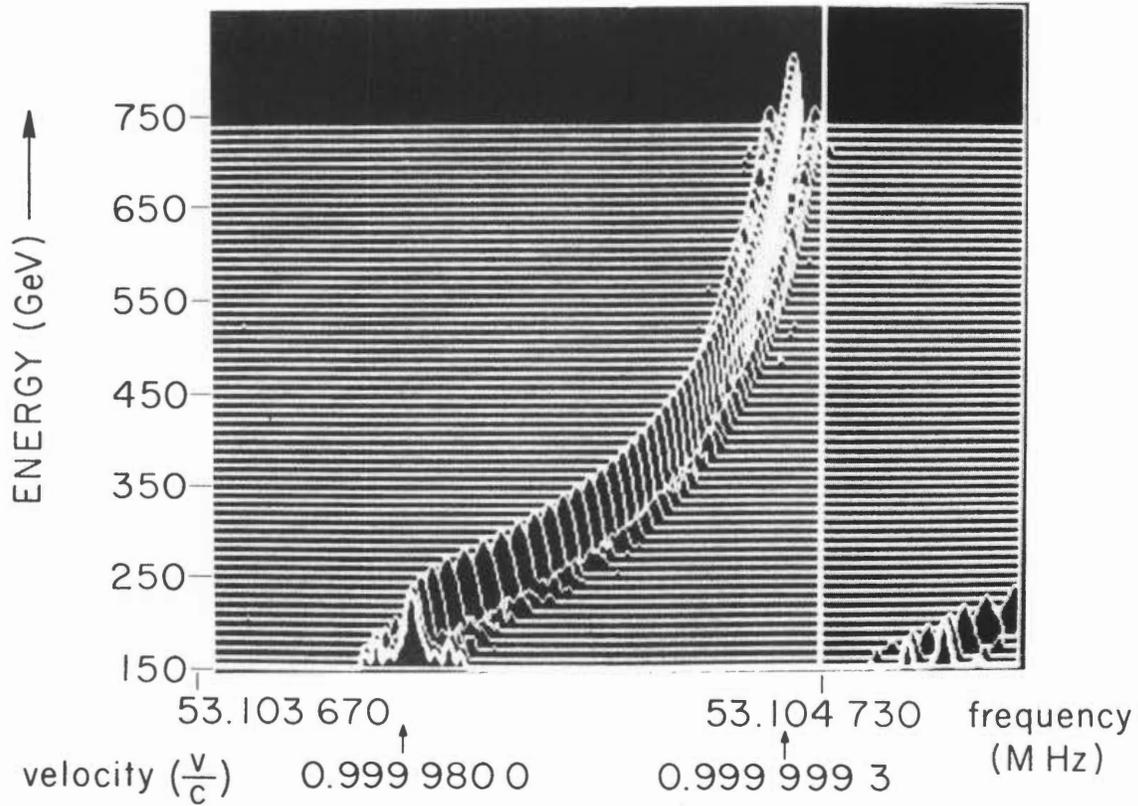


# fermilab report



Fermi National Accelerator Laboratory Monthly Report

November 1984



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F. T. Cole, R. Donaldson, and L. Voyvodic, Editors

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FERMILAB-84/10



Fermi National Accelerator Laboratory

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THE COVER: Fermilab Experiment 723 - Measurement of Proton Velocity as Function of Energy, June 21, 1984.  
(Photo courtesy of A. C. Melissinos, University of Rochester)



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STATUS OF THE ACCELERATOR

Robert Mau

**Saver.** The repair work on TC magnets has been completed. The Energy Saver is again leak-tight.

E Sector. is at 5K. A Sector and F Sector are below 35K and are cooling down.

**Main Ring.** We have checked the Main Ring magnet inductance, completed a magnet hipot and completed a magnet blacklisting. No bad magnets have been found.

**Injector.** Beam has been accelerated in the Booster and extracted to the dump. The 8-GeV power supplies have been tested.

**Schedule**

Nov. 3-4	Ramp Main Ring Ramp Sectors A, E, and F of the Saver.
Nov. 10-11	Inject 8-GeV beam and transport it to D0.
Nov. 13	Complete installation of last vertical bend at D0.
Nov. 17-18	Start coasting and accelerated beam studies in Main Ring.
Nov. 21	Start cooldown of B, C, and D sectors of Saver.
Dec. 1	Inject into Saver.

RESEARCH DIVISION REORGANIZATION

Effective October 8, the management structure of the Research Division was reorganized under the leadership of its new head, Ken Stanfield, to meet its new challenges and tasks. With the installation and commissioning of the Tevatron complete, the task of completing the experimental facilities that will utilize the higher-energy beams is still largely before us. Work is proceeding on the Collider Detector at Fermilab (CDF) located at B0, the new Muon, Wide-Band, M-West, M-Polarized, and Prompt beams, upgrades of existing beam lines, and a large array of new and more sophisticated experimental detectors. With the advent of CDF, the Fermilab experimental program will move into a new era as it becomes both a fixed-target and colliding-beams program. The new Research Division structure will enable all parts of the Division to pool their resources and talents, and more efficiently carry out the tasks at hand.

In the Division Office, Roger Dixon has been named Deputy Head. He will have a variety of responsibilities, which include beams and experimental-area operations. He was formerly Head of the Experimental Areas Department (EAD).

Peter Garbincius has been named Associate Head in charge of all experimental installations. He was formerly Deputy Head of EAD.

Ray Stefanski was named Assistant Head in charge of construction and planning and will continue as Deputy Head of the TeV II project. He was formerly head of the EAD Construction Group.

Several new project and support groups will report to the Division Office. The new Administrative Support Group will be headed by Barb Edmonson. All administrative assistants and secretaries in the Research Division are in this group. The Safety Group will be headed by Don Cossairt. A new set of Project Groups was formed with Al Brenner heading the New Computer Acquisition Project, Tom Nash heading the Advanced Computer Group, Thornton Murphy heading the Beams Group, and Tony Glowacki heading the Engineering and Design Group.

One of the major reorganizational changes was the combining of the EAD and Research Services Departments, and the forming of several new departments. Previously, several groups in Research Services and EAD provided similar support services. The combined efforts of these groups will increase their efficiency, and bring greater uniformity throughout the Division. Jack Lindberg was named Head of the Mechanical Department. Bob Trendler was named Head of the new Electronics and Electrical Department. This Department combines the EAD Electrical Group with the Electronics Support, Beam Systems, and P.C. Shop Groups of Research Services.

Steven Pordes will head the Facilities Department which includes the former EAD Facilities Support Group and the Particle Detector Group of Research Services. Along with his responsibilities as Associate Division Head, Peter Garbincius will head the Experimental Areas Support Department. This Department brings together the former EAD Site Support Group and the Alignment Group of Research Services. Joel Butler was named head of the Operations Department. The new Operations Department includes the former EAD Operations Group and the Software Support Group of Research Services. Rich Smith will head the Cryogenic Department. This Department merges the former EAD Cryogenics Group with the Cryogenic Construction, Hydrogen Target, Cryogenic Engineering, Magnet Fabrication, and Mechanical Design/Drafting Groups of Research Services. Hugh Montgomery was named Head of the Computing Department. Roy Schwitters and Alvin Tollestrup continue to Co-Head the Collider Detector Department. Chris Quigg will continue to Head the Theoretical Physics Department.

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Users Executive Committee members seated (left to right) are Ken Heller, University of Minnesota; Carol Wilkinson, University of Wisconsin; David Levinthal, Florida State University; Robert McCarthy, SUNY-Stony Brook; and Chuck Brown, Fermilab; standing (left to right) are Bill Reay, Ohio State University; Carl Bromberg, Michigan State University; Roger Dixon, Fermilab; Paul Grannis, SUNY-Stony Brook; Alex Dzierba, Indiana University; Stewart Loken, LBL; Phyllis Hale, Fermilab; and Frank Merritt, University of Chicago (not pictured is Ken Young, University of Washington).

(Photograph by Fermilab Photo Unit)

FAREWELL RESEARCH SERVICES

Frank Beck

The Research Services Department was part of the Research Division, and historically performed services common to the Meson, Neutrino, and Proton Departments. When these three departments were merged into a single Experimental Areas Department in June 1982, Research Services went on fulfilling these same responsibilities. The personnel available for this task comprised one of the strongest cryogenics teams at the Laboratory, supported by two technical groups and a drawing office, a printed circuit shop with the capability for producing large circuits and fine detectors, the hydrogen target group, an electronic instrumentation team, and a hardware and software team to support beam-line instrumentation. These teams, employing some 90 people altogether, were located in two distinct areas, most of the department being in Labs 3 and 8 in the Fermilab Village, with the electronics and software groups on the 14th floor of Wilson Hall. Administration of the Village activities was handled by Rich Smith, assisted by Ron Fast and Al Ito, and on the 14th floor by Frank Beck assisted by Hugh Montgomery.

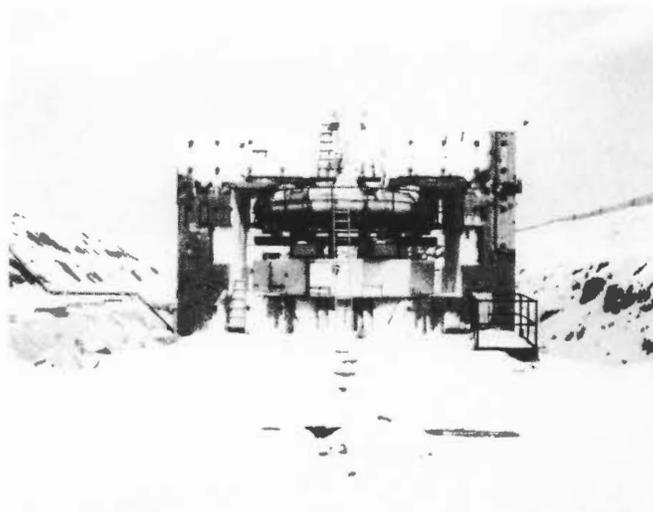
**Cryogenic Engineering**

Research Services had the responsibility for several important projects in the area of cryogenic engineering. A major effort of this kind went into the design of the superconducting solenoid for the magnet of the Collider Detector Facility (E-741). This coil was fabricated in Japan and is now ready to install. A complete refrigeration system was designed, fabricated, and put through safety assessments. Preliminary tests of the system were completed and transfer lines are currently in the construction stage, ready for full-scale tests of the magnet in the near future.

Another major superconducting magnet project has been the 30-inch bubble chamber conversion project. This project, which contributes to the Laboratory effort to cut power consumption, has involved remodeling of the iron and the design, construction, and installation of superconducting coils. Research Services has also designed the complete cryogenic support equipment for this magnet, including transfer lines and two large helium dewars. The installation work on this system is now in an advanced stage, as is the plumbing supporting the chamber itself, also a Research Services project.

The superconducting coils of the reconstructed Chicago Cyclotron magnet have been installed in the new Muon Lab. The laboratory was built around this magnet during the summer, and

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The Chicago Cyclotron Magnet awaiting the protection of a temporary cover prior to the construction of the new Muon Laboratory.

the magnet will be commissioned this spring. A lot of preparatory work was done for the design of the large superconducting magnet M3 which was to be the principal muon shield for the Prompt Neutrino Facility (E-636). Tight budgets caused the Physics Advisory Committee to require a complete re-think of the prompt neutrino beam line with a view to reducing the price without the loss of too many prompt neutrinos. It is likely that a new design will involve only conventional magnets.

#### **Conventional Magnets**

Three large, conventional spectrometer magnets for E-687 and E-706 were completely designed, the copper was acquired, and contracts for coil fabrication were awarded. The iron is also on order. Some of the iron is being supplied from the USSR as part of the E-672 collaboration. A fourth conventional magnet, for E-711, is being made by rebuilding an older magnet, increasing its gap, and replacing aluminum coils by copper, which will result in a considerable energy saving during operation.

#### **Operational Responsibilities**

Research Services has major operational responsibilities in addition to these construction projects. The beam-line control system has been completely rebuilt in previous years, and during

this year it was commissioned and put into operation for experimenters and the beam-line operations staff. New capabilities have been added as experience has shown them to be necessary, and a new phase of the project has been defined, which will allow the system to control diverse services (cryogenics and vacuum) not yet incorporated. It involves the integration of the three independent control systems into a network-based system, with the elimination of reliance on shared memory for the transfer of information between computers. This new phase of the project will also permit a relaxation of certain constraints, such as the limit on the number of concurrent users.

A pilot study was performed for replacement of the user interface of the EPICS system by a personal computer with a color display. Preliminary results were encouraging, and a full-scale project to implement such color interfaces might be considered in the future.

Hydrogen targets are built and operated for various experiments by the hydrogen target group. Three experiments (E-557, E-605, and E-609) were supported in this way in the past year. Operation of the superconducting magnet for the multiparticle spectrometer was a Research Services responsibility, and a helium recycling plant was built and commissioned, which conserved five times its costs in helium during the run which has just ended.

Another important job of Research Services was to provide magnetic measuring equipment. The principal device is the zip-track, on which there was a decisive electronics upgrade this year. A very busy schedule was pursued this summer calling for ziptrack work on experiments E-400, E-605, E-615, E-690, E-705, E-731, and E-745.

The printed circuit shop does not attempt to duplicate services in local industry, but rather specializes in circuits which are too large to be obtained elsewhere (up to 12 ft long) or in fast turn-arounds for research and developmental needs. This department also fabricates SWICs and proportional counter planes, and has most recently made available a Gerber printer-plotter with a routing attachment, for the fabrication of large calorimeter segments by cutting, rather than etching the copper cladding. Single boards 12 ft by 4 ft are available by this method. The routing attachment was made for us by the Physics Department. The first user of this facility is E-706, but there has already been a stream of enquiries about using it from other experiments.

The electronics group has been working in the support of E-705 and E-741. The major project was a precision amplifier, ADC and Cluster Finder System for E-705 which has been completely designed and is in fabrication. This system is for a large array of scintillating glass blocks for which the system which controls



The converted Gerber router (with Delbert Venters, Ed Arko, George Fandurakis, and Wilcox Yang).

the motorized movement has also been designed. In addition development work was performed on the amplifier discriminator electronics for the vertiex and central tracking detectors of the CDF project. The group has also supplied the CDF project with a regulated power supply for their superconducting solenoid and



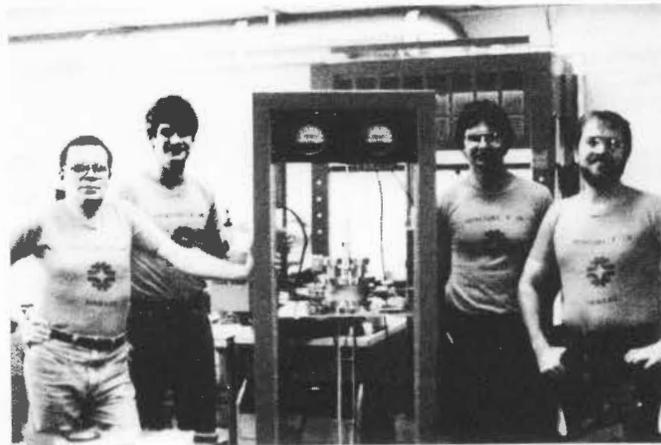
Wrapping the superinsulation on the coil for the Tohoku 32-in. bubble chamber magnet (with Roman Dachniwskyj, David Smith, and Barry Skinner).

worked on the control circuitry for the 32-in. bubble chamber. Some help, mostly in the form of consulting services, was given to the Accelerator Division.

Research Services provided the Laboratory's alignment services, involving a group of 13 people, supported by contract labor, currently about 8 additional surveyors. The group serves virtually every construction project and experiment on the site, and its work was usually channeled from people requiring it through the Experimental Areas Department and the Tevatron Construction Group.

#### Particle Detector Group

The Laboratory was fortunate in being able to recruit two members of the well-known Charpak group at CERN to found a



The Particle Detector Group with their prototype liquid argon detector (Stan Majewski, John Fitch, Brian Kross, and David Anderson).

research group on particle detectors. David Anderson and Stan Majewski have now been with Research Services most of the year, and in addition to installing their laboratory facilities and recruiting two helpers, the group has started to work on their first experiments, involving a beam test of a ring-imaging Cherenkov counter built in collaboration with the Swiss Institute for Nuclear Research and tests on the radiation resistance of barium fluoride, a scintillator. Other projects currently under study are a low-pressure detector for Cherenkov photons and a scheme for doping liquid argon with a photosensitive material to increase the electron yield and drift velocity and to reduce the

effects of ionic recombination. The group is also involved with the SSC study and has proposed a forward calorimeter for SSC experiments which was the subject of a working group at the recent Snowmass meeting.

### Reorganization

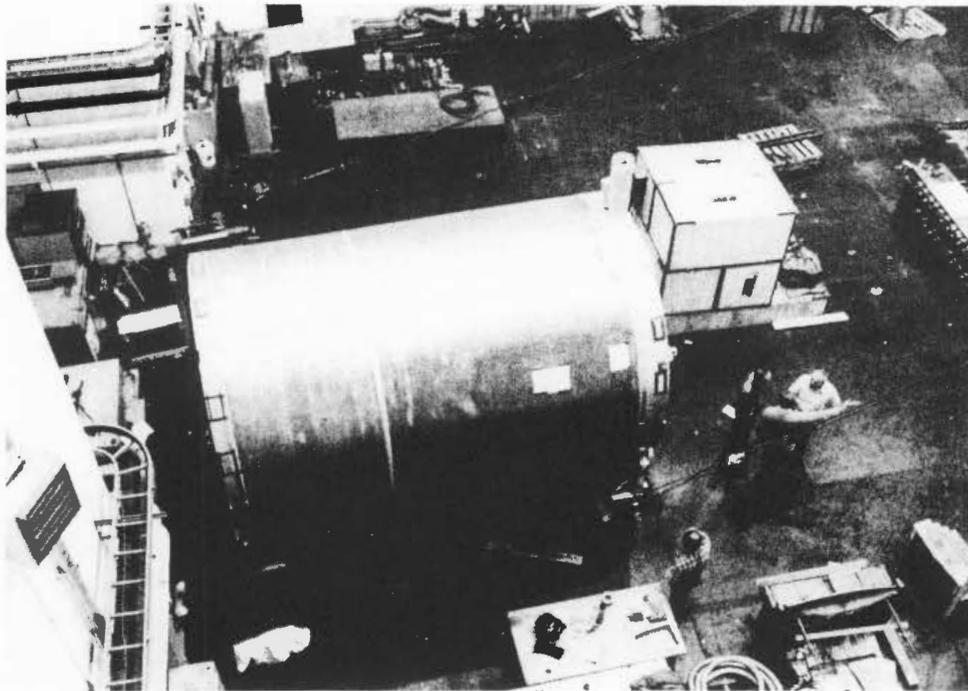
The combination of the three areas into an Experimental Areas Department in mid-1982 left Research Services in an anomalous position. Constant discussion of whether a particular project should be in EAD or Research Services, and the repeated requirement for one department to lend effort to the other, made it clear that a new arrangement of the groups would be needed, and at the beginning of October this year, Ken Stanfield, the new Research Division head, announced a new administrative structure. This structure involves departments with more specialized functions and will in principle allow limited manpower resources to be applied more efficiently. After some 12 years, Research Services is no more.

The group, and the people in them, will continue under a different management structure to serve the research program as members of the Cryogenics, Operations, Electrical, and Facilities and Experimental Areas Support departments. Only the name of Research Services has come to an end, and it is with a mixture of pride and regret that I realize that I was the last holder of a position which served the research workers at Fermilab during most of its history. As I return to CERN in Geneva, I wish the erstwhile members of Research Services much luck and a productive and successful future in their respective positions in the Research Division. There may not be a "Research Services" any more, but Services to Research will continue to be what the Laboratory is all about.

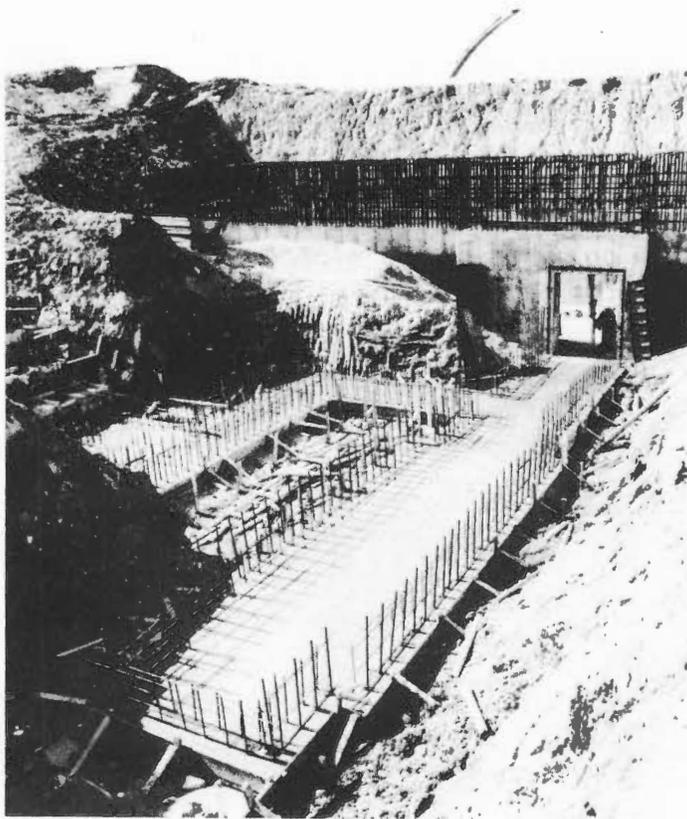
### Heads of Research Services 1972-1984

Frank Beck	1983-1984
Brad Cox	1981-1983
Marvin Johnson	1979-1981
Paul Mantsch	1978-1979
Lincoln Read	1976-1978
Quentin Kerns	1975-1976
Miguel Awschalom	1973-1975
Win Baker	1972-1973

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The superconducting CDF coil delivered and in the pit at B0.  
(Photograph by Fermilab Photo Unit)



A Tevatron II beam enclosure being built.  
(Photograph by Fermilab Photo Unit)

HYPERON PHYSICS AT THE TEVATRON  
DECEMBER 7-8, 1984

This is the third in a series of workshops held at Fermilab to follow up on discussions that took place at the June 1984 Fixed Target Workshop. The focus of this informal workshop will be on the present state of hyperon physics and what exciting experiments remain to be done.

A tentative agenda includes the following:

**Experimental Reviews** of hyperon programs.

**Theoretical Reviews:**

- a) Hyperon polarization and production;
- b) Magnetic moments;
- c) Semi-leptonic and other rare decays;
- d) Hyperon interaction processes;
- e) Charmed hyperon production, etc.

**The Future of Hyperon Physics:**

- a) The theoretical viewpoint;
- b) The experimental viewpoint.

Time permitting (most likely Saturday morning), small groups will be formed in which specific topics can be discussed in detail. Ideas for the subjects of these discussions, as well as major topics, would be appreciated. Anyone interested in contributing ideas or talks to the workshop should contact any of the following persons: Joe Lach, Andy Beretvas, or Gina Rameika c/o Fermilab Users Office (312) 840-3111 or Marleigh Sheaff, University of Wisconsin, (608) 262-0804.

MANUSCRIPTS, NOTES, LECTURES, AND COLLOQUIA PREPARED  
OR PRESENTED FROM FROM OCTOBER 14, 1984 TO NOVEMBER 11, 1984

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**

- V. K. Bharadwaj et al.      A Large Area Liquid Scintillation  
Experiment #516              Multiphoton Detector (Submitted to  
                                 Nucl. Instrum. Methods)
- P. Reiner et al.              Search for Anomalous Gravitational  
Experiment #723              Effects at the Fermilab Accelerator  
                                 (FERMILAB-Pub-84/97-E)

**Theoretical Physics**

- S. Kivelson et al.            Effect of Interactions Between Elec-  
                                 trons of Like Spin in Conducting  
                                 Polymers (FERMILAB-Pub-84/57-T; sub-  
                                 mitted to Phys. Rev. D)
- A. Sen                          Comparison of the Canonical Hamil-  
                                 tonian and the Hamiltonian of Callan  
                                 and Rubakov for the Monopole Fermion  
                                 System (FERMILAB-Pub-84/61-T; sub-  
                                 mitted to Phys. Rev. D)
- A. Sen                          Radiative Corrections in Grand  
                                 Unified Theories Based on  $N=1$   
                                 Supergravity (FERMILAB-Pub-84/85-T;  
                                 submitted to Phys. Rev. D)
- C. H. Albright                Probing for Preon Structure Via  
and I. Bars                    Gluons (FERMILAB-Conf-84/87-T; sub-  
                                 mitted to the 1984 Summer Study on  
                                 the Design and Utilization of the  
                                 Superconducting Super Collider, Snow-  
                                 mass, Colorado, June 23-July 13,  
                                 1984)
- L. McLerran                    Eleven Lectures on the Physics of the  
                                 Quark-Gluon Plasma (FERMILAB-Conf-  
                                 84/101-T; lectures presented at a  
                                 Workshop on the Physics of the Quark-  
                                 Gluon Plasma, Hua-Zhong Normal Uni-  
                                 versity, Wuhan, People's Republic of  
                                 China, September 1983)

**Physics Notes**

- L. Cohen et al. Tolerance of the Human Spinal Cord to High Energy p(66) Be(49) Neutrons (FN-408)
- P. D. Kurup et al. Fast Neutrons and Misonidazole for Malignant Astrocytomas (FN-409)

**General**

- B. C. Brown et al. Persistent Current Fields in Fermilab Tevatron Magnets (Presented at the Applied Superconductivity Conference, San Diego, California, September 9-13, 1984)
- A. D. McInturff et al. Model Magnet Studies (Submitted to the Applied Superconductivity Conference, San Diego, California, September 9-13, 1984)
- T. H. Nicol et al. Computer Aided Engineering Without CAE (Submitted to the ASME International Computers in Engineering Conference, Las Vegas, Nevada, August 12-15, 1984)
- R. C. Niemann et al. Superconducting Super Collider 5T Dipole Magnet (Presented at the Applied Superconductivity Conference, San Diego, California, September 9-13, 1984)
- R. C. Niemann et al. Cryogenic Design of a Superconducting 5T Dipole Magnet for the Superconducting Super Collider (Presented at the ICECIO, July 31-August 3, 1984, Otaniemi, Finland)

**Colloquia, Lectures, and Seminars**

- D. E. Johnson "Lattice Design for Cooler Rings" (Invited talk for ECOOL '84, Karlsruhe, West Germany, September 25, 1984)
- C. Hill "Quantum Instability of De Sitter Spacetime" (Fermilab, October 17, 1984)

- J. Grimson "Discussion of Proposed Standards SD-38, Pressure Piping Systems, and SD-40, Maintenance of Pressure Systems" (Fermilab, October 18, 1984)
- K. Ellis "Overview and Discussion I: Tests of QCD" (Fermilab, October 19, 1984)
- A. Ruggiero "Frascati Workshop: New Methods of Accelerating to Very Large Energies" (Fermilab, October 23, 1984)
- S. Das "Some Properties of  $O(32)$  Superstrings" (Fermilab, October 24, 1984)
- D. McConnell et al. "Synchronization of Proton and Antiproton Transfers for Antiproton Collection and Colliding Beams" (Fermilab, October 25, 1984)
- C. Quigg "Overview & Discussion II: Electroweak Standard Model" (Fermilab, October 26, 1984)
- P. Grafstrom "Electron Asymmetry from Polarized  $\Sigma$ -Beta Decay: A Critical Test of the Cabibbo Model" (Fermilab, October 26, 1984)
- F. Mills "Report on the Karlsruhe Workshop on Electron Cooling; Report on the Indiana Workshop on Nuclear Physics with Cooled Beams" (Fermilab, October 30, 1984)
- A. Moretti "Status of Fabrication of the Debuncher RF Cavities and Power Amplifiers" (Fermilab, November 1, 1984)
- L. Bartoszek "Status of the Shutter for the Accumulator: Recent Tests Applications Programs, and Schedule for Construction" (Fermilab, November 1, 1984)
- T. Castellano "Status of Antiproton Source Kickers: Recent Tests, Applications Programs, and Schedule for Construction" (Fermilab, November 1, 1984)

J. Peoples

"Plans for Operating and Commissioning the Antiproton Source"  
(Fermilab, November 8, 1984)

J. MacLachlan

"RF Stacking and Unstacking in the Accumulator: the Sequence of Operations and Applications Programs Needed to Accomplish the Sequence"  
(Fermilab, November 8, 1984)

DATES TO REMEMBER

December 1, 1984

Users Executive Committee Meeting,  
Fermilab, 9 a.m., Comitium, Wilson  
Hall 2E

December 7-8, 1984

Hyperon Physics at the Tevatron  
(the third in a series of workshops  
held at Fermilab to follow up on  
discussions arising at the June  
1984 Fixed Target Workshop). For  
more information, see the article  
on page 13, or contact Joe Lach,  
c/o Fermilab Users Office, (312)  
840-3111.