

April 18, 1985

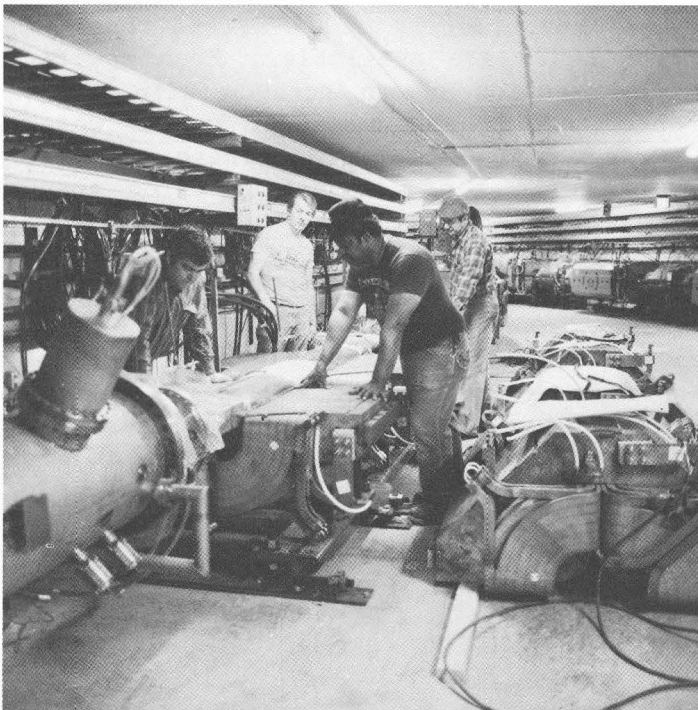
FERMI NATIONAL ACCELERATOR LABORATORY

# FermiNews

## LAST MAGNET INSTALLED IN $\bar{p}p$ ACCUMULATOR

by Glenn Lee and John Satti

A major milestone was accomplished April 8 as the last magnet was installed in the Antiproton Source Accumulator. The Source is rapidly approaching operational status since an 8 GeV proton beam was transported from the Main Ring through the AP-1 and AP-2 lines on March 31. Injection into the Debuncher was first attempted April 7, but magnet cooling water problems were encountered. Injection into the Accumulator is planned for late April. This is the culmination of much diligent work by many people.



Installing the vacuum chambers into the large quadrupoles are (l. to r.) Tom Rathbun, Lee Benson, Roy Meeks, and John Satti.

The Accumulator Ring, approximately 474 m circumference, consists of many quadrupole and dipole magnets connected with stainless steel vacuum chambers for beam circulation. The Accumulator is a high class storage ring designed to accept the injection of antiprotons every few seconds. The antiprotons, traveling at 99.5% of the speed of light, are accumulated over a

period of several hours. Ultrahigh vacuum is required to minimize interaction of the circulating beam with the outgassed molecules of the chamber wall. A nominal pressure of  $3 \times 10^{-10}$  Torr is required in the beam tubes to avoid beam intensity loss from excessive beam-gas collision. This pressure can be met with a combination of sublimation and sputter ion pumps, and with well conditioned chambers to reduce the rate of gas desorption.

The vacuum chambers will be baked at  $300^\circ\text{C}$  each time they have been opened to atmospheric pressure. One critical problem is to bake the chambers in the magnets at high temperature without overheating the laminated magnets. Some of the magnets are 5 m long with very restrictive space for the heaters and insulation. An average space of only 7.5 mm around the chamber is available. In this space a heating system has been designed and tested to heat the chamber to  $300^\circ\text{C}$  and allow a maximum temperature of  $65^\circ\text{C}$  next to the magnet components. This was accomplished by using a heating blanket completely covered with a water cooled, copper heat sink jacket to protect the magnet from the high temperatures.

All metal parts of the vacuum system are fabricated of type 316L stainless steel. This alloy was chosen for two very important reasons. When stainless steel is welded, the welds become slightly magnetic; typically the permeability increases to 1.2 or 1.3. Any such weld situated in a magnet would distort the precise magnetic field. Type 316L stainless steel is less susceptible to such permeability increase. Also, all stainless steel parts are degassed in a vacuum furnace at  $900^\circ\text{C}$  to bake out the residual hydrogen trapped in the metal during fabrication. If it was not baked out, the gas would desorb at high vacuum and increase the resultant pressure. If not controlled at the proper temperature, however, such bakeout can cause some stainless steels to become magnetic. Again, type 316L is less susceptible to

(cont'd on next page)

this problem, and the metal and the welds come out with an acceptable permeability of 1.02 or less.

Pumping of the Accumulator vacuum system is accomplished by three types of vacuum pumps. Roughing pumps are high speed, turbomolecular pumps. Careful measurements have shown that these pumps are very clean and allow little or no back-streaming of pump oil. Ion pumps are used for the high-vacuum phase of pressures down to approximately  $10^{-8}$  Torr. Pumping-speed measurements show that the pumping speed of ion pumps decreases drastically below  $10^{-8}$  Torr, so titanium sublimation pumps are used for high speed pumping at ultra low pressures.



(l. to r.) R. Thomas, D. Beckner, D. Zedonis, S. Smith, A. Gilley, B. Philips, J. Satti, D. Moon, K. Fitzgerald, J. Humbert, G. Mendoza, and V. Rivera are the people who installed the bakeout jackets on the large dipole vacuum chambers.

The entire system must be baked in place to remove water vapor and gases bound to the walls. John Satti, Leon Bartelson, and Mike Gormley have designed the heating jackets, electrical, and control system for the bakeout, with Don Poll taking care of electronic assembly. The Accumulator must be baked in sectors to avoid excessive temperatures in the tunnel. This is a difficult, expensive process, but is necessary to achieve the type of vacuum necessary for adequate storage of anti-protons.

Vacuum testing, measurement, and assembly were handled by Jim Klen and his technicians Ed Podschweit, Rich Tiesi, and Tom Price. They also supervised the installation of AP-1, the Debuncher vacuum parts, and have operated the control system. Tom Larson and his crew, Chuck Bourge and John Spencer, are supervising the installation of AP-2 and AP-3 lines. Tom Rathbun, with Roy Meeks and other

temporary technicians, assembled all the star chambers and installed them in the small quads. They are now supervising Accumulator vacuum installation. Lee Benson has been used everywhere, from cleaning parts and cutting tubing, to assembling and any other job necessary to complete the system. Jim Humbert and his inspector, Don Zedonis, together with many personnel, have installed the bakeout jackets and installed the chambers in the dipoles.

Many other people have contributed to the project. Machinists and welders have produced parts on demand, and we must not forget to thank Fabrication Procurement and the Parts Procurement people in IB Central. We would like to thank everyone, such as the Receiving and Shipping Department, who has contributed to this project.



Approximately 100 drift chambers from E-326 are available. Each chamber is a section of an octagon with a 47" outer radius and an inner radius which varies from 5" to 17". These chambers were built for a magnetized iron spectrometer.

If you have use for these chambers, call Mel Shochet at the University of Chicago, (312) 962-7440 before May 1.

## YOUNG SCIENTISTS TO SHINE AT "INTECH 85"



Barbara (Tech Services) Sizemore (l.), advises Wendi De Gohan, a student from St. Charles High School, on a biology experiment for Intech 85, a science fair to be held on April 20 at the Amoco Research Center, sponsored by the Corridor Group. Eight Fermilab professionals will act as pro-advisors and four physicists as judges for the competition.

# HISTORIANS, PHYSICISTS TO EXPLORE 1950s PHYSICS



*Luis Alvarez*

The "International Symposium on Particle Physics in the 1950s", to be held in Fermilab's Ramsey Auditorium from May 1 through May 4, promises to be an historic occasion in more ways than one. According to Lillian Hoddeson, Fermilab's resident historian and, along with Laurie Brown and Max Dresden, a Symposium organizer, "This meeting of approximately 30 leading particle physicists and 9 historians of science will be one of the first significant public encounters between science historians and physicists. We hope that, as a result of this encounter, new ground will be broken in the writing of the history of contemporary physics.

"This symposium also marks the first gathering of this many high-energy physics historians in the same auditorium. We expect the exchange of ideas to be quite lively."

At the time of the first Fermilab History of Particle Physics Symposium, held 5 years ago, there was virtually no exploration into the subject of particle physics by professional historians of science. Since then, particle physics history, and the era of the 1950s in particular, has become a focal point of historical interest. Two of the speakers scheduled to appear prove the point: John Heilbron, who will address the historian's interest in particle physics, is the director of the LBL history project; Armin Hermann, who will discuss European Laboratories, heads the CERN history project. These two major undertakings represent the first fully funded, large-scale historical studies of major large-accelerator laboratories to get underway in the last 5 years.

The ultimate purpose of the symposium, according to its organizers, is to identify major themes and important historical problems in order to motivate historians and lay the basis for future detailed historical studies of particle physics in the 1950s. As for goals, the first is to create a forum where physicists will present their unique first-person recollections to historians, for whom these recollections are a basic tool, and where the historians in turn present their more objective analyses to physicists who lived through phases of the events being examined. The second goal is more concrete: a Cambridge University Press volume comprised of papers based on the talks delivered at the symposium. It is expected that some of the papers will be expanded and enriched as a result of the unique atmosphere of interaction between physicists and historians at the symposium.



*C. N. Yang*

Among the distinguished speakers at the symposium will be physicists Luis Alvarez, C. N. Yang, Owen Chamberlain, Murray Gell-Mann, Michiji Konuma, Abraham Pais and W. K. H. Panofsky, and historians Peter Galison, Alan Franklin, Andrew Pickering, Silvan Schweber and D. Hywel White.

Registration for the "International Symposium on Particle Physics in the 1950s" will begin at 5:00 p.m. on May 1. Leon Lederman will present his opening remarks at 7:30 p.m. The symposium will end at noon on May 4. For a complete schedule of speakers and times, and more information, contact Lillian Hoddeson, M.S. 109, ext. 3401.

*Illustrations from: "Modern Men of Science"; McGraw-Hill.*



## SUMMER'S HERE! (ALMOST)

The Fermilab swimming pool will open for the 1985 season on Saturday, May 25. Pool membership is open to Fermilab employees, visiting researchers, employees of DOE at Fermilab, Great Lakes Security personnel at Fermilab, and families and accompanied, paid guests of all the above.

Pool memberships may be purchased at the Information Desk in the Atrium at Wilson Hall, and at the Housing Office at Aspen East, beginning May 1. Memberships may also be obtained at the pool itself on Friday, Saturday, and Sunday, May 25-27 only.

Season rates are \$20 for a single, \$35 per couple, and \$50 for a family membership. Daily charge for swimming is \$2.

Lifeguards are on duty from 11 a.m. to 7 p.m., Monday through Friday; 9 a.m. to 7 p.m., weekends and holidays. The pool is restricted to adults from 7 p.m. to 9 p.m.; the pool is closed from 9 p.m. to 6 a.m.

Swimming instruction will be available for children, and will be taught by a certified water-safety instructor. Registration for lessons may be made with the lifeguards.

—Helen McCulloch

## DEFENSIVE DRIVING COURSE SAVES LIVES

For the 4th year, Fermilab is offering the National Safety Council's Defensive Driving Course. Over nine million safety-minded drivers have already taken this course and learned the principles of accident avoidance driving--literally a new way to drive.

Taking the Defensive Driving Course (DDC) and driving defensively can improve your skill in avoiding accidents. Defensive driving may save you from death or injury in a highway accident, or from being the cause of injury or death to some other innocent person. A research study of 8,000 DDC graduates in 26 states indicated that the group had 32.8 percent fewer accidents the year following the course as compared with the previous year.

If interested, please contact your safety officer or call ext. 3482.

—David Cathey

### THE OFFICIAL RULES:

- \*\* Never say "oops" in the operating room.
  - \*\* All progress is based on a universal innate desire on the part of every organism to live beyond its income.
  - \*\* People will accept your idea much more readily if you tell them Benjamin Franklin said it first.
- (From "The Official Rules", Dell Publishing)

## HISTORY WORKSHOP SCHEDULED

As part of an ongoing US/Japan collaboration to study the history of Japanese particle theory (supported by NSF and the Japan Society for Promotion of Science), a series of workshops were held in Japan during 1978-79 and are being held during 1984-85.

On Monday, May 6, 1985, 10 a.m. to 5 p.m. and Tuesday, May 7, 9 a.m. to noon, a workshop will be held in the 1 West Conference Room, in collaboration with the Fermilab history project (Historian: Lillian Hoddeson), emphasizing especially the recollections and work of expatriate Japanese physicists. All those attending the Symposium, and all other interested persons are invited to attend.

For more information contact Laurie Brown, Northwestern University, Evanston, Illinois 60201, (312) 491-3236.

## COUNTRY & WESTERN NIGHT AT BARN

Dance to the music of Bill Reeves and Company, April 19, as NALREC presents their Country & Western party at the Kuhn Barn.

Refreshments and food service will start at 6:30 p.m. and the band plays from 7 p.m. to 11 p.m. Free dance lessons for such steps as the Texas Two-Step, and the Country Schottische will be given from 6 p.m. to 7 p.m. For additional information call Glenn Lee ext. 4448, or Jesse Guerra, ext. 4305.

## Congratulations To . . .

Irene and Steve (Computing Department) Shepard on the birth of Jerod David on April 8, 1985, at Hinsdale Hospital. Jerod weighed 10 lbs, and 15 1/2 oz. and was 22 inches long. Jerod was welcomed home by big sister Tara who is 12 years old.

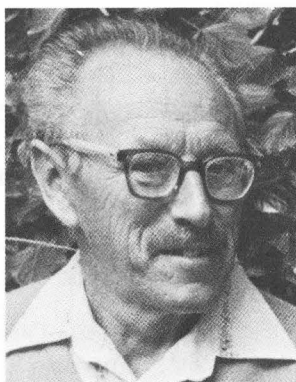
## Congratulations To . . .

Betty and Alan (Computing Department) Petitt on the birth of Aaron Joseph on March 6, 1985, at the Geneva Community Hospital. Aaron weighed 6 lbs., 9 oz. and was 19 inches long. Welcoming Aaron home are brothers Justin and Adam, and sisters Amber and Laura.

## OFF HE GOES, "WILD BILL" YONDER

Bill Froemming, of Facilities, Operations and Engineering, has "hit the silk", free-falling from Fermilab into retirement after 12 years of service.

Bill, an avid aviator in his spare time, began his career at Fermilab on January 22, 1973 as a carpenter, eventually moving to T&M Contracts as Construction Inspector, and, finally, Construction Coordinator between Fermilab and various contractors operating on-site.



*Bill Froemming*

Bill's post-retirement activities include a vacation in Florida, more time with his granddaughter, Stephanie, and finishing up the building of an airplane he and some friends began four years ago.

When earth-bound travel plans are in the offing, Bill can fire up the new travel trailer parked in his driveway. As "Wild Bill" said, "From now on I plan to go low and slow, not high and fast."



## I.D. CARD TO AID DISABLED PERSONS

A Disabled Persons Identification Card is now available from the State of Illinois on a voluntary basis. This ID card will eliminate the plethora of cards currently needed to prove disability in order to obtain services and benefits.

In addition, the card alerts police and emergency medical personnel to the nature of an individual's disability in the event special attention is required.

The phone number for the Office of the Handicapped in Illinois is (217) 782-2434. For brochures and more information contact Emergency Services, on 1NE in Wilson Hall, ext. 3494.

## GOULD IS 1st "DISTINGUISHED SPEAKER"

*Fermilab's Distinguished Speakers series will periodically present renowned speakers of outstanding distinction and accomplishment in the sciences. We expect that these lectures will be of special interest to a broad audience, especially to members of the Laboratory community.*

After more than a century, Charles Darwin is still the subject of controversy. Assaulted on the battlefields of high-school curricula and textbook publishing, his ideas are nevertheless accorded near universal acceptance among practicing scientists. In the last decade no one has explained and amplified Darwin's thought, in its crucial importance to biology as well as social science and politics, more brilliantly than Stephen Jay Gould. We are honored to present Professor Gould in the inaugural lecture of Fermilab's Distinguished Speakers Series, on Friday, May 3, 1985, at 8 p.m. in Ramsey Auditorium; his talk is entitled "Darwin: The Science of History."

Widely acclaimed as an essayist, much sought-after as a lecturer, Gould has been named **Discover** magazine's 1982 Scientist of the Year and a MacArthur Fellow. A paleontologist, he teaches geology, biology, and history of science at Harvard University. He is the author of many books, including **Ever Since Darwin**, **The Panda's Thumb**, and **Hen's Teeth and Horse's Toes**, as well as a monthly column, "The View of Life," in **Natural History** magazine. Gould received his doctorate from Columbia University, and his specialized research concerns the evolution of West Indian land snails.

Admission to Professor Gould's lecture is \$2, \$1 for senior citizens, and tickets are available at the Information Desk in the Atrium of Wilson Hall, ext. 3353. Those reservations not paid for within five working days will be released for sale.

—Dan Kaplan

### Blood Drive

The Aurora Blood Bank will hold its Blood Drive on Tuesday, April 30, 1985 from 9 a.m. to 2 p.m. in the 1 West Conference Room. For more information, contact the Medical Office on ext. 3232.



**B-BALL...**The Winter Basketball League ended its season with a final tournament game on March 14 between the teams Quantum Jump and the Lakers. And the winner is--Quantum Jump by a score of 64 - 55.

Taking third place was Run & Gun; Ratsfleet and The Bulls tied for 4th place, followed by Maxwell Demons in 6th place, and the 69ers in 7th.

Competition starts anew in the Summer Basketball League. Watch for more information.

**WINTER V-BALL...**In the Volleyball Winter League final game on March 25th, Team # 1, captained by G. Andrews, took first place by defeating Team #3 (C. Ankenbrandt, captain). The other teams in the League finished as follows: 3rd place, Team #2 (P. Yurista); 4th place, Team #4 (T. Lahey); 5th place, Team #5 (M. Tartaglia); 6th place, Team #7, (R. Padilla); and 7th place, Team #6 (J. Weiss).

Volleyball will continue with a spring session during the month of April before organizing for the Summer League (see below).

**SUMMER V-BALL...**Sign-up for Summer Volleyball League II (competitive) is underway. The summer schedule will commence in June and games will be played on the two outdoor courts in the Village, next to the tennis courts.

Prospective players are asked to contact League Representative Brian Mac Kinnon at ext. 4790 or 3976, or Helen McCulloch, ext. 3126.

**MISSING IN ACTION...**Mark ("I got it! I got it!") Augustine found himself caught between Brian Pientak and a hard place while diving for a volleyball. Mark suffered a severely dislocated elbow, and extensive embarrassment.

When asked what Mark's absence would mean to the team's chances, his teammates responded, "Mark who?"

Following some unpleasant surgery, Mark is back at work in record time.

**RUNNING-AROUND-IN-CIRCLES DEPARTMENT...**In a feat of supreme athletic skill, if not supreme logic, Merle (RD/Collider Detector) Haldeman ran the Main Ring jogging circuit backwards. Total time for Merle's 3.875-mile jaunt was 42 minutes, 39 seconds. Asked to comment, Merle said, "There are advantages; the wind is always at your back."

**CLARIFICATION...**Karate classes are offered on an ongoing basis at the Recreation Complex. Classes are divided into ten-week sessions, but students may enroll anytime and need not wait for a new ten-week session to begin.

Beginning and experienced students are welcome. Classes meet Monday, Wednesday, and Friday from 5 p.m. to 6 p.m. at the complex. The cost for each ten-week session is \$36. Students must be members of the Recreation Complex to join the class.

To enroll, contact Mark Leininger at ext. 4776, or (312) 695-3263.

*R. Fenner, editor; S. Winchester, ass't. editor*

Fernilab is operated by Universities Research Association, Inc. under contract with the U. S. Department of Energy. Fernilab is published by the Publications Office, P. O. Box 500, Batavia, IL 60510, phone (312) 840-3278.