

FermiNews

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Fermilab summer intern
Chufu Holly.

Keeping Cool at Fermilab

by Eric Berger, Office of Public Affairs

As debate heats up among lawmakers on the fate of the nation's helium reserve, Fermilab researchers prepare for a long, cold summer. How cold? Minus 450 degrees Fahrenheit—the temperature of the liquid helium that cools the Tevatron's superconducting magnets. Proposed congressional changes to the 1960 Helium Act, however, could ultimately affect Fermilab's vital cooling operation, which uses 13 million cubic feet of gaseous helium annually.

Electric current travels through a superconductor friction-free, like skaters on smooth ice, allowing physicists to run accelerators at higher

energies, while using far less electricity than regular conductors require. But there is a catch: superconducting magnets work only at a few degrees above the temperature of outer space, or 2.7 Celsius degrees above absolute zero.

The challenge of cooling Fermilab's superconducting magnets falls to Jay Theilacker, Accelerator Division Cryogenic Department head since June 1990. The tools available to Theilacker are simple: helium, nitrogen and experience.

Twenty-four satellite refrigerators cool the four-mile Tevatron, while six larger compressor

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These 30,000 gallon tanks store gaseous helium at pressures up to 200 psi. The helium will be liquefied and used to chill the superconducting Tevatron, the world's most powerful accelerator.

Minnesota, Fermilab & the Great Neutrino Mystery

The search for neutrinos and their oscillations brings the University of Minnesota to the energy frontier.

by Donald Sena, Office of Public Affairs

Although they are among the most mysterious members of the particle physics world—zipping through matter with few interactions to speak of—neutrinos will provide the solid foundation of present and future high-energy physics experiments for University of Minnesota researchers working at Fermilab.

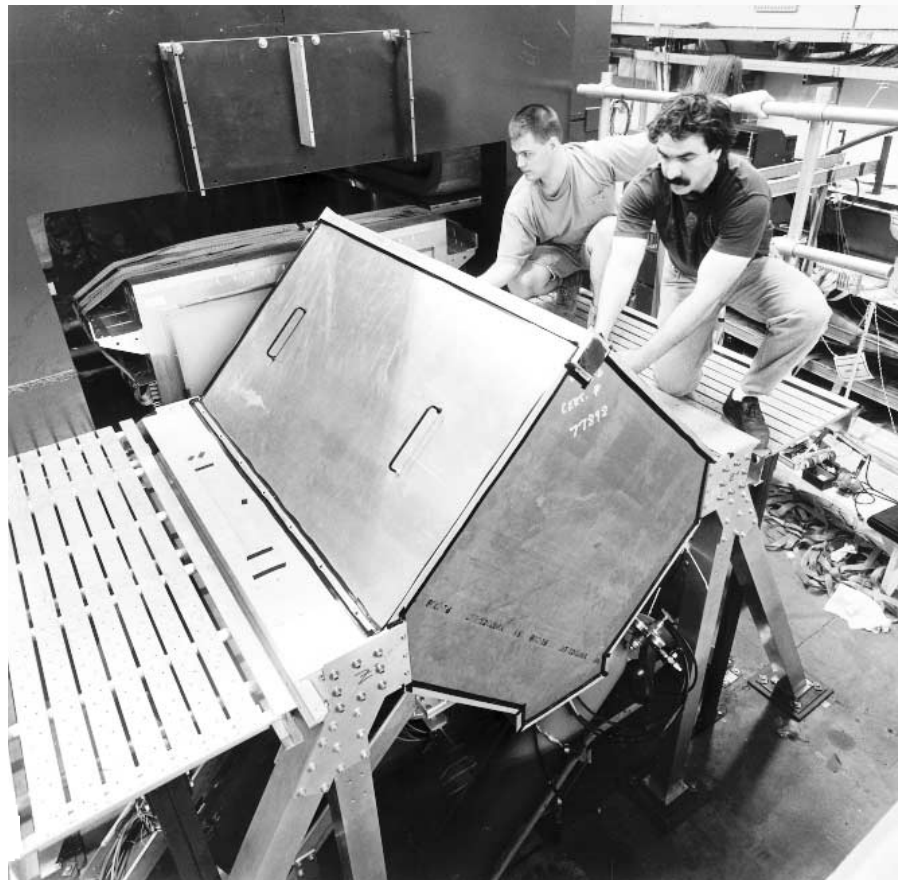
Professors from Minnesota and their postdocs and students are currently setting up an experiment to directly observe the tau neutrino, the only flavor of neutrino that scientists haven't yet seen. Many of the same collaborators are also part of another study designed to determine if neutrinos oscillate—an indication of mass—shedding light on much of the universe's unexplained dark matter. Keith Ruddick, a professor at UM who participated in Fermilab experiments about 10 years ago, said he is excited to return to the Laboratory and study the elusive particles at the energy frontier.

"Neutrinos are the sexy thing this decade," said Ruddick.

First the Observation...

The Minnesota team at Fermilab will begin with Experiment 872, the direct search for the tau neutrino. The particle is the only fundamental piece of matter left in the Standard Model that scientists have not directly observed. E872 collaborators hope to see the tau neutrino and measure some of its properties. Ken Heller, another Minnesota professor, said the Standard Model predicts many properties of the elusive neutrino, but he added that some of its parameters may be unexpected.

"We felt one should directly observe [the tau neutrino] because there could be surprises,"



said Heller. "History tells us not to take anything for granted."

Minnesota, which brings two faculty members (Heller and Roger Rusack), three postdocs and three graduate students to the experiment, will design, build and test the large drift chambers and, along with Fermilab's computing experts, develop the data acquisition software. The Minnesota collaboration has also tapped the university's machine shop to help build an important apparatus that aligns and holds emulsion detectors and other instruments to very precise measurements. Heller said E872 is an important step in the progression to the next major neutrino experiment at Fermilab, Neutrinos at the Main Injector (NuMI), which will attempt to observe oscillations of the particles.

"If you are going to do a neutrino oscillation experiment, you better know what they all look like," said Heller, referring to the three flavors of neutrinos, including the tau.

...Then the Oscillation

As the tau neutrino experiment gets set to take data, Heller, Ruddick and other Minnesota faculty and postdocs are already preparing to take advantage of Fermilab's newest accelerator, the Main Injector. In 1999, Fermilab plans to

John Trammel (left) and Dave Ciampa, both of the University of Minnesota, work to get their experiment—the direct search for the tau neutrino—up and running.

"In a sense, doing an experiment at Fermilab is like a hunting license to go into the dark forest to find something you didn't expect."

— Ken Heller,
UM professor

send a beam of muon neutrinos toward a detector on the Fermilab campus—called COSMOS—and toward a larger one—called MINOS—in a mine located 450 miles away at Soudan, Minn. to study neutrino oscillations. Broadly stated, the goal is to see if neutrinos change from one flavor to another. If researchers find evidence of this in either the near or far detector, the discovery will signal that neutrinos have mass, providing a possible explanation for at least some of the mysterious dark matter in the universe. UM researchers, who have performed other experiments in the mine, are already designing detector parts for MINOS.

The MINOS detector will be about 40 meters long and eight meters high. Plates of magnetized iron, known collectively as the passive detector, will alternate with planes of particle detectors, known as the active detector. Minnesota researchers, along with other universities and Fermilab, are developing three different options for the active detector: a very large array of scintillation counters and two gas detectors known as Iarocci tubes and resistive plate chambers.

In parallel, Hans Courant, of the UM physics department, and Tom Chase, of the UM mechanical engineering department, are involved in the design of the iron, or passive, detector. Most of the neutrinos in the beam will pass right through the detector without interacting, but every so often a neutrino will interact with the iron. Experimenters will study the debris of the interaction to look for any evidence of oscillation.

“Not only should we be able to detect the evidence for it, but also measure how neutrinos oscillate,” said Courant.

Ruddick is the coordinator for the scintillator option effort. Heller, the coordinator for research and development of the active detector for MINOS, added that the MINOS collaborators will make their choice for the active detector in summer 1997.

The professor also expressed concerns about funding, deploring the effects of the annual appropriations process on large experiments and collaborations. He said these experiments need stable funding over a number of years to build the hardware and software and be ready for the Main Injector by 1999.

Although it seems like a long time away, “the time scale is very tight,” said Heller.

Recently, Martha Krebs, director of the Office of Energy Research in the Department of Energy, visited the Soudan mine with several MINOS collaborators.

Others have recognized Minnesota’s contribution to research, including Rep. James Oberstar (D-Minn.), the representative for Minnesota’s 8th district, which includes Soudan.

“Congressman Oberstar is very pleased this project is being conducted in his district,” and that the University of Minnesota is involved, said Mary Kerr, an aide to Oberstar. “The University of Minnesota is one of the finest research institutions in the world and he thinks this research will continue that tradition.”

A History in Batavia

Minnesota’s high-energy research at Fermilab began long before these new studies. In fact, Minnesota researchers have been delving into the fundamental questions of particle physics since Fermilab’s inception.

Heller, first as a postdoc at the University of Michigan and then as a professor at Minnesota, worked on a series of groundbreaking experiments that would ultimately introduce the world to new physics. This series of experiments began with E8 in 1972. It set out to observe the properties of neutral hyperons and their interactions. However, collaborators soon discovered that hyperons produced by the high-energy interactions were polarized, leading to a whole series of experiments to explore this revelation.

Heller said the series of experiments had two major thrusts. The first used the newly discovered polarization to make the world’s most precise measurements of hyperon magnetic moments. Before the Fermilab experiments, those measurements were either crude or nonexistent. The second focus was the attempt to understand the origin of polarization. Despite the measurement of the behavior of this effect, Heller said physicists still do not fully understand the phenomenon.

Heller added that the series of experiments spawned many “side thrusts,” including the first high-energy measurements of weak radiative decays, rare weak decays that produced photons. The work also disproved the existence of a Fifth Force, which postulated some “bizarre” properties of gravity affecting lifetimes of K mesons. E621, one of the series, searched for CP-violating decays of the



Photo courtesy of University of Minnesota

The entrance hall to the MINOS cavity at the Soudan mine in Minnesota. In October 1995, workers performed test boring in the cavity.

short-lived neutral K meson. Although it did not establish CP violation, the collaboration reduced the upper limit on the process by a factor of 40. This series of experiments concluded with E800, which gave a precise measurement of the magnetic moment of the omega-minus, a hyperon consisting of three strange quarks.

“A lot of our work could be categorized as trying to understand the strong interactions,” said Heller, referring to the interactions between quarks.

In parallel with Heller’s fixed-target work, Ruddick worked on E272 with researchers from the University of Rochester. This experiment shed light on the electromagnetic decays of mesons. A second similar experiment used the equipment from E272 to observe direct photon production; this study spawned a large-scale Fermilab experiment known as E706. However, Ruddick left E706 to turn his attention to other physics questions, particularly proton decay experiments in the Soudan mine.

The Unexpected

Heller said he enjoys high-energy physics because it draws upon many skills. He said in any given week researchers and students could be working in a machine shop, sitting at a computer analyzing data or setting up electronics. The UM professor also said he looks forward to continuing experimentation at the energy frontier in Batavia, Ill.

“In a sense, doing an experiment at Fermilab is like a hunting license to go into the dark forest to find something you didn’t expect,” said Heller. ■

Working Smarter

by Eric Berger, Office of Public Affairs

When the Department of Energy offered Fermilab the opportunity to find a better way to manage its Environment, Safety and Health, the Laboratory jumped at the chance.

In January 1995, in response to mounting concerns about too much ES&H bureaucracy at its laboratories, a group of high-level DOE officials decided to try a new project, "Necessary & Sufficient Standards." DOE chose Fermilab as the only DOE lab to conduct a site-wide pilot, a project the Laboratory completed in June 1995, under the leadership of Assistant Director Larry Coulson.

"From the ES&H professionals' standpoint, one of the things this has allowed a lot of them to do is get back to thinking about really protecting the people, instead of the paperwork and external things they used to have to do," Coulson said.

"We finished our pilot and modified our contract (with DOE) on the same day," he continued. "The new standards adopted by the Laboratory achieve the same results as the old ones, but without the costly non-value-added requirements imposed by DOE. The result is less paperwork, and more time for assessing and managing risks around the Laboratory."

After the first wave of nine initial pilots at national laboratories, 15 more have begun. "It's very important to institutionalize this process," Coulson said. "What we're vulnerable to, if this isn't institutionalized, is somehow backsliding into the old way of doing business."

During her speech at the users' meeting, Secretary of Energy Hazel O'Leary referred to "Work Smart Standards," her official name for N&S. Coulson said O'Leary's statement officially blesses the direction DOE is headed.

Counting Deer

Rod Walton, leader of Fermilab's environmental protection staff, welcomes the reduced volume and processing time of paperwork associated with the new standards.

"As part of the Necessary & Sufficient process we tried to make a little more sense out of regulations," Walton said. He cites the example of the annual aerial deer survey he makes to chart Fermilab's deer population. Under the old standards a flyover required about a year's preparation to file paperwork and obtain permission.

"That's a process that now takes, at a maximum, 60 days, which is fairly simple," Walton said.

An accurate deer count requires snow to make deer tracks visible. Walton cannot predict when snowfall might cover the ground, making the year-long approval procedure obstructive. Besides being quicker, the new process allows for a range of dates on the application, giving Walton the opportunity to obtain the elusive deer count.

"We figure, conservatively, they're probably increasing at 10 percent per year, and by now there could be close to 500 (deer on site)," Walton said. If the projection is correct, there are approximately 50 deer per square mile. A recommended density in this area is five to 15 per square mile, he added.

Providing it snows, Walton will count the deer this winter.

Cutting Red Tape

In some cases, N&S has cut the paperwork by 90 percent. Under old orders, purchase orders required National Environment Protection Act stamps, about 30,000 per year, Coulson said. Now only about 3,000 need the stamp, saving time for anyone who needs to request a purchase order.

A cut in paperwork and reporting duties has led to a reduction in the ES&H Section staff of five employees, due to attrition or transfer. Two others, previously tied to ES&H work, have returned to research.

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"If we want to continue to protect people and the environment, we have to be allowed to focus our resources so it makes a difference. Now we can."

- Larry Coulson,
Assistant Director

According to Rod Walton, leader of Fermilab's environmental protection staff, the number of deer on Fermilab's site is probably rising. Increased deer populations cause problems. Deer eat things, destroy foliage and cause about 15 on-site automobile collisions annually.



Photo by Reidar Hahn

One Last Check

GETTING READY TO RUN

As the fixed-target experiments edge closer to start-up, FermiNews makes one last check on the status of the accelerator and the experiments.

THE ACCELERATOR

The Preac, Linac, Booster, Main Ring and Tevatron are up and running, said Bob Mau, head of accelerator operations.

“Right now, we are tuning up the Switchyard and that’s a slow process. Also, we are aligning septa, fine tuning the extraction system and we have started to bring the intensity of the machine up,” Mau added.

THE EXPERIMENTS

E862, Antihydrogen Production

“We’ve got work to do, but we ought to be able to make it,” said Dave Christian, E862 spokesman.

E815, NuTeV

“It’s exciting to see how everything turns out when you start operating for real. Things never work exactly the way you expect them to,” said Debbie Harris, E815 collaborator from the University of Rochester.

E872, Search for the Tau Neutrino

“As you can hear, welding...is going on, so we’re getting steel in place,” said Byron Lundberg, experiment spokesperson. Set-up “is going full bore.” He added that they expect to take beam in early September.

E871, HyperCP Experiment

“We expect to take beam at the end of August and we’re installing [equipment] right now,” including electronics, wire chambers and other experimental hardware and software, said Craig Dukes, experiment spokesperson.

KTeV, The origins of CP Violation in the Kaon System

Project manager Greg Bock says KTeV will have the detector and beam in place by the middle of July; in the meantime, members of the collaboration are installing the last of the crystals in the CsI calorimeter.

E781, Segmented Large X Baryon Spectrometer

“We have sat for 10 days of shifts and we have had 12 hours of beam,” said E781 spokesman Jim Russ. “Everything is working, including the off-line analysis. We are ready to go.”



Photo by Reidar Hahn

E831, FOCUS

“Basically we’re very close to getting ready,” said experiment spokesman John Cumalat. “We’re still installing some electronics, and the Research Division is still connecting some vacuum pipes. But we are attempting to take beam each night, and we are starting to time in detectors.”

E835, Charmonium States

Stephen Pordes, E835 physicist, said preparations for the experiment are progressing, and the collaborators hope to take beam in about six weeks. He adds that he and his colleagues are excited to begin their study.

E866, Proton Structure

“We’re waiting patiently for beam; our detectors are ready to go, but our target is not installed yet,” said E866 physicist Chuck Brown.

E868, Search for Antiproton Decay

The experiment has already finished taking data, and experimenters have been presenting some preliminary results.

“Our two graduate students recently gave talks” at an APS meeting, said Steve Geer, E868 spokesman. “We expect more results to come out the rest of this year.” ■

Bryan Johnson, crew chief of the Research Division’s Operations Department, enables the beam permit. This is the final stage of preparation for extracting beam from the Tevatron to the fixed-target experimental areas.

“We’ve got work to do, but we ought to be able to make it.”

– Dave Christian, E862 spokesman

The Charm and Beauty of Summer at Fermilab

by Eric Berger, Office of Public Affairs

A warm breeze lazily wafts across the grassy prairie, carrying the laughter of children. The cafeteria seems a bit more crowded with younger faces. A summer intern shares the workload in a lab or office. Sun-struck luncheoners crown the steps leading to Wilson Hall. This is summer at Fermilab.

Joy Thomas knows all about summer employees; she meets them before they ever begin their summer work. As a part of her personnel administrator job, Thomas runs the employee orientation for summer workers. Approximately 200 college and high-school students have descended upon Fermilab this summer, Thomas said.

"The majority of college students are probably in the technical areas like computer science, electrical engineering and drafting," Thomas said. "High-school students are doing things like roads and grounds, maintaining the site and cutting the lawns."

Summer jobs at Fermilab are "hot" commodities.

"We haven't had any problems in filling our positions," Thomas said. "We have more applications than openings, and well over 100 applicants waiting whose applications we probably won't even consider."

A Summer of Physics

Besides the general hiring program, Fermilab has several specialty programs, including the Summer Internships in Science and Technology for minority college students and Target: Science and Engineering Program for minority high-school students. Equal Opportunity Office Manager Dianne Ingram said the programs were designed to develop the interest of science-minded minority students.

The college program, which began on May 21, will enroll 22 students this summer. Ingram added all of the students intend to graduate from college with science degrees. Fermilab pays for and arranges their housing. Khufu Holly is spending his second year in the program, and he is working in the Accelerator Division. Holly's job is to design, assemble and test timing/calibration modules for the new 8 GeV beamline Beam Position Monitor system. He joined the program for the experience and the skills he can learn at the Laboratory.

"I've been in other programs and they just make you do busy work," Holly said. "But in this program you actually get to do something that is meaningful and has a purpose."

Yolanda Person came to Fermilab this summer for the first time because she remembered a high-school tour of the facility and the impression the high-tech environment left on her. So far Person says she has been testing and calibrating sensors in a mechanical model for superconducting magnets to determine whether they should be used in the actual magnet.

"It's definitely a high-tech environment where you can learn so much," Person said. "I've learned a lot about engineering and physics and how the two disciplines work together on a project and overlap."

The high-school program, which begins in June, includes counseling, tours and lectures, with the goal of stimulating participants' interest in engineering and the sciences. Ingram said there are 25 participants in this year's Target program.

"The program is for high-school students interested in science and engineering, to encourage them to continue with science and to provide them with a paradigm of success in doing technical things," Ingram said. "This is a great opportunity because most high school kids generally have to work at McDonald's."

Forget the Beach

While many college students choose to spend their summers lifeguarding, waiting tables, or doing other jobs that give them a break from the books, a hardy few venture to Batavia for Fermilab's Summer Physics Program. The program began in 1980, when physicist Drasko Jovanovic observed the hundreds of extra applications for summer jobs at Fermilab. He decided it would be a good idea to collect the applications of those students who were specifically interested in jobs related to sci-

RAC (Teacher Research Associates Program) teacher Nigel Thompson with mentor Juliana Whitmore.

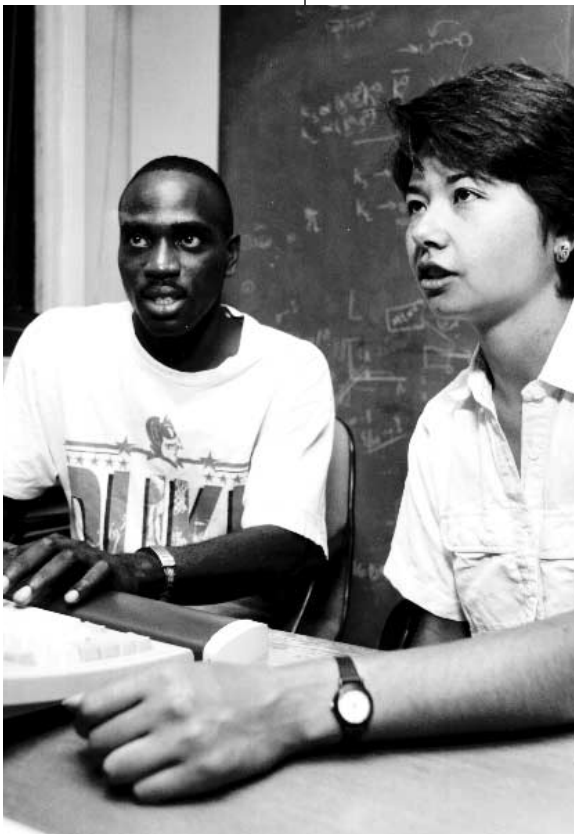


Photo by Reidar Hahn



Ori Nelson, of FESS, takes a mighty swing for her softball team, The Brew Crew, last year's champions.



On one of the first hot and sunny days this season, an unidentified (and undressed) member of the Fermilab family soaks up rays at Wilson Hall.



Children of Fermilab users and employees enjoy the hot summer days in the Fermilab pool.

ence and design a program for them.

"We get kids who are really motivated," Jovanovic said. "They are seeking Fermilab by reputation, and we really get the best and the brightest. It is really a pleasure that I get to conduct this program."

During the selection process Jovanovic chooses 20 students (no more than two from the same institution), primarily physics majors, along with a few electrical engineering and computer science majors. Among the 20 students are three foreigners. This year's students came from numerous institutions, including Northwestern University, M.I.T., Stanford University, Rose-Hulman University, Purdue University, Carnegie Mellon and Harvey Mudd College.

The program began on June 3, and while the pay is not great, Jovanovic said, the experience the students get from the lab more than balances it out.

"After we invest about two weeks in teaching the students, they become very helpful, and people want them back," he said. "But for the students, it's a one-time program, so if people want them back they have to secure money from their own programs."

Recreation

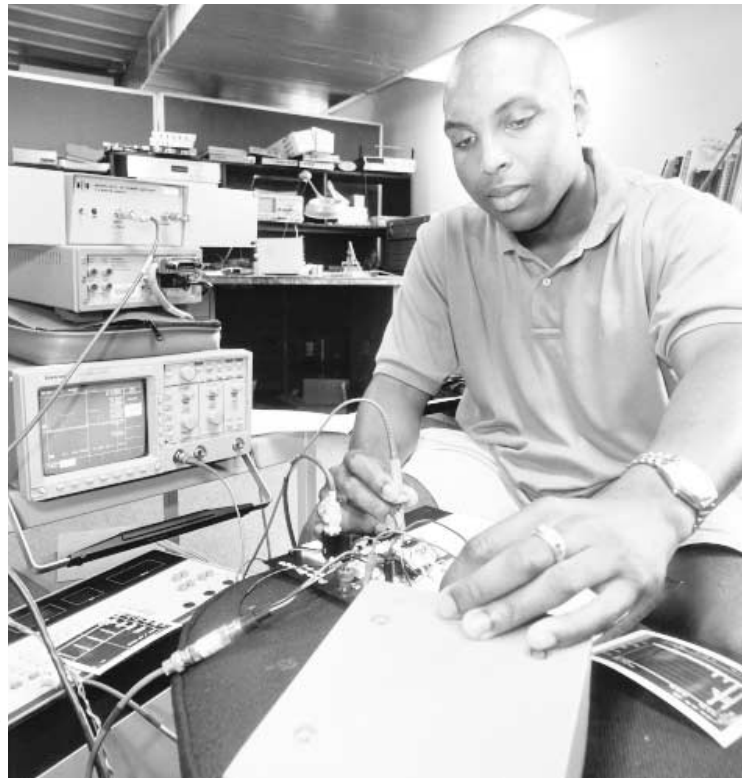
With the summer sun high in the sky, opportunities abound for the athletically-minded on the Fermilab grounds. Besides the bike trails and fishing, the Recreation Office offers many organized leagues and activities.

The Fermilab pool (located behind the Kuhn barn on Sauk road) opened last month, and the summer day camp began in June, said Jean Guyer, recreation manager.

While many of the summer sports leagues have already begun, Guyer said, most still have openings. She encourages readers who would like more information about the above programs to visit the Recreation Office in WH 15W. A recreation booklet may be obtained by calling Guyer at x2548.

Teaching the Teachers

Two major changes come to the Education Office during the summer months, said Education Office Manager Marge Bardeen. Prairie workshops can be offered because the prairie is in bloom, and the Education Office



Khufu Holly, an undergraduate at Jackson State University, participates in Fermilab's Summer Internships in Science and Technology program. During his work in the Accelerator Division, Holly helps design, assemble and test timing/calibration modules for new accelerator technology.

offers more programs to teachers, who are generally out of school during the summer.

"A major focus of what we do is teacher education," Bardeen said. "The best time to do that is the summer."

The Education Office runs three categories of programs: the Teacher Resource Center, Science Experiences (mainly for youth) and intensive staff development, such as LInC, the Leadership Program to Integrate the Internet, Instruction and Curriculum.

"It's a course for teachers to learn how to develop engaging, learning projects using the Web," Bardeen said. "It's like a 'What do I do now that the computers are in my classroom' type-program."

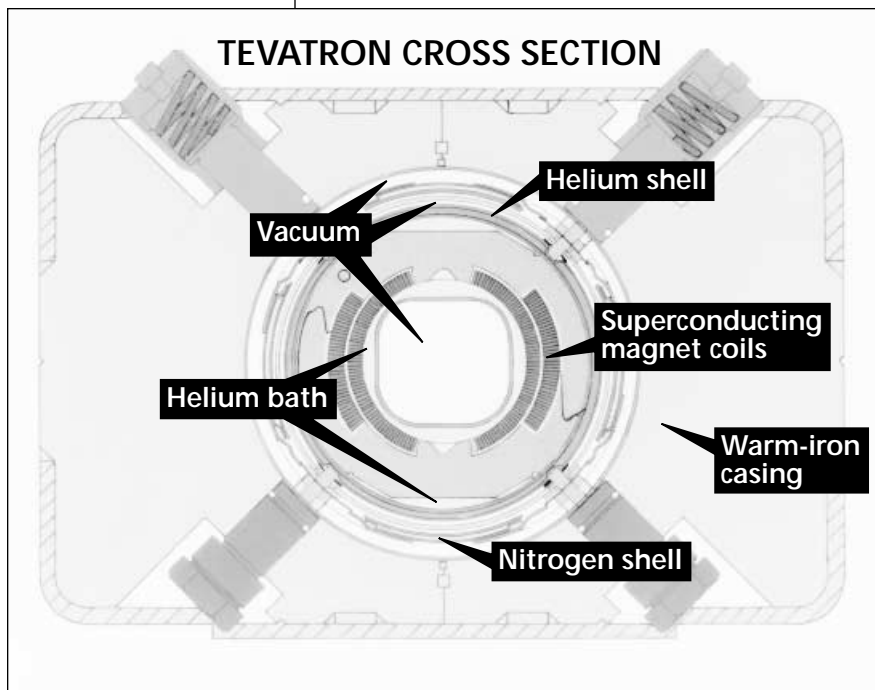
In 1995, about 5,100 teachers participated in teacher resource and development programs at Fermilab's Leon M. Lederman Science Education Center.

Oh, and one other activity is going on at the lab this summer as well. There are a few physicists preparing for something called a fixed-target run. ■

Keeping Cool

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buildings supply high-pressure gas for each refrigerator. High-pressure and low-pressure pipes distribute helium and nitrogen gas around the system. A large central helium liquefier distributes liquid helium to each of the refrigeration satellites to boost their cooling capacities. The cooling system began operation in 1983. A decade later the American Society of Mechanical Engineers designated it an International Historic Mechanical Engineering Landmark.



Liquid helium at a temperature of 4.5 Celsius degrees above absolute zero flows around the coils at the center of a superconducting magnet, maintaining the magnet's superconducting state. A vacuum surrounds the magnetic coils and helium bath, reducing heat transfer into the coils. In the next concentric layer, a liquid nitrogen passage shields the inner vacuum and magnetic coils from the room temperature atmosphere outside. After another vacuum, a warm-iron casing intensifies the magnetic field inside and keeps extraneous magnetic influences in the tunnel from interfering with the Tevatron.

Theilacker said the Cryogenic Department pays close attention to the cost and availability of helium and nitrogen. Helium is the only element that can cool the Tevatron magnets to superconducting temperatures. Other helium uses include space shuttle applications, fusion experiments and magnetic resonance imaging.

Fermilab consumed slightly more than 13 million cubic feet of helium in 1995, at a cost of \$835,000. On average the Laboratory uses about \$1 million worth of helium annually. A mylar balloon contains about 1 cubic foot of helium.

Helium occurs at varying concentrations in deposits of natural gas. Some deposits contain helium concentrations as high as 0.3 percent, making extraction cost-effective. Concentrations this high exist only in the United States. Because of the high cost of total helium extraction, gas companies allow half the helium in natural gas to vent into the atmosphere.

"The important thing about helium is that it is what's called a fossil product," AD/Cryogenic Department physicist Mike McAshan said. "Helium is a product of radioactive decay that

has been trapped in natural gas products. Therefore it is something that is absolutely limited."

Because natural gas companies mine helium as a by-product of natural gas, they cannot slow down their production of helium to match the rate of consumption, McAshan said. To promote the collection of helium by private companies, the government stores privately-owned helium under the current Helium Act.

Additionally, the act directs the Secretary of the Interior to purchase and store helium for future government use, including research at national laboratories. The government also operates and maintains helium production and purification plants. The debate in Congress stems from the \$1.4 billion debt run up by the combined operations.

Helium Conservation

Given helium's expense and finite supply on Earth, the Cryogenic Department works to conserve it. "Conservation of helium is a very important thing," Theilacker said. "We go through a considerable amount because the inherent design of the system is such that every time we quench a magnet we blow the helium overboard."

One of the main losses comes from power outages. If they last more than 45 minutes, outages can result in \$50,000 worth of lost helium. "It's going to take money to upgrade the systems, make them more leak tight, and to conserve helium under adverse conditions such as power outages or quenches," he said.

Theilacker cited the "modern" superconducting HERA accelerator in Germany, now five years old, as a good model of helium conservation. "Their accelerator is roughly the same size as ours, but their helium loss is extremely small. They put a lot of money and time into their design." Theilacker estimates the HERA design consumes 10 percent of the helium needed to cool the Tevatron.

Potential Helium Drought?

In 1994 the U.S. Bureau of Mines estimated the helium resources of the United States at about 470 billion cubic feet, including the federal reserve at Cliffside Field, Texas (34 bcf), helium-rich natural gas fields (250 bcf) and helium-lean natural gas (190 bcf). Helium resources outside the United States are estimated at 650 bcf, and an international consortium is currently building a plant in Algeria that will recover about 300 million cubic feet per year. Annual consumption worldwide, which has grown at a rate of about 10 percent per year, is about 3.2 bcf.



ay Theilacker, head of the Accelerator Division Cryogenic Department, holds a piece of the transfer line that distributes liquid helium and liquid nitrogen from the Central Helium Liquefier to cool the Tevatron.

The notion that helium is only for party balloons and dirigibles has kind of been dispelled; everyone realizes helium is not just for anachronistic uses."

Bob Simon, aide to the Senate Energy Research and Development Subcommittee

"If the supply of helium tightens up, it's going to take some significant dollars to change the system to run in a different mode," Theilacker said.

To make the Tevatron more efficient Theilacker said Fermilab would need a better helium handling system. When a superconductor "goes normal"—loses its superconducting properties—the release of stored energy boils the helium from the magnet, commonly called a quench. The HERA design saves and recycles the boiled-off helium. Theilacker cited this reliquefaction as one way accelerators could conserve helium.

William Fowler, former Cryogenic Department head, questions the hysteria driven by fears of a helium drought. Fowler doubts the continuance of the annual 10 percent increase in consumption, noting the cyclical nature of helium demand in the past. The current worldwide supply should meet public and private needs for a long time, he said.

The U.S. House of Representatives recently spawned the helium controversy by overwhelmingly passing the Helium Act. Under the act, now being considered by the Senate, the government would end its refining activities and begin helium stockpile sales by 2005. By then prices should be high enough for helium sales to cover the reserve's debt. Although sponsors

of the bill claim it gives more incentive to those who mine natural gas to refine all of the helium, some opponents disagree.

Once helium escapes, it becomes prohibitively expensive to recover it from the air. Fowler believes the investment in setting up the helium reserve makes it a bad idea to sell the facility. But under intense public pressure to pare the budget, Congress has identified the helium reserve as a prime target. No one knows exactly how selling off the reserve might affect science research.

An amendment sponsored by Sen. Bennett Johnston, D-LA, calls for provisions in the Helium Act to make sure the sell-off of the reserve does not adversely affect scientific research. The amendment passed out of the Senate Energy and Research Development Subcommittee on June 19, said Bob Simon, minority science fellow to the Subcommittee. The Senate will probably vote on the bill, now including the Johnston amendment, in the next few weeks. If approved, the House would probably then vote on a similarly rewritten bill.

The amendment stipulates that three years before the reserve can be sold the Secretary of the Interior must request a report from the National Academy of Sciences. The report, delivered no later than 18 months before the proposed sell-off, must detail its effects on scientific research and medical activities. The secretary will then bring the report before Congress where discussion regarding the approval or disapproval of the sale can take place.

In the interval before sales of the helium reserve would begin, the amount of helium necessary for scientific purposes might fluctuate.

"No one really knows what the world will look like nine years from now," Simon said. "Maybe there will be many more applications for superconductors, and we will need helium; or maybe we will have made progress in high-temperature superconductors and demand will not be all that great."

Simon believes that senators have come to recognize the special properties of helium. "I think the physicists have done a good job of communicating that. The notion that helium is only for party balloons and dirigibles has kind of been dispelled; everyone realizes helium is not just for anachronistic uses."

"I think we've done a good thing," Simon continued. "The problem, not uncommon in Washington D.C., is both sides are right. Helium needs to be conserved for the future, but at the same time the helium reserve has run up a great debt. No one's going to win this argument conclusively." ■

Mail Talk

A conversation on e-mail migration

by Judy Jackson, Office of Public Affairs

"You shouldn't feel threatened. Nobody will be deprived of e-mail. You will still be able to do all the things you can do now—and more. You will still be able to send, forward, reply to, save and store your mail."

Irwin Gaines, associate head of the Computing Division, sits at a metal table in the experimental hall of his fixed-target experiment, E831, testing ribbon cables for a detector. He is on shift, but he has agreed to talk to a reporter who, like many of the Fermilab staff, has awakened to the fact that something is about to happen to electronic mail at the Laboratory, but has no idea what she personally is supposed to do. Gaines plugs a cable connector into a board on the table, and a string of tiny green bulbs lights up. He writes "okay" on a piece of masking tape, sticks it on the cable, and reaches for another.

For the reporter's sake, he begins at the beginning. When the VAX Mail System began operating in 1980, he says, it served users well, connecting the high-energy physics community long before the Internet existed. But times changed, and the Internet arrived.

The green bulbs flash as another cable passes the test.

Gaines said migration from VMS to UNIX will move the Laboratory toward open, standardized systems.

Like many Fermilab users, the reporter had responded to the Computing Division announcement of the July 1, 1996 changeover from the VMS system by asking what to do.

"Oh," the Computing Division replied, "that's up to you."

It was as if the mailman had knocked at the door and said, "I won't be delivering your mail anymore. You have complete freedom of choice in how you get your letters from now on." While the computing experts interpreted their response as giving users their freedom, many people were confused by the large number of choices.

Over the months, the positions converged. Laboratory staff have begun to face up to the impending change in e-mail service. The Computing Division has begun to understand that people need a lot of help. As a result, computing personnel have started to provide it in the form of seminars, clinics and personal consultations.

Individual users still have choices, but Computing Division guidelines and assistance make the choices easier, Gaines explains, stuffing a tested cable into a cardboard box.

As an e-mail user, you must arrange for a new way to read your mail. The old central VMS system, FNALV, maintained by the Computing Division, will go away. The Computing Division will still be there, however, with FNAL, the three-year-old central mail server for the Laboratory. FNAL serves as Fermilab's gateway—in and out—for all electronic mail. It should become the single address for all mail coming in to Fermilab: gaines@fnal.gov, for example.

It was as if the mailman had knocked at the door and said, "I won't be delivering your mail anymore. You have complete freedom of choice in how you get your letters from now on."

To get an FNAL account, to check your current account, or to retrieve a password lost in the mists of time, send e-mail to compdiv@fnal.gov. The Computing Division staff will get you going.

With an account on FNAL and a password, you have a Fermilab address that will accept your mail. Now you need a way to read it. You must tell FNAL where to send the mail addressed to you. You have to "set a forward."

If you primarily work on a PC or a Mac, you should get an account on a second server, known as the POP server. The POP server will forward mail from FNAL to you. Now install software to read the POPmail you receive: the Computing Division recommends Eudora for Macs and Pegasus for PCs. QuickMail also works, but the Computing Division makes a

face at the mention of it because of its proprietary nature. Eudora and Pegasus are both free; send e-mail to helpdesk@fnal.gov to find out how to find and install them.

If you mostly use an X-terminal or a UNIX workstation at your desk, get an account on FNALU or your local workgroup UNIX cluster and read your mail using exmh or Pine, the Computing-Division-supported mail readers. Send e-mail to helpdesk@fnal.gov for instructions.

Good. Now you can read and send mail. But don't relax yet. You must still bring your stored mail into the brave new world of Eudora, Pegasus or exmh. You can do this with a mail conversion utility, available on FNALV. Send mail to helpdesk@fnal.gov for instructions.

Not a single green bulb has failed to light throughout the conversation. E831's cables appear perfect. May the Great Mail Migration of 1996 be as flawless. ■

Chez Léon

M E N U

Lunch served from
11:30 a.m. to 1 p.m.
\$8 / person
Dinner served at 7 p.m.
\$20 / person

For reservations call x4512
Dietary Restrictions
Contact Tita, x3524

—
Wednesday, July 3
Thursday, July 4

CLOSED

—
Wednesday
Lunch
July 10

Grilled Flank Steak
with Pea Pods and Mushrooms
Strawberry Sorbet with Cookies

—
Thursday
Dinner
July 11

Melon and Prosciutto
Filet of Sole with Crabmeat
Parslied Rice
Vegetable of the Season
Orange Flan

—
Wednesday
Lunch
July 17

Grilled Miso-Marinated Beef
on Rice Noodles with Vegetables
Salad with Ginger Mustard
Vinaigrette
Summer Fruit
with Honey Cream

—
Thursday
Dinner
July 18

Angel Hair Pasta with Smoked
Salmon and Golden Caviar
Swordfish Kabobs
Vegetable of the Season
Ricotta Cheesecake
with Blueberry Sauce

Catching Fish, One Way or Another



Photo by Reidar Hahn

If you don't know what type of fish inhabit Fermilab's ponds, you are not alone, because neither did the Illinois Department of Natural Resources. Fish Biologist Rob Miller (seated) decided it was time to collect baseline data on Fermilab's fish population. Using an AC electrofishing unit to stun the fish, and nets to probe the deeper waters, Miller obtains an assessment of the number of each type of fish and their respective weights. From his preliminary analysis, Miller said the fish species with the highest biomass is carp. "From a fish management standpoint, we would probably rather not have them (carp)," he said. "They create more problems than they are worth. They root around on the bottom and keep the sediment turned up,

which makes it difficult for bass and other sight feeders to find their prey." He added carp also have an adverse effect on bass nesting. Miller believes if Fermilab wants to improve the fishing quality of its ponds, there are several options, including stocking by the Department of Natural Resources. "It all boils down to the fact that a pond is going to generate x amount of pounds of fish flesh," Miller said. "Those pounds can be spread across a number of useless fish, or you can get a nice range of desirable fish like bass or channel catfish." When Miller completes his report, expected by early winter, *FermiNews* will publish the results.

— Eric Berger, Office of Public Affairs

Working Smarter

continued from page 4

Another major savings comes from "cost avoidances," including the expense of Tiger Team corrective actions that no longer require implementation under N&S. The ES&H Section estimates the savings at 39 person-years and \$290,000 in materials and services.

Fermilab Associate Director Ray Stefanski believes the N&S standards have removed a notable burden from the shoulders of the ES&H, but he said the standards affect others as well. "The senior safety officers, from what I can tell, are enthusiastic on Necessary and

Sufficient because it's given them an opportunity to actually exercise their judgment as safety professionals rather than having to rely on Department of Energy orders," he said.

But the work is not completed, Stefanski cautioned. Now Lab management must get the word out to Fermilab's employees. "The message to people at the Laboratory is that safety is an individual responsibility. Common sense is still a very important ingredient to that," he said.

ES&H Section Head Bill Griffing believes the N&S process will make his organization more cost-effective.

"What's good about these standards

is they allow the ES&H professionals to begin to apply the tools of their trade," Griffing said. "For the last 10 years at Department of Energy facilities it didn't seem to matter how much anything cost if it was for safety. If you were spending money on environment, safety and health every dollar was good, and the more you spent, the better you were."

Under new budgets, both Griffing and Coulson note, resources are getting tighter and tighter.

"If we want to continue to protect people and the environment, we have to be allowed to focus our resources so it makes a difference. Now we can,"

Coulson said. ■

CLASSIFIEDS

FOR SALE

■ House in Warrenville, 2-story, 3 bedrooms, 2 baths, spacious living and family rooms, dining room, European kitchen, 2-car garage, on a cul-de-sac 1/3-acre lot, fully fenced backyard, mature trees, professional landscaping, 5 miles from Wilson Hall School District 200. \$149,900. Call Alex, x3873 or (708) 393-6774. (bogacz@calvin.fnal.gov)

■ Moving sale: contemporary dining set (glass-top table and 6 chairs) excellent condition, \$500; bedroom set (king-size bed and 2 dressers), \$400. Call Alex, x3873 or (708) 393-6774 (bogacz@calvin.fnal.gov)

■ Two-story Colonial house in well-established NW Geneva neighborhood, 3 bedrooms, living room, separate dining room, French doors to large family/sun room, hardwood floors, fireplace, 2-car garage, 1 block from grade school, 2 blocks from high school, walking distance to downtown. Call Barb, x4136 or (708) 365-5275.

■ 1985 Mazda RX7 GSL, 5 spd, well maintained, rotary engine, runs well, looks good, rust free. AM/FM radio w/tape deck and equalizer, two removable tops, mag wheels. \$3300. Call Jack x2812 or mateski@fnal.gov.

■ Three pieces of furniture: An 8-year-old country blue couch-hide-a-bed for \$75, 8-year-old blue recliner for \$25, gold velour rocking chair for \$15. Kuhlmann@fnal.gov or call Steve at (708) 978-1627.

■ 14 ft. Starcraft fiberglass sailboat w/Spartan trailer \$150, 21 ft. aluminum mast, sail and all fittings. 12 ft. Sunflower sailboat w/ sail and all fittings, \$50 light-weight for cartop carry. Call R. Trendler, x3084, (708) 377-1644.

■ 1993 Ford Thunderbird LX, 5.0 liter V8 engine, standard Thunderbird amenities plus automatic temperature control, rear window defroster, dual illuminated visor mirrors, pwr antenna, 7-spoke cast aluminum wheels, anti-lock brakes. Excellent condition, with 32,000 miles. \$11,500. Call Don x4309.

■ 1988 Cadillac Sedan Deville. Excellent condition, low mileage. \$5500. Well below book value, must sell quickly. Contact Ed at x4191 or (708) 466-1498.

■ House, North Aurora, Fox Valley Country Club Estates, 1816 sq. ft., bi-level, 9 ft. ceilings, 4 bedrooms, 2 1/2 bath, central air, fireplace in family room, large lot 77' x 244', \$162,400. Bonus to buyer at closing, \$2,000. Call (708) 879-5502.

■ 1988 Honda Accord LXI, 5 spd, air, full pwr sun-roof, AM/FM cassette stereo, 80,000 miles, excellent condition. New: brakes, tailpipe, muffler, front shocks, and tune-up. \$5,300. Call Sandy x4171.

■ 1984 Chevy cavalier CS station wagon, 2.0L, 5 spd., body, brakes, tires, exhaust system, all in good cond. \$800. Call Albert Dyer, x3863.

■ IBM 286 computer, monitor, keyboard, mouse, software, \$275. Call Rich at (708) 690-1691 or x3880.

■ 1993 Chrysler Lebaron convertible CTC package, all leather interior. All pwr., 24,000 miles, like new, emerald green/tan top and interior, \$13,400. Call (708) 406-6080 after 5:30 p.m.

■ Brand-new convertible baby bed with mattress and bedding, \$150 o.b.o. Size 5 wedding dress, excellent condition, like new, cleaned and boxed, with veil, \$500. New solid oak bunk beds with mattresses, \$250 o.b.o. Call Gerald Davis at (708) 554-0589.

LAB NOTES

OZONE ACTION DAYS

In voluntary cooperation with the Partners for Clean Air coalition, Fermilab will again take steps this summer to minimize atmospheric ozone levels. Upon notification from the EPA of forecasted ozone levels above a dangerous threshold, Fermilab will notify each division or section office, broadcast a message on Channel 13, and post signs on Wilson Hall exits encouraging employees to car pool, bike or walk to work on the Ozone Action Day. Fermilab will also curtail site operations that may add to the ozone level such as mowing, structural painting, and deferrable auto or truck usage.

PUBLICATIONS AVAILABLE

The Office of Public Affairs has everything you need to convey to visitors or to members of the public the nature and value of high-energy physics research at Fermilab. Stop by next time you need transparencies for a lecture, "Come on In" brochures for visitors, or Fermilab information kits for students and visitors seeking more detailed information. We also have back issues of *FermiNews* and an index to stories.

RADIATION BADGES DUE

On July 1, 1996, badge wearers should turn in all badges with blue inserts that are dated April 1, 1996 to their proper rack or mail to MS 119. Those who applied for a permanent badge (black holders) before June 1, 1996, will find their badges on the rack. Individuals who applied after June 1, 1996, will receive their badges via Fermilab mail. Temporary badges (red holders) may be obtained at: CDF, DO, EAD Ops Center, AD Main Control Room, User's Office, or WH-7E. Contact Sheila Collins at x3642 or SCOLLINS@fnal.gov for further assistance.

CHILDREN'S SWIMMING LESSONS

Fermilab offers children's swim lessons Monday, Wednesday, Friday. Beginners meet 10:45-11:30 a.m.; Intermediate 10-10:45 a.m. Beginners must be 42" tall or five years old. Session II runs July 15-August 16. Applications are in the Recreation Office, WH15W. First come, first served.

CALENDAR

JULY 9

Muscle toning class, July 9-September 12. Classes Tuesday and Thursday 5:30-6:30 p.m. in the recreation facility. Cost is \$50 for the 10-week session; you must be a current recreation facility member to participate. Registration and payment prior to the start of the session in the Recreation Office, Wilson Hall 15W.

JULY 19

Fermilab golf outing at Blackberry Oaks Golf Course. Scramble Format. Green Fees \$25. Scramble fees \$12/team, Optional Contests \$3/person. Deadline for collecting fees is July 12. For more info or to pay fees contact Rod Klein at x4682 or Bob Andree at x3703.

MILESTONES

BORN

RETIRED

Patricia Haring, on June 27, 1996. She started at Fermilab on February 6, 1978. Haring worked for the Computing Division's Computing, Database and Information Group as a Program Librarian.

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Fermi National Accelerator Laboratory

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Please send your article submissions, classified advertisements and ideas to the Public Affairs Office, MS 206 or E-mail: ferminews@fnal.gov

FermiNews welcomes letters from readers. Please include your name and daytime phone number.

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