FermiNews

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Run I Crosses Finish Line

At 0800 on Tuesday, February 20, Fermilab's Collider Run I at the Tevatron entered the history books. Run I set luminosity records, flushed the top quark from its hiding place at the high end of the mass scale, and took us all into unexplored territory where no high-energy physicists had gone before. In one way or another, everyone at Fermilab had a hand in Run I, and, when it was over, the spokesmen of the two collider detectors wrote to Fermilab Director John Peoples to express their thanks to the entire Laboratory.

COLLIDER DETECTOR AT FERMILAB

February 20, 1996

John Peoples
Director
Fermilab

Dear John,

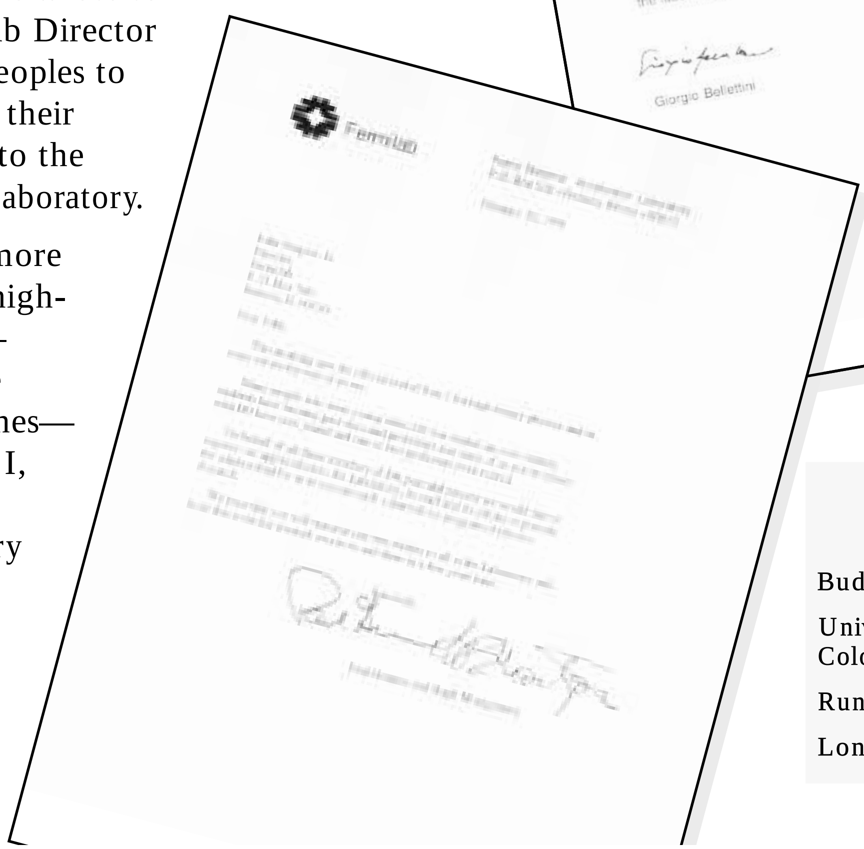
We wish to convey to you our heartfelt thanks for an incredibly successful Run I.

Please pass on our thanks to everyone at the laboratory. We are sure that sometime between the end of the "88-89 Run" in June, 1989, to the end of Run I today, everyone at the lab helped us in some way - in the design, building, installation, running, or processing of the data. They all have a share in CDF's discoveries and measurements.

We look forward with relish to Run II and the continued joint venture with the laboratory in the exploration of the high energy physics frontier at 2 TeV.

Bill Carithers

Giorgio Bellettini



Fermilab

For more of the highlights—and the headaches—of Run I, turn to the story on page 6.

Inside

THE SCIENCE OF BUDGETS AND LEGISLATION

Using the Basic Research subcommittee in the House of Representatives as an example, a Congressional aide decodes Washington's budgetary process

by Donald Sena, Office of Public Affairs

At Fermi National Accelerator Laboratory, when people refer to "the process," they could be speaking of the complicated and orchestrated task of accelerating particles to high energies, forcing them into collisions and detecting the results for later analyses. However, there is another equally arcane sequence of events that affects the Laboratory almost as much: the legislative and budgetary process in Washington, D.C.

Each year the nation's lawmakers and their staffs perform their own orchestrated task of deciding which government programs will be funded and how much money each will receive. Like high-energy physics, the legislative process has its own terminology and esoteric concepts, such as authorization vs. appropriation, budgetary vs. oversight hearings and legislation "mark-up."

It helps to have a guide for getting through Washington's budget thicket; Kristine Dietz, a veteran of the legislative process, is a staff member of the Basic Research subcommittee. She was assigned to that position by its chairman, Rep. Steven Schiff (R–NM). Using her subcommittee as an example, Dietz provided a general overview of the major steps of moving legislation through the House of Representatives in a typical year. [She cautioned, however, that the present budget season is aberrant due to the protracted battles between the Administration and the Republican-controlled Congress.]

APPROPRIATION VS. AUTHORIZATION

It is important to note at the outset that there are two types of committees and subcommittees in Congress that deal with budgets: authorization and appropriation. Authorization bills sanction agencies and specific programs and set maximum funding levels for each year. An appropriations committee assigns actual spending levels with greater detail. Appropriations cannot exceed the level set by the authorization, but they can appropriate less. These two entities often work together in the spirit of partisan solidarity. However, Dietz said, the appropriations process has evolved over the years as the more powerful of the two. Moreover, appropriations are sometimes provided to programs that don't have authorization.

"Technically, under the rules of the House and Senate, you cannot spend money for a program that has not been authorized. That obviously is just a rule that is not adhered to," Dietz said. For example, "the Department of Energy has not been authorized in years."

THE THICKET

The budget process begins with the executive branch and the president, who submits a budget to Congress in February. Each subcommittee then addresses the parts of the budget that it has authority over. For example, the Basic Research subcommittee staff begins to research programs and sometimes drafts legislation.

Dietz said it is a well-known fact that staffers research and write much of the legislation on the Hill. However, she said, the representatives are involved with every step of the process, meeting on a daily basis with their staff and providing direction. Science Committee aides only write legislation for the chairman, while the individual members and their staffs are responsible for drafting their own bills. Staffers send the draft bills to the appropriate administration agency and to various "users" of government programs, and ask for comments. Experts often write depositions on broad topics, such as high-energy physics, or comment on specific legislation, detailing how it would affect their institutions. A good time in the budget process to address concerns and suggest changes in a bill is when it is in draft form, according to Dietz.

"I don't want to be to the point where my boss introduces a bill that is out there for public consumption and public knowledge, and I found out that the main organization that is affected by this legislation doesn't support it for one particular reason or another," said Dietz.

HEARINGS

An important part of building legislation is budgetary hearings. Committee staff invite people, including program directors, university professors, users in the private sector and other "experts," to Washington to illuminate the importance of various programs. Witnesses elaborate on how funding levels will affect an institution, how the institution will use the money and how users could improve a program. Dietz stresses that all testimony is vital to producing the best possible legislation and ensuring the programs properly spend the government's money. She said she thinks many witnesses feel that their testimony is not vital to the end product.

"That is absolutely not the case, especially when it comes to writing legislation," said Dietz. "Because if I am writing a bill, I am going back to those hearings and I am looking at testimony and the questions and answers."

Subcommittees can also convene budgetary hearings before draft legislation is penned or after legislation is formally introduced. The subcommittee also holds oversight hearings throughout the year, which members use to address nonbudgetary topics.

Dietz emphasized that one of the most important parts of developing legislation is the input from those outside the political system, such as university professors and students who engage in high-energy physics research at Fermilab. These people are the users of the programs—the persons who actually benefit from government funding—and their expertise is essential and welcome. She said that the science community needs to be more proactive with the subcommittee staffs to keep them informed.

An important part of building legislation is budgetary hearings. Committee staff invite people, including program directors, university professors, users in the private sector and other "experts," to Washington to illuminate the importance of various programs.

"As a staff member, you are more than appreciative to have input. I don't know of any other staffer who would want to turn something like that away. If they did then they are doing their committee and their chairman a disservice," said Dietz.

MORE LEVELS OF SCRUTINY

Staffers then write the final version of the bill, incorporating comments collected from hearings, written depositions and their own research. The legislative counsel then translates the document into legal language. The author of the bill and any cosponsors sign it and take it to the House floor, where it's formally introduced. The bill receives an "H.R." number and becomes public information, which opens up another layer of scrutiny.

The subcommittee may hold more hearings on the actual legislation. In certain circumstances, the full committee can hold hearings, which usually happens when the committee chairman has a special interest in the legislation.

The subcommittee mark-up follows soon after. This is the first chance for members to add amendments to the legislation. Mark-up on a specific bill can last a few hours to weeks, depending on how many amendments are introduced, how many times committee members are interrupted by business on the House floor and how long the debate lasts for each amendment. Eventually, the subcommittee votes on each amendment and then on the final version of the bill; if it passes, it heads to the full committee, where it enters a similar mark-up process. If it is reported out of the full committee, it is put on the calendar, which is controlled by the Speaker of the House and the majority leader. If the Speaker chooses not to put it on the calendar, then the legislation will not likely make it to the House floor for a final vote. If the majority leadership schedules a vote, the bill goes to the Rules Committee. The political sensitivity of the legislation determines what kind of rule it gets introduced under: an "open" rule allows an unlimited amount of debate and number of amendments, while a "closed" rule limits both.

If the legislation makes it past all the hurdles, it gets voted on by the full House membership. If it passes, it may move on to a conference committee to work out the differences between the House legislation and the Senate's version of the same bill. It then heads to the president's desk, where he will either sign it or veto it.

Dietz summed up her explanation of the process with an ominous note: "I just gave you a theoretical overview of the process. It never works that way," she said with a laugh. "There are so many other variables involved and so many other forces at work...You could get a master's degree in the legislative process." ❑

From the Land of the Silver and Gold

Researchers from the University of Colorado, Boulder, mine veins of particle physics at Fermilab

by Leila Belkora, Office of Public Affairs

"I'm looking at the minutes of the first annual meeting of the Council of Presidents of the Universities Research Association—in November 1965—and Colorado is listed, so they had to be here when we first formed. Colorado was represented by Joseph R. Smiley." So says URA secretary Rhonda Gudger, confirming that the University of Colorado participated in planning for the National Accelerator Laboratory, now Fermilab, in Illinois. Joseph Smiley was CU's ninth president. Indeed, at the time of the URA meeting, the location of the new lab that URA would operate was an open question, and former Atomic Energy Commission chairman Glenn T. Seaborg says in his account of the history of Fermilab that "the Denver, Colorado site was a strong contender."


Photo by LEILA BELKORA

Eric Vaandering, left, graduate student at CU-Boulder, and his advisor, CU Professor John Cumalat. CU physicists built the lead-glass calorimeter behind them, which Vaandering painted with the CU football team logo.

The lab didn't come to the mountains, so physicists from the mountains have been coming to the lab. One of CU's recent contributions, according to faculty member Tony Barker, is a set of four lead-scintillator particle detectors for the KTeV experiment. The square detectors, which weigh 10 tons each, are about 16 feet on a side and "just barely fit in a truck if you put them in diagonally," says Barker. A half-dozen undergraduates and as many graduate students and faculty built the equipment, which arrived at Fermilab last fall and has just been installed in the KTeV experimental hall.

A COSMIC ASYMMETRY

Currently, physicists from the high-energy research group at CU participate in two Fermilab projects. Collaborators in the KTeV program, which itself is a pair of experiments, will focus on the particle interactions that lead to the observed predominance of matter over antimatter in the universe.

The asymmetry between matter and antimatter—the fact that our world seems to be made mostly of matter, despite the fact that antimatter particles pop up routinely in laboratory experiments—may hinge on a phenomenon called CP violation. A process that violates the rule of CP conservation is one of several conditions that make it possible for particles to outnumber antiparticles in the universe. Barker, his colleague Uriel Nauenberg, and their team of postdocs and students at KTeV are pursuing the origins of CP violation in the decay of kaon particles.

"The big challenge of the experiment," says Barker, "is that it has to be so precise. We're trying to measure a number [that represents the magnitude of the CP violation] to one-part-in-a-thousand precision." The 10-ton detectors he and his coworkers built in Colorado help achieve this precision by making sure that no particles produced in a decay go unrecorded. Experimenters refer to these detectors generally as anti-counters, because they identify events that could be misinterpreted, and are eliminated from the data set.

Colorado physicists also built part of the trigger system for the experiment. The trigger system rapidly evaluates signals or combinations of signals from the detectors, and based on this, tags each particle interaction event as worthy or not worthy of further study. The evaluation of signals at the level supervised by the Colorado-built trigger is a specialized task: "We can't do it with a computer," says Barker. "The decision is made too fast. The Level 2 trigger [built in part at CU] is custom-designed electronics."

CHARM PARTICLES

John Cumalat, who has participated in experiments at Fermilab for over 20 years, leads the department's efforts to study the charm quark using photons as probes. When the charm quark was discovered in 1974, at Brookhaven National Laboratory and simultaneously at the Stanford Linear Accelerator, physicists were surprised to learn that the charm quark is heavier than a proton; the proton itself consists of up and down quarks. Today, Cumalat and his colleagues are adding to the list of known parameters of the charm quark and its interactions.

The goal of the charm experiments, according to Cumalat, is to reconstruct the quark from the cascade of secondary particles it transforms to. "For example, the charm quark can turn into a strange quark plus a virtual W particle," he says. "Then the virtual W can decay in either a 'favored' or 'suppressed' way–a probable or improbable way." One of the measurements the experimenters want to make is the relative rate of those alternative decays.

Because the study of the charm particles is indirect, and some of the modes of decay so improbable, the physicists need lots of events. Cumalat, who is also spokesperson for the experiment, expects it to yield "ten times more charm than anyone has seen before." He says this will be possible thanks to the source of charm particles, "the world's highest-energy photon beam" in Fermilab's Wide-Band Photon Hall.

Colorado's contribution to the experiment is the construction of a silicon microstrip detector and its mechanical support, and an electromagnetic calorimeter. The calorimeter identifies some of the highest-energy electrons, photons, and neutral pions that are produced along with the charm particles from the high-energy photon beam.

The calorimeter consists of an array of lead-glass elements, encased in two large steel panels. Graduate student Eric Vaandering saw in those steel panels a blank canvas, and painted them with a favorite motif: a charging buffalo, symbol of the CU football team.

A TRAIL OF STUDENTS

Richard Harpel, Assistant Vice President for Academic Affairs and Federal Relations at the University of Colorado, says he's aware of CU's long-standing involvement at Fermilab, and credits Colorado's congressional delegation with much of the support necessary to keep the high-energy physics program going. "Our champion on our delegation is David Skaggs," he says, of the representative from Colorado's Second Congressional District. Skaggs "took a very personal interest in the general area of the sciences [when Skaggs was on the House Science Committee]...and he's still very, very supportive." Skaggs is now on the Appropriations Committee.

On the academic side, Cumalat, Barker and Nauenberg point to a trail of former students from Colorado as a happy sign of CU's long-standing involvement in research at Fermilab. Nauenberg interrupted his wiring task at KTeV the other day to wave to Rick Tesarek, a research associate at Rutgers University who was an undergraduate at CU. "I taught him in one of my classes," says Nauenberg. "It's good to see him now in high-energy physics." ❑

Photo by ERIC VAANDERING

Elements of a lead-glass calorimeter arrayed on the roof of the physics building in Boulder. Glass that has suffered radiation damage (as part of a detector element in a previous experiment) can be cured by exposure to ultraviolet light, including sunlight.

Photo by FRED ULLRICH

Uriel Nauenberg (foreground), CU physics professor, and Anatoly Ronzhin, guest scientist at Fermilab. They are checking the wiring of photomultiplier tubes at the base of a lead-scintillator calorimeter. CU students and faculty built the calorimeter in Boulder.

We called it a run, but it was more like a marathon—

Fermilab's Collider Run I

By Judy Jackson, Office of Public Affairs, and John Crawford, Accelerator Division

It began on a hot day in August 1991, and by the time it ended on a cold morning in February 1996, Collider Run I at Fermilab had changed our understanding of the natural universe. It had delivered the astonishing number of 179.67 inverse picobarns of luminosity, or 12,572,000,000,000 high-energy proton-antiproton collisions, to each of Fermilab's two collider detectors, CDF and DZero. "It was like winning the data lottery," said CDF Department Head John Cooper.

Those Run I data held the evidence for new physics. "Physicists Track Down an Elusive Atomic Particle," said the front-page story in the New York Times on March 3, 1995. "Culminating nearly a decade of intense effort, two rival groups of physicists announced today that they had found the elusive top quark—an ephemeral building block of matter that probably holds clues to some of the ultimate riddles of existence.

"The announcement brought sustained applause and a barrage of questions from an overflow audience of physicists at the Fermi National Accelerator Laboratory, where the work was done. Fermilab has the world's most powerful particle accelerator."

"YOU HELPED MAKE IT POSSIBLE."

A few days later, the 475 members of the division that operates that accelerator received a letter from Division Head Dave Finley. "We make them," he wrote. "They find them. And together we have discovered the top quark. And that's a scientific fact...What you have heard over the last few years, from 'prediction,' to 'evidence,' to the 'discovery,' was science history in the making. And you helped make it possible."

The Computing Division helped as well. For the first time in Fermilab history, the most intensive processing of the data, which must be done before the analysis leading to the physics results, was complete within days of the data's creation. An array of computers provided the computing power to extract the essential physics results, check and recheck them, and eventually declare the discovery of the top quark.

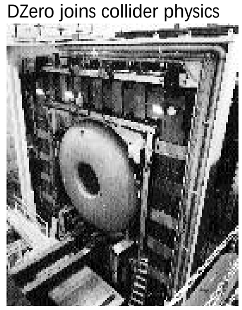
Finley credits Laboratory Director John Peoples for much of the success of Run I. "The constant through Run I was John, who kept the direction steady. He kept the detectors and the accelerator going in the same direction when the sky was falling [in the form of the Superconducting Super Collider]. People came and went, but John and [Deputy Director] Ken Stanfield kept a constant direction, and that made all the difference."

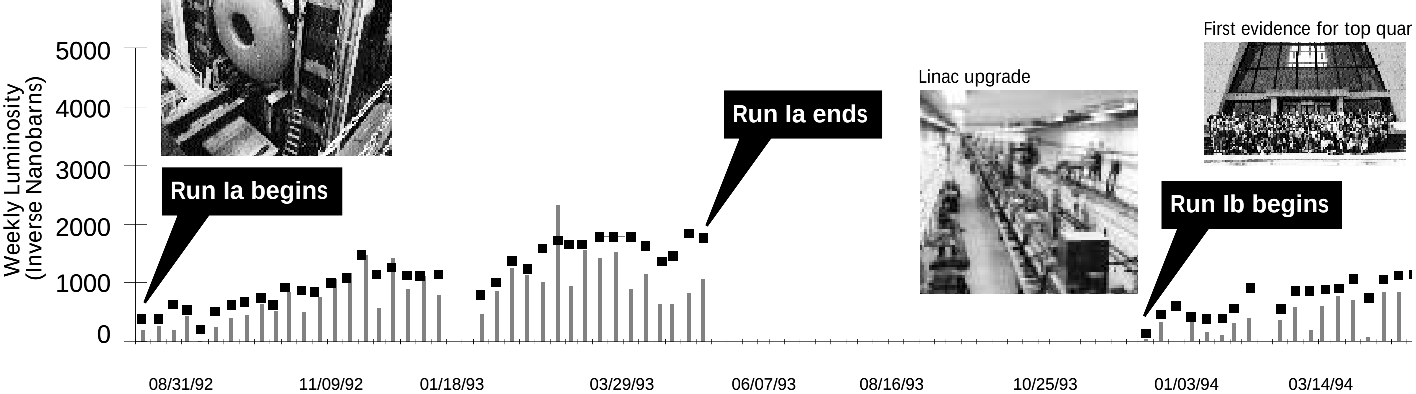
Besides discovering the top quark, experimenters measured its mass and studied the way it decays, as they opened a new era of top quark physics in Run I. They also made the most accurate measurements to date of the mass and width of the force-carrying particle called the W boson. Combining the precisely measured characteristics of the W with precise top quark data will provide insight into the nature of the Higgs boson and the mystery of mass.

MAGNETS, NITROGEN, AND CHERRY TREES

Run I was exhilarating, but it was no romp through the roses. Most vexing of Run I's headaches was the failure of the Tevatron's luminosity to rise after a 1993 shutdown for the installation and commissioning of a new 400 MeV linear accelerator. The new Linac was expected to double the luminosity from pre-shutdown levels, but when operations resumed luminosity obstinately refused to rise, barely attaining the previous levels. For months, Laboratory staff searched in vain for the bottleneck. At last, in the final week of July

DZero joins collider physics





COLLIDER RUN 1: WEEKLY AND PEAK LUMINOSITY The bars represent weekly luminosity and

1994, the problem was traced to a misaligned Tevatron magnet. Workers realigned the magnet and luminosity instantly shot up. “Fermilab’s collective sigh of relief was heard as far away as Glasgow, scene of the International High Energy Physics Conference,” said Fermilab’s 1994 Annual Report.

Tevatron performance soared until the end of August 1994, when trouble struck again. The 5000.3B “Occurrence Report” to DOE told the tale: “On Friday, August 26, 1994, the outside vendor contracted by Fermilab to provide liquid nitrogen (LN2) to the Accelerator Division’s Central Helium Liquefier (CHL) for use in operation of the Tevatron accelerator ceased their scheduled deliveries of LN2. Laboratory personnel were notified by a representative of the vendor at approximately 0800 hours on 8/26/94 that there would be no more deliveries to CHL in the immediate future beyond the one just then completed.

“CHL is the source of the LN2 used...in the process of achieving and maintaining the superconducting temperatures in Tevatron components necessary for Tevatron operation. Onsite inventories and reliquefaction capability are insufficient to maintain operating cryogenic temperatures in the Tevatron without daily deliveries of LN2 from an outside vendor.”

Fermilab used the “nitrogen drought” to carry out a planned accelerator maintenance program—and to make arrangements for a more reliable future nitrogen supply.

On May 10, 1995, the Tevatron set the peak luminosity record for Run I. And on June 22, the lights went out. “Blackout disrupts Fermilab operations,” reported the Aurora Beacon-News. “Power was cut off for more than four hours to Fermilab here Thursday, but it could take much longer than that for normal operations to resume at the site of the world’s highest energy-producing accelerator. The outage occurred at about 10:20 a.m., when a [cherry] tree made contact with the 345-kilovolt electrical line that supplies power to the laboratory and created a short...” Recovery took a couple of weeks.

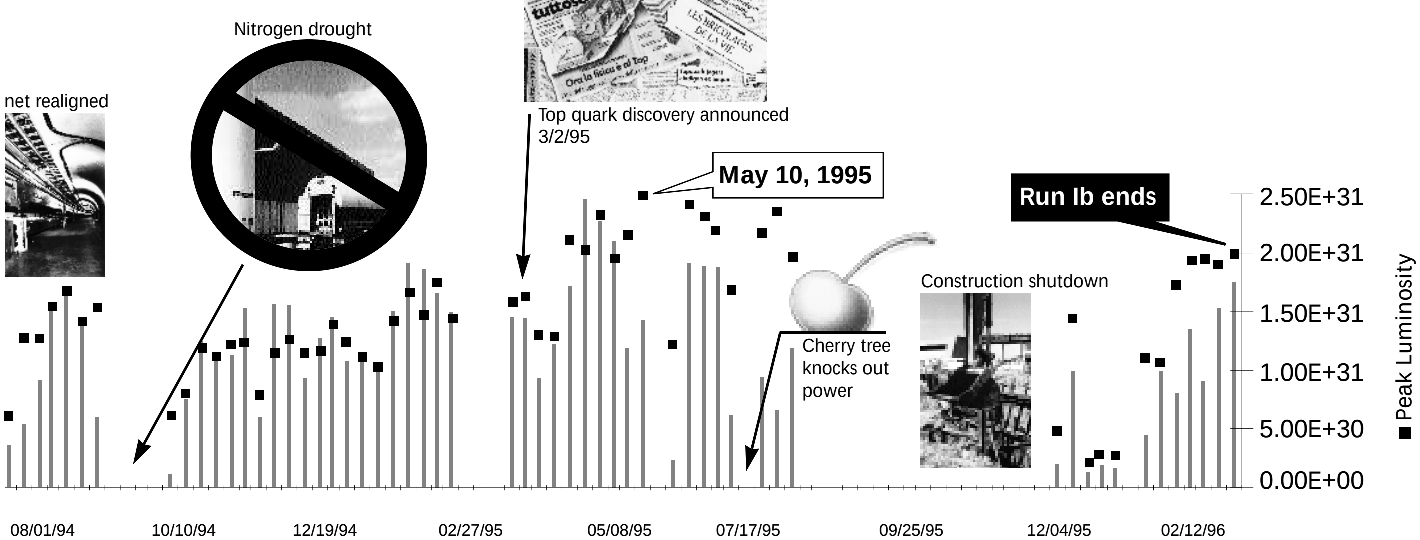
GOOD-BYE RUN I, HELLO RUN II

Following a summer 1995 shutdown to allow progress on constructing Fermilab’s new Main Injector, Run I ended with a dazzling flourish of high luminosity.

Researchers greeted the end of Run I with mingled pride, regret, and relief. “The original 1981 CDF design report talked about a luminosity on the scale of 1 pb^{-1},” said CDF Cospokesman Bill Carithers, “It discussed the likelihood of discovering the top quark if its mass was less than 25 GeV!” In fact, CDF recorded 129 pb^{-1} of data in Run I, and the top quark weighed in at something over 180 GeV.

Run I was the first Fermilab collider run with two detectors, as DZero joined CDF, across the accelerator ring. “When DZero started out, the feeling was that Run I would be an ‘engineering run’ to get the kinks out of our detector,” said DZero cospokesman Paul Grannis. “Of course, it turned out to be nothing of the sort. I am very pleased at our ability to search for new physics in areas far beyond what had been done before.”

Now, as they continue to analyze Run I data, the collaborations will move on to upgrading the detectors for Run II, the first run with the Main Injector. Soon the two 5,000-ton detectors will roll out of the collision halls and into view for the first time in over three years. “It will be a pleasure to see our old long-lost friend again,” Grannis says, “and to kick its tires and climb around inside it. I’m really looking forward to sprucing it up for the next phase of its career.” ❏



epresent peak luminosity. Dates refer to the beginning of the week.

Blue Devils at Fermilab

Duke University continues its long history at Fermilab with work on the CDF upgrade

by Donald Sena, Office of Public Affairs

The term "March Madness" on the Duke University campus usually evokes images of storied basketball players leading the Blue Devils to numerous Final Four appearances. But in March of 1995, as Duke was left off the NCAA's hoop dance card, another institution at the university was participating in its own brand of March Madness.

The Duke University high-energy physics group, a member of the large Collider Detector at Fermilab (CDF) collaboration, was a player in the discovery of the top quark, the final quark of the standard model. CDF and DZero, Fermilab's other collider collaboration, announced top's discovery one year ago this March. Duke's participation in CDF is the latest manifestation of a partnership with Fermilab that dates back to bubble chamber experiments more than 20 years ago.

The Department of Physics at Duke has 22 faculty members, including six professors of particle physics. The department has about 50 undergraduates with physics majors and 70 graduate students, six of whom are specializing in experimental high-energy physics.

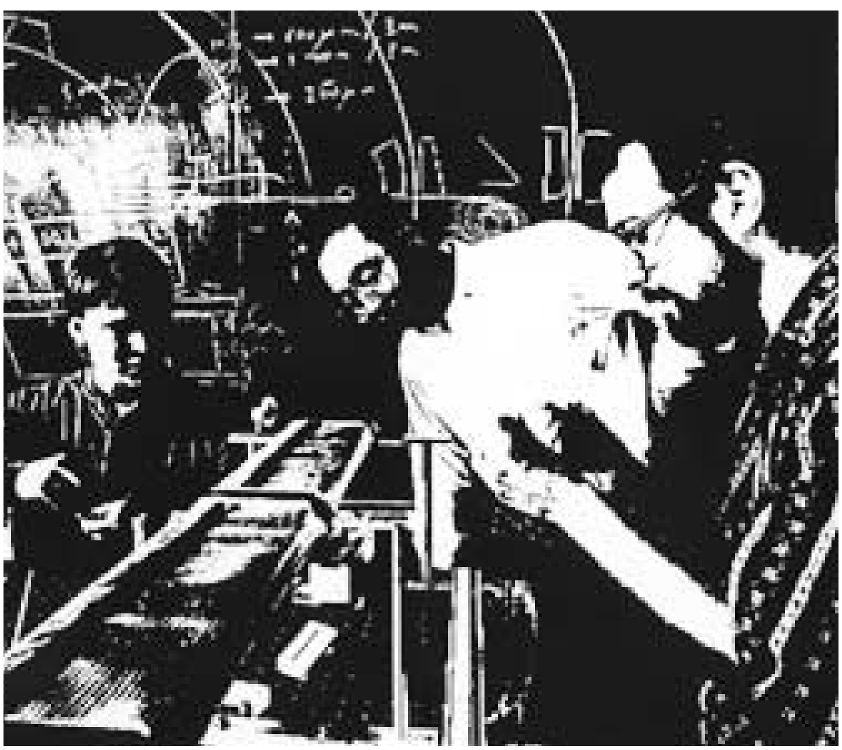


Photo courtesy of DUKE UNIVERSITY

From left : Daniel Cronin-Hennessy, research assistant and graduate student; Seog Oh, associate professor of physics; William Ebenstein, instructor and engineer, Duke Department of Physics.

Alfred Goshaw, physics professor at Duke, said he was first attracted to Fermilab—and is still active here—because the Laboratory's sophisticated physics tools give his group the best arena in which to perform research at the energy frontier.

Fermilab's beam of subatomic particles "is now, and will be for the next ten years, the highest energy particle beam" in the world, said Goshaw. "We thought then, and believe now, it has the greatest potential for elementary research anywhere in the world."

YEARS OF PHYSICS

Martin Block founded the high-energy physics group at Duke in the early 1950s, and Earl Fowler led the team from the late 1950s to 1970. Soon after, William Walker, now professor emeritus of physics at Duke, arrived to help lead the university's first collaboration with Fermilab. He built the Laboratory's 30-inch bubble chamber while at the University of Wisconsin. (After stints at Wisconsin and Argonne National Laboratory, the bubble chamber was moved to Fermilab in 1971, where many universities used it.) Walker's team engaged in several studies with the physics device, the last of which, E597, studied collisions of hadrons with nuclei in 1981; the Duke professor is in the process of publishing the final paper on that experiment.

In the 1980s, the Duke collaboration participated in fixed-target experiments and collider studies at Fermilab. In the fixed-target area, Lloyd Fortney, physics professor at Duke, led his team's work on E705, a study of charmonium and directly-produced photons. Specifically, Fortney's group developed the reconstruction software of the electromagnetic calorimeter, among other tasks. Duke also participated in an outgrowth of that experiment called E771, which was designed to study B physics.

In parallel with the fixed-target work, the rest of the Duke professors and students participated in an early collider study using the Tevatron at the CZero section of Fermilab. Experiment 735, which began in 1985, studied the production of relatively low-momentum particles produced from high-energy collisions—a precursor to the present studies of particles with higher momentum.

The group built the straw tube detectors, charged-particle tracking devices, for CZero. They also developed a photon detector using sodium-iodide crystals. Cal Loomis, presently at Rutgers University, worked on the photon detector while a graduate student at Duke University. Goshaw said that the experiment gave the Duke collaboration an expertise in collider physics and, more specifically, in the development of high-rate tracking detectors. From CZero, Goshaw, Seog Oh, Walker and the Duke group moved to CDF where they joined Run Ia. Their initial contribution to the experiment included helping to develop and install tracking detectors and their accompanying electronics.

CZero "is where we built up our knowledge," said Goshaw, who is also the chairman of Fermilab's Users Executive Committee. "...We then joined [CDF] and carried over some of that" expertise.

For Run Ib, Duke helped organize data distribution for the entire 450-person collaboration, among other duties. After the detectors and computing infrastructure detect and record the data from the experiment, researchers process it through reconstruction programs. The data are then divided among the collaboration. Goshaw said each group only wants certain data, depending on which trigger they are interested in or worked on. Getting the right data to the proper group is essential for productive analyses and for making discoveries.

"The efficiency with which you get the data analyzed depends on the speed with which you get it distributed to collaborators," said Goshaw.

A FUTURE AT CDF

Goshaw, Oh and the Duke team plan to build upon their knowledge of tracking detectors by contributing to the CDF detector's critical upgrade. Fermilab recently completed the latest run of collider experiments. Though the fixed-target experiments will take center stage for the next few years, work on CDF and DZero will continue. Experimenters will work to upgrade the detectors to get ready for Fermilab's newest accelerator. The Main Injector, scheduled to switch on in 1999, will greatly increase the Tevatron's luminosity, resulting in many more collisions per second at CDF and DZero. The detectors in their current mode would not be able to keep up with

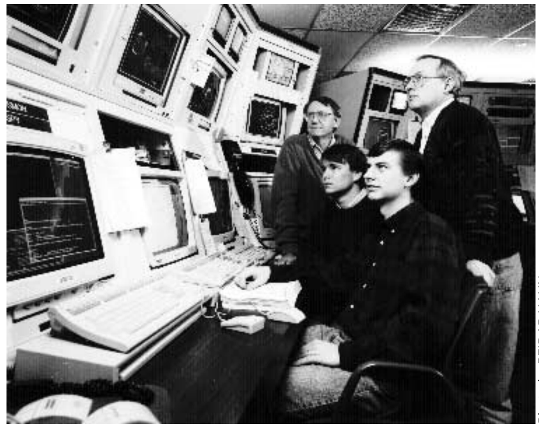


Photo by REIDAR HAHN

Some members of the Duke University high-energy physics group in the CDF control room in 1995. Left to right: Alfred Goshaw, Daniel Cronin-Hennessy, Jay Dittmann. Standing is Wolfgang Kowald.

all that extra luminosity. As a result, they need upgrades for the various layers of tracking.

The Duke team, along with other groups, have designed and hope to build the newest version of the straw tube detectors. A straw tube detector consists of a wire chamber filled with gas that measures the trajectory of charged particles in an environment of extremely high luminosity. The straw tube layer is just outside the layer of silicon vertex trackers and scintillating fiber—other components of the CDF detector getting upgrades.

Funding is a key issue with the detectors, however. CDF and DZero need adequate funding to keep their upgrades on schedule. Insufficient funding will delay the Main Injector's benefits, according to Fermilab sources.

STUDENT INVOLVEMENT

The leaders of the Duke collaboration are performing their straw tube research and prototype construction at Fermilab and at Duke's Durham, North Carolina campus—an arrangement that benefits younger students. The parallel operation allows the group to bring some work home and get undergraduates involved with the technology and physics.

"There is certainly a bright and active student body at Duke, and we take advantage of that for help," said Goshaw.

Goshaw said he hopes continued collaboration with the Laboratory will bring more chances for students to perform research at the energy frontier, and possibly be part of "new physics."

Fermilab "has a very long and exciting future, and we are looking forward to contributing to that and being involved with [more] discoveries, hopefully," said Goshaw. ❑

Fermilab "has a very long and exciting future, and we are looking forward to contributing to that and being involved with [more] discoveries, hopefully."

– Alfred Goshaw, physics professor at Duke

THE LONGEST-RUNNING CLASSIFIED

FOR SALE

■ 1990 Mitsubishi Eclipse GSX, all-wheel drive, 16 valve dual overhead cam intercooled turbo, 5 speed, AC, cruise, FM/AM cassette, 68,952 miles. New: 1KA battery, brakes, timing belts, Pirelli P7000 205/55ZR16. Must see (no rust) and test drive; $8651. Call Bob x3769, (708) 879-6355, or flora@admail.fnal. gov.

by the Editors, Office of Public Affairs

Bob Flora of Fermilab's Accelerator Division began advertising his 1990 Mitsubishi in the December 8 FermiNews, and he hasn't missed an issue since. Over the months, according to analysis by the FermiNews staff, (see Figure 1) mileage on the car has increased monotonically from 67,215 miles to 68,952 miles. The price increased slowly until January, went through a local maximum at $9513, and thereafter decreased precipitously. Analysts are at a loss to explain the period of negative depreciation of the vehicle, but suggest that the mileage/price ratio may soon reach a new peak. Figure 2 shows the vehicle, and its owner. "It's a very special car," says Flora, "and it's in excellent condition. I do all the maintenance on it myself. It's got four-wheel drive and it's a great winter car—it's great in the summer too." Flora advises readers that interest in the red and black vehicle has recently picked up. If the car runs as faithfully as the ads, this could be a transportation opportunity. ❏

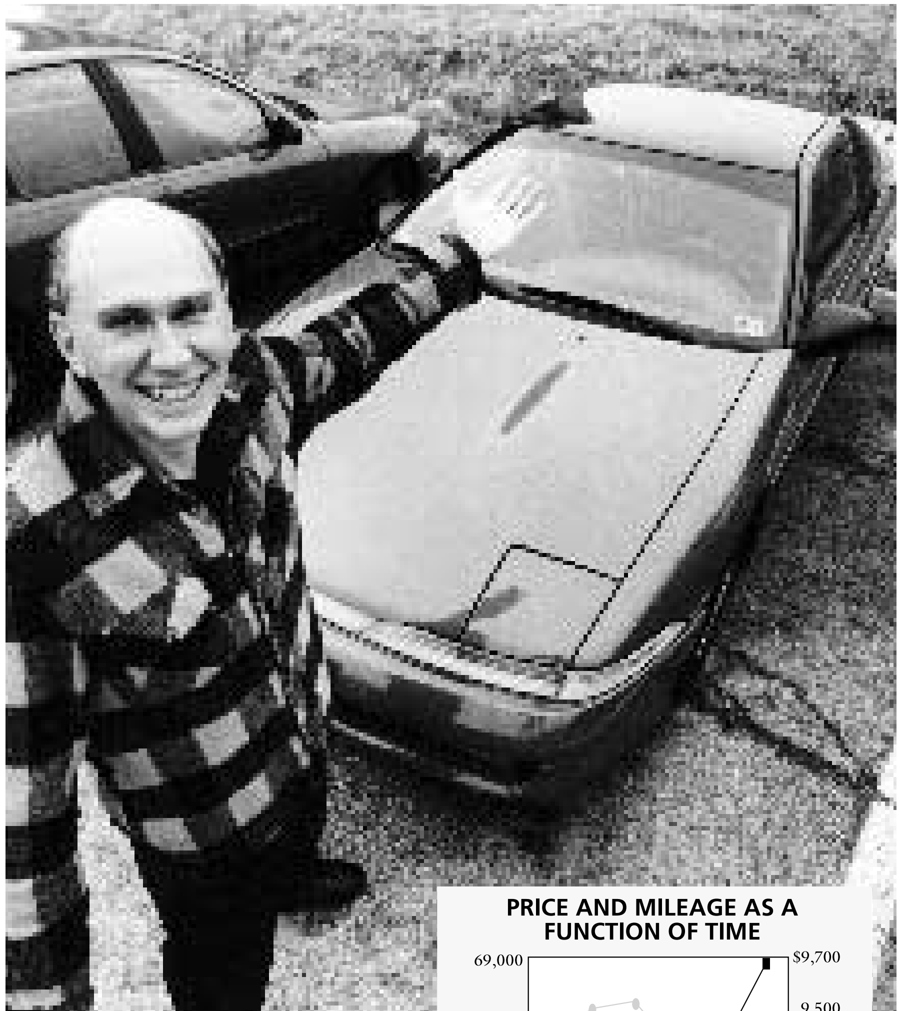


Photo by REIDAR HAHN

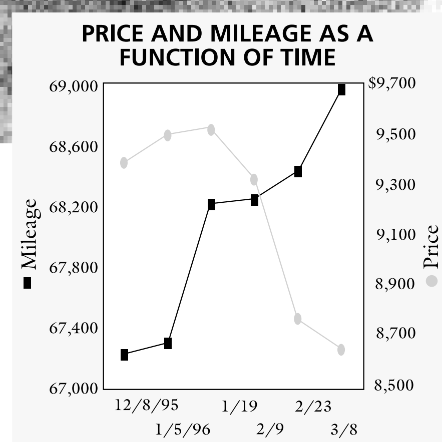


Figure 1 (right) and Figure 2 (above)

> *"It's a very special car, and it's in excellent condition."*

LAB NOTES

1996 SUMMER DAY CAMP

Fermilab will again sponsor three supervised day camp sessions for children of employees, visitors, and Fermilab contractors. Session dates are June 17-July 5, July 8-July 26, and July 29-August 16. The fee is $225 per child, per session. Admission is by lottery drawing on April 1. Contact Jean Guyer at x2548 for more information and for a registration form.

AREA CODE CHANGE

Fermilab's telephone area code will change from 708 to 630 on August 3, 1996. Watch for further information in future issues of FermiNews.

CLAIMS DEADLINE

The filing deadline for submitting 1995 claims to your Health Care Reimbursement Account and Dependent Care Reimbursement Account is March 31, 1996. CIGNA must have your claims in their claims office by the close of business on that date.

FERMILAB CALENDAR

MARCH 8, 22

The Fermilab International Film Society will be showing the following films during the month of March.

Eat Drink Man Woman on March 8 at 8 p.m.

A witty and emotionally involving story of generational conflict in which food plays a pivotal role in observations on a changing Chinese culture.

Cobb on March 22 at 8 p.m.

The dark side of the American dream told with wit, bravery, passion and depth through the story of baseball's finest, if most demonic, player, Ty Cobb.

Admission is $4. The films are shown in Ramsey Auditorium, Wilson Hall.

MARCH 10

The Fermilab Folk Club is sponsoring an acoustic jam from 3 to 5:30 p.m. in the Village Barn. Contact Lynn Garren x2061, garren@fnal.gov for more information.

MARCH 10

There will be a barn dance in the Village Barn from 7 to 10 p.m. The Saturday Night Occasionals will be playing and Tony Scarimbolo will be calling. We do contra, square, and circle dances. All dances are taught. No experience is necessary. Admission is $5. Contact Dave Harding x2971 or Lynn Garren x2061 for more information.

MARCH 13

The Fermilab Barnstormers Radio Control Model Club will host their annual Delta Dart Night at the Kuhn Barn starting at 5:30 p.m. Everyone is invited. Delta Darts are rubber-band-powered airplanes constructed of balsa wood and tissue paper. For a $1 materials fee, club members will provide guidance in constructing and flying these planes. (You can build one in about half an hour.) No experience is necessary. Children under 12 are exempt from the materials fee, and there will be a "juniors' fly-off" at 7 p.m. For more information, call Jay Hoffman, x4156, Kurt Krempetz, x4657, or Jim Zagel, x4076.

MARCH 17

The Fermilab Folk Club is sponsoring an afternoon barn dance from 2 to 5 p.m. in the Village Barn. Music will be provided by the Elmwood String Band, with calling by Paul Ford. We do contra, square, and circle dances. All dances are taught. Admission is $5. Contact Dave Harding x2971 or Lynn Garren x2061 for more information.

MARCH 19

Blood Pressure Screening, 11:30 a.m. to 1:00 p.m., in the Users Office

MARCH 20

The Wellness Committee presents Dollars and Cents, a lecture on debt management and budget counseling by Diane Bedenbaugh of Consumer Credit Counseling in Aurora. Noon-1 p.m. in 1 West.

MARCH 29

Fermilab Lecture Series presents Cosmic Revolutions: 1609, 1929, 1999 by Dr. Edward W. Kolb, Fermilab / University of Chicago

Remarkable new instruments today reveal the universe in unprecedented depth and detail. Dr. Kolb explores these recent findings in his lecture at 8 p.m. in Fermilab's Ramsey Auditorium.

Admission is $5. Tickets are non-refundable. For further information or telephone reservations, call 708-840-ARTS weekdays between 9 a.m. and 4 p.m.

APRIL 16

Blood Pressure Screening, 11:30 a.m. to 1 p.m., Users Office.

Chez Léon MENU

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, MARCH 13

Chicken and Three Bean Burritos

Latin Confetti Salad

Pina Colada Mousse

THURSDAY, MARCH 14

Steamed Mussels in White Wine

Grilled Pork Loin with Garlic Almond Sauce

Wilted Greens

Chocolate Pecan Tart

WEDNESDAY, MARCH 20

Vegetable and Cheese Strudel with Mixed Green Salad

Lemon Ginger Cake with Lemon Cream Cheese Frosting

THURSDAY, MARCH 21

Steamed Artichokes with Maltaise Sauce

Grilled Tuna with Rosemary Butter

Boiled Red Potatoes

Vegetable of the Season

Mixed Green Salad

Strawberry Tart

LETTER TO THE EDITOR

Dear Editor:

I'd just like to express my congratulations to the Visual Media Services and Duplicating groups for the fine demonstration they put together to present the newest acquisition of equipment to the duplicating room, the Docutech. What a "cool" machine, I can't wait to try it out. The demo was educational, informational, and easy to understand. The staff did a really nice job setting up the demo, addressing the different needs Fermilab has, and explaining them to us. The vendor representative was informative and able to answer all of our questions. Thanks for doing a terrific job showing us what a terrific machine we can all access.

-Luann O'Boyle, Directorate

ACCELERATOR UPDATE

Feb. 14–Feb. 27 saw the accelerator involved in colliding beam physics and Tevatron studies before accelerator staff turned off the beam for an extended maintenance period. On Feb. 14, store #5906 was colliding at 9:11 a.m. with an initial luminosity of 1.52×10^{31}. From 8 a.m. Feb. 16 to 8 a.m. Feb. 19, the accelerator operated very reliably with 61.5 hours of high-energy physics. From 8 a.m. Feb. 19 to 8 a.m. Feb. 20, the accelerators were involved in a period of repairs and studies, and studies continued for the remainder of the week. On Feb. 27, Accelerator Division staff turned off the Main Ring, Tevatron and Antiproton Source for an extended maintenance period, effectively ending collider physics for a number of years.

FERMINEWS HITS WEB!

FermiNews is now on the World Wide Web. It can be found at http://www.fnal.gov/directorate/public_affairs/ferminews; it is also linked to the Fermilab home page located at http://www.fnal.gov

CLASSIFIEDS

FOR SALE

■ 1991 Honda Civic hatchback. Blue, 4-speed, no rust, excellent condition. 56,000 miles. $5,400. Call Marise at (708) 898-4631.

■ 1990 Plymouth Voyager, SE, 3.3 l., v6, 4-speed automatic, ps/pb, cruise, tilt, AM/FM, Cassette stereo, luggage rack, 78k miles. Good condition, $7,500. Call Jim Shallenberger at x5441 weekdays or (815) 824-2936 Monday–Thursday.

■ 1987 Plymouth Horizon, 125k miles, good condition, runs great, 5-speed. New battery, tires, clutch, starter. $1,000/obo. Call Mark at x2253.

■ 1987 Mazda 626 LX, 4-door, full power, fully loaded, moon roof, 5-speed transmission. Must sell/must see. Only $4,000/obo. Call 879- 8256 for Denise.

■ 1985 Ford F150 pickup with bed liner, 302 V8 engine, 78K mi., $3000. Call Leon at x4065 or (708) 892-7120

■ Sega Game Gear with rechargeable powerpack, like new, $75/o.b.o. Includes 2 game cartridges. Call Hank at x8105 or (708) 475-1160.

■ Insulated steel entry door, 36" w. x 80" h., with single side lite and complete frame. Six panel design. Also, matching Emco "Forever" storm door with self-storing screen and glass window. Very good condition, only eight years old. $100 for all. Call Bill at x4396 or email to pritchard@fnal.gov.

WANT TO RENT

■ Garage space for small classic car, now through August. Aurora or Batavia preferred. Len Bugel x3266 or bugel@fnal.gov.

SEEKING ROOMMATE

■ I live in a very nice apartment in Naperville, about 20 minutes driving from Fermilab, and I am looking for a roommate starting in April. I would prefer someone who plans to be around for a year at least. If you are interested, you can contact me at gervasio@fnal.gov.

The deadline for the Friday, March 22 issue of FermiNews is Tuesday, March 12.

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

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

FermiNews

Fermi National Accelerator Laboratory

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