FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY

The Final Goal **2**

Photo by Reidar Hahn

Volume 22
Friday, May 14, 1999
Number 10

INSIDE:

THE FINAL GOAL:

Another Beginning

by Mike Perricone

After nearly a decade of planning and building and fixing, of taking an idea and turning it into two miles of machine, all those connected with the Fermilab Main Injector anticipated the shining moment when the nearly-$230-million accelerator could be declared completed and ready for operation.

That moment came on Wednesday, April 28, when a U.S. Department of Energy Project Acceptance review recommended that DOE confirm Critical Decision 4: Operation of the Main Injector.

And once they got their view of the Promised Land, all those involved with the Main Injector knew they could pause just long enough to take a deep breath, maybe enjoy a quick toast, and then get right back to work the next day.

“We’re already meeting to plan the strategy for our (next) goals, while we have the momentum to do it,” said Main Injector commissioning chief Shekhar Mishra.

Setting the stage for the acceptance review, Mishra’s commissioning crews reached the seventh and final commissioning goal on April 27, declaring victory over resonant extraction.

Among its planned uses, resonant extraction is critical to the future success of the MINOS long-baseline neutrino oscillation experiment, sending a beam of neutrinos through the earth to an underground detector 438 miles away in Soudan, Minnesota. The first six commissioning goals were achieved between November and January, but resonant extraction proved a tougher challenge.

“At Fermilab, commissioning is always a ‘24-7’ operation,” Mishra said. “We go 24 hours a day, seven days a week, around the clock, three shifts. Weekends. Holidays. In fact all our other commissioning goals were reached on holidays—Thanksgiving week, Christmas Eve, New Year’s Eve.”

Those ‘24-7’ and holiday pushes took place in compressed time periods, during lulls in installation activity in the tunnel.

“We actually met our commissioning goals in a very short amount of time,” Mishra said. “Initially, we were supposed to have about a year to do this (resonant extraction). In fact, adding up the actual hours we were running, we got about three weeks. Everybody on the commissioning team should be very proud that we’ve delivered all the commissioning goals as we promised to the division and to the Lab management.”

Not only was the Main Injector delivered on time, but the cost is expected to be under budget, whether the figure used is the total estimated cost of $229.6 million, or the total project cost of $259.3 million, which includes research and development, pre-operation costs and spare equipment.

Photos by Reidar Hahn

Steve Holmes (left), Beams Division head and Main Injector Project Manager, celebrates the good news with Main Injector commissioning chief Shekhar Mishra after achieving resonant extraction, the seventh and final commissioning goal. Looking on are Ralph Pasquinelli and Tom Meyer.

Cover Photo: In the Main Control Room, Mishra toasts the official achievement of the final Main Injector Project commissioning goal.

With **DOE** recommending CERTIFICATION, the **Main Injector** prepares for the **work ahead**.

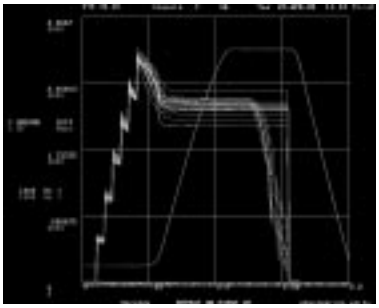


Image courtesy Beams Division

The evidence: The jagged curve with six "steps" represents six batch transfers from the Booster into the Main Injector; the "hump" curve represents the acceleration level. The jagged curve is stable or flat when the resonant extraction system begins operation, and the dropoff shows beam exiting the machine to the P1 transfer line.

As a major bonus, Fermilab delivered another accelerator within the Main Injector's original schedule and budget: the Recycler, the only machine of its kind in the world, which will save and store antiprotons that would have been discarded after previous collider runs of the Tevatron. Cohabiting the Main Injector tunnel, the Recycler and its permanent magnet technology have won awards for designers Bill Foster and Gerry Jackson, in the areas of accelerator design and energy savings.

Ron Lutha, who has provided oversight as the DOE's Fermilab Main Injector Project Manager, expressed unreserved admiration during the acceptance review's closeout session.

"I've been associated with this project since 1992," Lutha said. "The management of this project has been very good from the start. When you note the awards this project has gotten, you can see how well it has done. We all look forward to the operation of the Main Injector, and everyone involved with this project should be very proud of it."

The DOE approval did come with one reservation: the Lab must complete as quickly as possible a segment within the Tevatron enclosure between F17, the branch point to the Antiproton Source target, and F47, the straight return at the beginning of AØ.

"We started working on that in the afternoon following the meeting," said Main Injector Department head Phil Martin. "People are cranked up to finish this off."

Martin estimates that completing the segment will take about $75,000 and two weeks of total access time during periods when the accelerator is not running.

Main Injector Department head Phil Martin (left) shares the good news with Fermilab Deputy Director Ken Stanfield (center) and Mishra (right).

Photos by Reidar Hahn

Mishra and Operations Chief Bob Mau check over documentation for the final commissioning goal of resonant extraction.

Beams Division head and Main Injector Project Manager Steve Holmes explained that the transfer segment had been delayed to focus attention on the leaks in the Low Conductivity Water system that surfaced in November 1997, caused by bacteria growth in water that was stored in the system. Holmes said the LCW repairs posed the most serious problem the project had faced, though there had been others along the way.

Among the major challenges: the great blue heron, a protected waterfowl species, had a rookery in the middle of the proposed Main Injector site; serendipitously, the heron switched to a roomier site in the Main Ring just months before the start of construction. There was a major mitigation project for six acres of wetlands, which not only passed muster with the Army Corps of Engineers but also won environmental awards. There were difficulties with the material for magnet coils and magnet steel. There was flooding during the tunnel construction. There was the Recycler magnet compensator material that went down in an Atlantic Ocean shipwreck. And there was the ongoing saga of the transformer that was ordered but never delivered in working order; the Main Injector power system was redesigned to work without it, though the transformer will eventually be replaced because it is needed for better over-all Lab operations.

But with the seal of approval on the Main Injector, the entire Fermilab accelerator complex is near readiness for the upcoming fixed-target experimental run:

- The Booster has been running at record intensity levels, achieving $5x10^{12}$ protons per accelerator cycle, which is the level required for Collider Run II.
- The Tevatron has been chilled to super-conducting temperatures, with all magnets ramped up to 800 GeV. The revised Safety Assessment Document, reflecting the machine's reconfiguration in the Main Injector era, was accepted on May 5.

Commissioning of the beam transfer between the Main Injector and Tevatron at 150 GeV (the line has already run beam at 8 GeV and 120 GeV) began on May 7.

- In the Antiproton Source, the Accumulator is essentially reassembled and ready to accept beam. The Debuncher is awaiting components for the stochastic cooling upgrade, set to arrive this fall. The Charmonium fixed-target experiment (E835) will utilize antiprotons in the fall.
- The Recycler installation is complete, with beam fully circulated for the first time on May 4. The next major milestone is achieving 1,000 turns of beam as a performance goal to demonstrate to DOE the effectiveness of the permanent magnet technology.
- The Main Injector will also be running target tests for NuMI (Neutrinos at the Main Injector), placing some of the candidate target material into the Antiproton Target area, running beam to the target, and observing the results.

And throughout the upcoming Fixed Target run, the Main Injector and Tevatron will undergo preparations for Collider Run II; Martin estimates that Run II-related studies will take up about 10 percent of the time devoted to the Fixed Target run.

Martin, Mishra and Holmes are just three of the many people who have been working on the Main Injector virtually from its inception. Martin is the only department head the Main Injector has had. Mishra was the first scientist hired onto the project from outside the Beams (then Accelerator) Division. Holmes has spent more than half his professional career on the project, since the idea began circulating in the late 1980s.

"It's been an awful long time to keep focused on one project," Holmes said. "But we've had a great group, and it's been a great experience. We've always kept the lines of communication open. And we've trusted each other."

Photo by Reidar Hahn

Getting PHYSICAL

National Academy elects Fermilab theorist Bill Bardeen

By Judy Jackson

Sure, Fermilab theorist Bill Bardeen was elected to the National Academy of Sciences last month for his distinguished contributions to theoretical physics. But can he go to his left?

"Not really. I wouldn't say he can go to his right either. He does have a jump shot," said engineering physicist Al Sondgeroth. As a ballplayer himself, Sondgeroth has had plenty of opportunity to critique the on-court prowess of the 6'1" Bardeen, who plays forward a couple of times a week in the Fermilab Lunchtime Pick-Up Floating Basketball League.

Fortunately, Bardeen's activities in the realm of the physical also extend to the physical sciences, where he gets considerably more respect. On April 28, he entered the science equivalent of the Hall of Fame when the National Academy of Sciences elected him to membership, one of only 60 U.S. scientists from all branches of science elected this year "in recognition of their distinguished and continuing achievements in original research," according to an announcement from the Academy.

Bardeen is internationally recognized for his work in the area of quantum field theory, the theoretical foundation for the understanding of modern particle physics. He is perhaps best known for his role, with theorist Stephen Adler, in formulating the Adler-Bardeen theorem that concerns anomalies in quantum field theory. Bardeen has also done pioneering work on applications of the theory of the strong force between the subatomic particles called quarks and gluons; and on mechanisms for the origin of mass in which the top quark plays a special role.

"Bill Bardeen has made many wide-ranging contributions in the area of quantum field theory," said Keith Ellis, head of Fermilab's Theory Group, "but always with an eye toward their relevance to experiment."

Bardeen was one of four physicists elected this year to the National Academy. The Academy's membership includes about 180 U.S. physicists, of whom Fermilab can claim five: physicist Alvin Tollestrup, Director Emeritus Leon Lederman, soon-to-be Director Michael Witherell, astrophysicist Michael Turner, and now Bardeen.

The National Academy of Sciences is a private organization of scientists, established in 1863 by a congressional act of incorporation, signed by Abraham Lincoln, that calls on the Academy to act as an official advisor to the federal government, upon request, in any matter of science or technology.

Fellow Fermilab theorist and basketball player Rocky Kolb admires the laconic Bardeen's style, both on and off the court.

"I would describe Bill Bardeen's style of basketball as quiet intensity," Kolb said. "I guess that is not surprising, because he is a quiet physicist. He doesn't say very much—he lets his papers talk for him. On the basketball court, it's the same. He doesn't say much—he lets his elbows talk for him."

LOVE of Country

Outdoorsman Kamran Vaziri wins Employee Award for Main Injector Readiness Reviews

Photo by Reidar Hahn

Kamran Vaziri "performed tirelessly" in conducting the Main Injector Accelerator Readiness Reviews.

by Mike Perricone

Kamran Vaziri's first sense of place in America would be hard to surpass: Logan, Utah, where the Logan River flows through Logan Canyon in a mountain valley in the northeastern corner of the Beehive State.

"Logan Canyon is one of the most beautiful places I've ever seen," said Vaziri, who left his native Iran after completing high school in 1974, enrolling at Utah State University to follow his dream of becoming a physicist.

He completed his Ph.D. in experimental nuclear physics at Los Alamos National Laboratory in New Mexico, then pursued postdoctoral work at the University of Colorado in Boulder—another grandly scenic area.

"I've always enjoyed hiking and camping," Vaziri said, "and Colorado and Utah were perfect for that."

Following research at Brookhaven National Laboratory, Vaziri moved to Fermilab in January 1992. He lives in Geneva with his wife, Azam, also a native of Iran, and their son, Barzeen, 14, and daughter Mondana, 11.

Vaziri is a member of the Radiation Physics Team in the Environment, Safety and Health Section. Two years ago, ES&H head Bill Griffing charged him with assembling a team of experts to conduct the Accelerator Readiness Reviews in accordance with the Main Injector's Safety Assessment Document; and working as a liaison between the Beams Division and the Department of Energy, which held the ultimate approval. Vaziri assembled a core group from ES&H of Deb Grobe, Bill James, Jim Priest and Greg Mitchell.

Vaziri was presented with a Fermilab Employee Recognition Award on May 7. The awards recognize "outstanding contributions to the Laboratory demonstrated by innovation, discovery, extraordinary effort and/or cost reduction."

Mike Andrews of Beams Division ES&H said Vaziri "performed tirelessly" in compiling and tracking the necessary safety documentation. Beams Division head Steve Holmes cited Vaziri's "great work" in running the Accelerator Readiness Reviews, and in clarifying and documenting the punchlist items. Griffing lauded the "extraordinary coordination" Vaziri achieved among ES&H, the Beams Division and the DOE-Fermi Group review team.

"We wanted to have DOE involved from the ground level," Vaziri said. "We invited DOE to bring in their team, cooperate and help solve problems as we went along. I think the process we laid out to do this is more effective and is more realistic in its relation to safety issues than going over paperwork."

DOE gave its formal concurrence during a meeting in Fermilab Director John Peoples' office on September 25, 1998; beam was introduced into the Main Injector the next day. The DOE Accelerator Acceptance Review recommended DOE's acceptance of the Main Injector's completion on April 27, 1999.

"I think we laid down a foundation for a methodology of conducting Accelerator Readiness Reviews with the DOE involved from ground level," Vaziri said. "I think it went well, and I think everyone was very happy in the end. The Main Injector is not a project anymore. Now it is part of the Laboratory facility."

PEDAL TO THE METAL

Employee Award winner

Frank Nezrick

brought a hard-driving history to Main Injector Safety Review Committee.

Image courtesy Ferrari North America

Nezrick wheeled a Ferrari like this 1962 model around the Lab's Oak Brook office in 1968.

Photo by Reidar Hahn

Frank Nezrick, adjusting the laser apparatus at proposed experiment P877, was cited for his efforts in chairing the Main Injector Safety Review Committee.

By Mike Perricone

Hanging a large-scale Ferrari poster in your office might represent a wistful dream for most sports car enthusiasts. For Frank Nezrick, it's a fond memory.

Nezrick bought a Ferrari in the 1960s while working at CERN, the European particle physics laboratory in Geneva, Switzerland. When he joined Fermilab in the summer of 1968, he brought the Ferrari with him.

"Originally, our offices were in Oak Brook, which was perfect for the Ferrari," he recalled. "When we moved to this site, the mud and dirt were not the place for a Ferrari, and I sold it."

Nezrick has attended the famed Skip Barber racing school and holds licenses from two national racing organizations. He began racing in the old Super Vee class (super-powered, open-wheeled Volkswagen Beetles). He raced an open cockpit Fiat Abarth for years until back problems made racing too painful.

He looks as mild-mannered as a coin collector—which he is, as well as being a carpenter; and professionally, he was researching neutrinos as early as 1959. Nezrick has also served in many administrative capacities in his 31 years at the Lab, and his 14 months of chairing the Main Injector Safety Review Committee earned him a Fermilab Employee Recognition Award on May 7.

Beams Division Head Steve Holmes cited Nezrick's leadership in completing the safety reviews necessary for the commissioning of the Main Injector. Mike Andrews of the Beams Division's Environment, Safety and Health Department cited his patience and dedication to detail during this highly demanding period, and ES&H Head Bill Griffing said Nezrick "has demonstrated an ability to successfully manage a large task under considerable time pressure for the good of the Laboratory."

"We were working with two parallel lines of approval," Nezrick explained. "The official line of approval went from ES&H to DOE to Lab Director John Peoples to the Beams Division head. In parallel, Steve Holmes wanted an independent assessment team that reported directly to him. Everyone was pushing very hard to have the Main Injector commissioned rapidly, and we wanted to avoid problems coming up at the last minute."

Now Nezrick is refocusing his attention toward smaller, non-accelerator experiments; and investigating axions, theoretical weakly-interacting fields proposed as a solution to the problem of dark matter in the universe.

He also mines surplus equipment, including three dipole magnets salvaged from the SSC for a laser interferometer, for proposed experiment P877. The goal: measure the effect of a magnetic field on the speed of light in a vacuum, within one part in 10^{25}—as precise, he explains, as measuring the distance to the star Alpha Centauri within the diameter of a hydrogen atom.

Parked in the dust and gravel outside his portakamp lab, Nezrick's surprisingly-docile subcompact bears the Illinois license plate "AXION 4."

"I wanted plain 'AXION,'" he said. "But there's a detergent with that name. I suspect somebody from Procter and Gamble beat me to it."

NO SUN ~BUT~ STILL FUN

by Mike Perricone

Once again, Fermilab's secret is out: science isn't just a lot of numbers and equations.

"It was fun," wrote five-year-old Cara Zagel on her web page journal for the day. "When I grow up I'd like to work at Fermilab."

While rain canceled the seeding and tree-planting scheduled for the Arbor Day celebration (rescheduled for April 29), more than 200 parents and children participated in the fourth annual Daughters And Sons To Work Day activities on April 22. The youngsters all had commemorative posters to take home at the end of the day—posters produced in rapid response by Fermilab's Visual Media Services, with photographs recording the day's activities.

Their day began with a group portrait on the front steps of Wilson Hall, followed by a gathering in Ramsey Auditorium for the keynote presentation by Director of Laboratory Services Kay Van Vreede.

Van Vreede spoke about the many different professions it takes to run a laboratory, from scientists to groundskeepers to secretaries. She emphasized how useful it is to try out many different ideas while you're growing up, illustrating her point with a photo of herself as a nine-year-old ballerina. When the time comes to make a career choice, Van Vreede's advice was simple: "Follow your heart."

The tone of the day ranged from the warmth of Van Vreede's message in the morning, to the surprising effects demonstrated in Jerry Zimmerman's cryogenics presentation at Ramsey Auditorium that afternoon.

After a hot dog lunch in the Wilson Hall cafeteria, Zimmerman had parents and kids alike mesmerized by the effects of ultra-cold temperatures on everyday objects. Cryogenics are an essential factor in operating Fermilab's particle accelerators. Metals cooled to temperatures near absolute zero (around -270

Rainy day doesn't put a damper on spirits for DASTOW 1999

degrees C or -450 degrees F) lose their resistance to conducting electricity, enabling electromagnets to carry large amounts of current and generate large magnetic fields.

Wrote Yannick Kwan, age 10: "The Cryogenic demo showed what happens when you put liquid nitrogen into bags and bottles with caps. It turns out it blows up from the pressure! Also, if you put a balloon into liquid nitrogen (the balloon) shrinks, and how about a glove? It cracks like glass! Liquid nitrogen is below about -400F! I thought Fermilab was boring, but it is really fun! (Even though Arbor Day was cancelled.)"

The Lederman Science Education Center was the headquarters for kids to compile their web page journals for the day, with 18 computers available in the Technical Classroom. The Science Education Center exhibits were a major attraction for the day, including the lab with microscopes available for viewing.

New to the day's program were morning tours of the Fermilab Fire Department, and an afternoon visit to the barn where the Lab's herd of 45 American bison are maintained. The Fire Department was ready with special kid-size equipment to demonstrate this critical aspect of Lab life.

But even a subject as serious as fighting fires was a high-spirited experience.

"I'm not sure who had more fun, the kids, the parents or us," said fire fighter Chuck Kuhn.

The Fire Department tour was part of the day's extensive mentoring activities, with 20 Lab professionals offering hour-long sessions with youngsters to talk about their careers and how their work fits into the big picture of the Lab's operations.

Amy Wojciechowski, age 12, spent her mentoring session with experimental physicist Jay Dittmann, who told her he had become interested in physics when he was in the seventh grade at about her age. His interest had grown from a school science project investigating how fast different colors heat up.

"It was fun and I learned a lot from my mentor," Wojciechowski wrote in her web journal. "I am now interested in going into physics one day."

The major goal of the day, celebrated nationally, is to familiarize kids with what their parents do at their jobs. The behind-the-scenes look can reveal the range of experience from the fascinating to the routine.

Dennis Fashimpaur, 9, spent the day with his dad, technician Dennis Sr., compiling this list of his dad's activities: "Fixes Internet Rack Monitors. Tests electronic equipment and makes electronic circuit boards. He also likes to drink coffee."

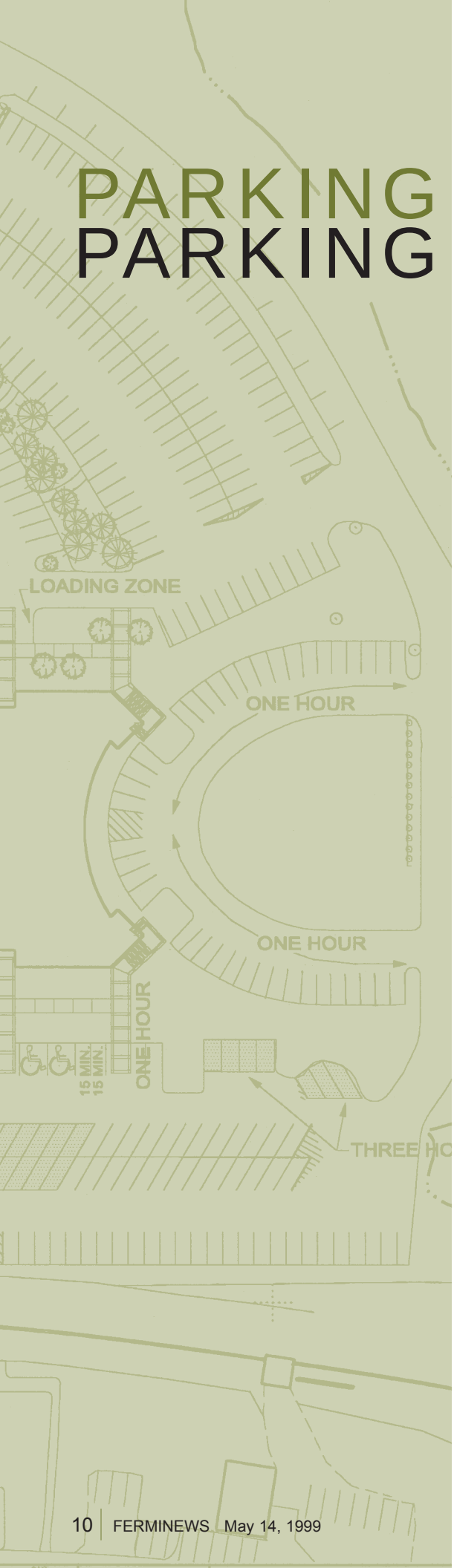
His comment on the day, which included lots of time working in his dad's office and two sessions of brewing coffee: "I think it was great, because I got to spend time with my dad and he was my mentor. I got to see the cryo show and I like cryogenics. I like science. This was way more fun than school."

Another part of the secret that came out during the day: it wasn't just the kids who were having fun. Mentors garnered plenty of rewards from their sessions with the kids, as described by physicist Dave Finley after a session that included the uncertainty principle, the difficulty in being "beamed up," working on the computer in the display on the 15th floor of Wilson Hall, and the universe's absolute speed limit—the speed of light in a vacuum.

"It's easier to say 'warp drive' than to make it work," Finley concluded. "I had a good time with Emily, Justin and Allison as a DASTOW mentor. Let's do it again next year."

PARKING Redux

PARKING Redux



By Judy Jackson

How did the universe begin?

Why is there more matter than antimatter?

What is the origin of electroweak symmetry breaking?

Will I find a parking space at the High Rise?

These are the fundamental questions that preoccupy the Fermilab community. Collider Run II at the Tevatron may help answer the first three. Director John Peoples aims to help answer the last, with a new parking plan that will go into effect on June 7, 1999.

The problem: People who work in the Wilson Hall "footprint" area fill all the close-in parking spaces when they arrive at work in the morning. Those who come to the High Rise later in the day for meetings or other business often can't find a place to park within hailing distance.

The challenge: Accommodate the later arrivals without overly inconveniencing—and totally enraging—the early ones.

It hasn't proved easy. Earlier plans setting aside close-in spaces for short-term parking drew such fire from some employees that the plans were reworked in response to suggested changes.

Fermilab managers considered a range of alternative solutions, some more practical than others. Astrophysicist Rocky Kolb, for example, proposed the introduction of valet parking at the Wilson Hall front door.

"The graduate students could do it," Kolb suggested. "It would be good training for them."

Other suggestions, including a decrease in the total number of short-term spaces, as well as an increase in all-day spaces in the east lot and opposite Ramsey Auditorium, have been incorporated in the current parking plan. The Laboratory has also paved additional parking areas.

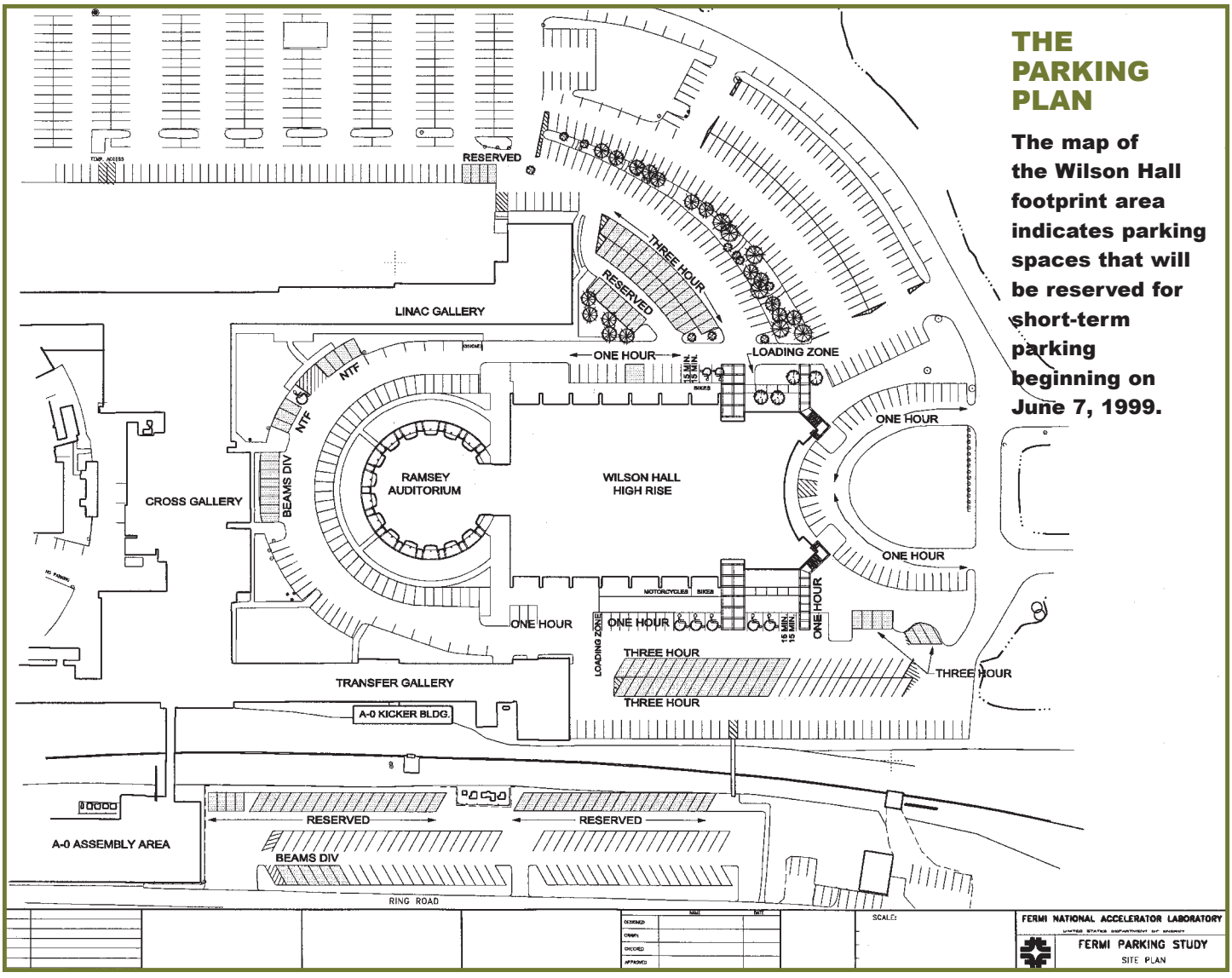
"It is clear that no parking plan devised by man could satisfy everyone," Peoples said. "Even Divine Providence might have trouble. But we have done our best to balance the needs of all the people at Fermilab who use the High Rise."

Finding the origin of electroweak symmetry breaking might be easy, in comparison.

See those two empty spaces in the horseshoe? They were about the only parking options near the High Rise on a June morning in 1990, and parking has only grown tighter with the years. Now a new plan aims to make parking more accessible for those who arrive at Wilson Hall during the day.

THE PARKING PLAN

The map of the Wilson Hall footprint area indicates parking spaces that will be reserved for short-term parking beginning on June 7, 1999.



How's WORK?

by Sharon Butler

THANKS TO NIU RESEARCHERS, FERMILAB WILL SOON HAVE DATA ON HOW EMPLOYEES RATE THEIR WORKPLACE.

Last fall, Northern Illinois University graduate student Scott Young and his advisor, Chris Parker, in the Industrial/Organizational Psychology Program, approached Fermilab about the possibility of doing what they called a "climate survey"—a study of the attitudes of employees and how those attitudes affect group cohesion, job satisfaction, and productivity. While the researchers were interested in data on small work groups, the information in aggregate would give Fermilab management a sense of how employees, as a whole, feel about their work environment.

The idea intrigued Associate Director Bruce Chrisman. No employee opinion survey had ever been conducted at Fermilab; management had only anecdotal information. The timing seemed appropriate, since the results of the study would be ready not too long after the new director, Michael Witherell, took office. And finally, such surveys typically cost a minimum of $20,000. Fermilab would have to pay only about $1,000 (to cover the cost of printing the survey).

Director John Peoples backed the idea, seeing it as a chance to strengthen a growing relationship with NIU, which recently launched a Ph.D. program in physics.

Photo by Reidar Hahn

NIU professor Chris Parker and graduate student Scott Young are conducting an employee opinion survey at Fermilab.

Now, the research team is ready to get started.

On May 20 and 25, at nine locations around the Lab, NIU researchers will be on hand to administer the surveys, which take only about 20 minutes to fill out. Watch for an all-employee mailing with details of the times and places.

Parker is hoping for full participation. "The more people who fill out the survey," he said, "the better for Scott's dissertation." But Parker also emphasized that the survey is a chance for employees to give feedback to management on how to improve Fermilab's work environment.

The questions address such issues as how employees view their managers, whether they feel that policies and procedures are fair, how challenging they find their work and how much freedom they have to do their jobs.

Parker emphasized that the survey will be absolutely confidential. Questionnaires are filled out anonymously. NIU researchers, not Fermilab staff, will collect, enter and analyze the data, sharing only aggregated information with the Laboratory. One sheet, which will be separated from the individual survey forms, asks employees to identify their supervisors, but that information is only for Young's dissertation work, since he needs to delineate work groups.

According to Kay Van Vreede, head of Fermilab's Laboratory Services Section, NIU expects to complete its analysis in about six weeks. Fermilab management will then review the aggregated results and share them with the Laboratory's employees. Depending on what emerges from the survey, management will decide how to proceed and what steps to take to address any serious problems. The researchers will also provide comparison data aggregated from similar surveys conducted elsewhere, giving Fermilab a means of comparing itself with other organizations.

Until then, Van Vreede is eager to encourage participation. "The more people that complete the survey, the more meaningful data we'll have," she said.

It's a sentiment Lab scientists can well appreciate.

the talk of the lab

Watch this space

Everyone who is anyone in the bustling field of particle astrophysics will be at Fermilab at the end of May for "Inner Space/Outer Space II," a symposium that will thoroughly explore, if not settle, such persistent questions as "Did the universe have a beginning?" and "How rare do you like your buffalo?"

The four-day symposium, from May 26-29, will feature the early universe (How early? "Ridiculously early," according to symposium co-chair Rocky Kolb), a "major policy address" by NASA Director Dan Goldin, the latest on the cosmic hunt for that pesky missing energy, a buffalo banquet, an all-out confrontation between two eminent cosmologists about the beginning (or not) of the universe, and much, much more.

The Inner Space of the symposium's title refers to the friendly confines of the subatomic world so familiar to particle physicists. Outer Space takes in the territory occupied by nature's great particle accelerator in the sky, the source of the highest-energy particles ever; not to mention black holes; supernovae; dark matter; the cosmological constant—and everything else.

Inner Space/Outer Space II is aptly dedicated to the memory of David N. Schramm, the late University of Chicago astrophysicist who was among the earliest scientists to recognize that astrophysics and particle physics are two different ways of exploring the same fundamental questions about the nature and origin of the universe. Schramm was an articulate and energetic exponent of the view that the exploration of nature on the very smallest and the very largest scales in fact converge. His career at the frontiers of particle astrophysics was cut short when he died in a plane crash in 1997.

"The universe was in some sense an elementary particle physics laboratory," wrote Schramm and particle physicist Leon Lederman in *From Quarks to the Cosmos*, their 1989 book on the subject. "In fact the physics governing what was going on in the early universe is the physics of elementary particles."

There's a whole lot of particle physics going on in today's universe as well, according to Kolb and symposium co-chairs Josh Frieman and Mike Turner. There's certainly a lot of it going on in the program they have planned, as a look at the Inner Space/Outer Space II Web page (www-astro-theory.fnal.gov/ISOSII/) will confirm. Speakers from corners of our local galaxy as far away as Tokyo and Stockholm will cover all that's hot in particle astrophysics at the moment: inflation (down in the U.S. economy but still going strong in the universe); ultra-high energy cosmic rays (think Pierre Auger Project); neutrinos (particle of the year in 1998, but still very much *au courant*); dark matter (hot or cold, take your pick) and something called "Hot Results," speaker (presumably whoever arrives with the hottest of the hot) to be announced.

Friday's midday session is a "Workshop on Future Missions," with heavy-hitting speakers Goldin, of NASA; Ernie Moniz, Under Secretary of the Department of Energy; and Bob Eisenstein, assistant director of the National Science Foundation. As noted, Goldin has said he will use the occasion for a major policy address. Come early for a good seat.

The undoubted highlight of the social program for Inner Space/Outer Space—perhaps of the entire season—will be Thursday evening's Buffalo Banquet, in a tent in the Fermilab Village. No Fermilab buffalo will be harmed for this banquet. In fact, The ISOS Web site points out that May is a good time for viewing the adorable buffalo calves at Fermilab

as banqueters pass their pasture on the way to the feast. Vegetarian menu available on request. (That's what the buffalo eat.)

Symposium organizers encourage members of the Fermilab community to attend Inner Space/ Outer Space. They hope for a high turnout from the Laboratory. Register on the Web site: http://fnpm27.fnal.gov/isos99/isos99registration.html

—Judy Jackson

Reversal of fortune

"Quench" is one of those words that accelerator physics turns into something other than it seems to be.

One common use of the word connotes satisfaction or fulfillment, as in quenching a thirst; another use describes cooling a hot metal by thrusting into water or another liquid.

But in dealing with the thousand superconducting magnets in Fermilab's Tevatron, Mike Church recognizes a "quench" as something other than a cooling or satisfying experience: a quench is the highly unsatisfying phenomenon resulting when a deposit of energy results in an increase in temperature, transforming a superconducting material (which has virtually no resistance to an electric current) to a state of regular conductivity.

"We have them pretty routinely," said Church, commissioning chief for the Tevatron. "When one happens, we try to reduce the total amount of energy that is dumped into the magnet. If we don't do that, we could possibly destroy the magnet. We try to avoid that scenario."

Church described three sources of quenching:

- A beam induced quench, when some fraction of the beam runs into the magnet, deposits energy into superconducting coils, raising their temperature and altering them to a state of regular conductivity;
- A component failure in the magnet itself, possibly a badly-soldered joint or some obstruction in the superconducting connections, generating resistance and raising the magnet's temperature; or the motion of a mechanical component, generating enough heat from friction to raise the temperature and cause a quench.

- A rare failure of the Quench Protection Monitor system, which measures voltages across the magnets, power leads and other connections, determining whether the voltages are within the limits necessary for superconductivity. If the voltages are outside the limits, the system interprets that information as the start of a quench. The magnet heaters are then turned on, raising the entire magnet to normal conducting temperatures and spreading out the deposit of energy. All the energy from the magnet is then short-circuited into dumps and bypasses so current flows around the magnet instead of through it. All these steps are taken to reduce the total energy deposited into the magnet itself. As Church explained, dumping all the energy into a magnet could destroy the magnet.

The rise in temperature causes a major evaporation of the liquid helium used to cool the superconducting components near absolute zero (-273 degrees C). Church emphasized that the helium doesn't vent into the accelerator tunnel, but remains in the system pipes and returns to the Central Utility Building compressor to be liquefied again.

"If the system works correctly, we don't lose helium," he added.

If there is a helium loss, that leads to words unmistakable in their meaning, in or out of physics.

—Mike Perricone

LETTER TO THE EDITOR

The cover of the Friday April 2, 1999, No. 7 Issue of *FERMINEWS* brought back memories of work done sometime in the 60s using fiber optic strands. On page 10 workers Ruggiero and Gielata are shown gluing multiple strands together, which I remember doing under a microscope to make a light scanning detector for missing separators in battery manufacture. Laser light generators were not yet available as used on present bar code scanners, and the light sources available for transmission were not adequate to achieve the intensity required for detection in a low contrast target. The reliability was not adequate to detect one missing separator out of six in the 1-1/2 inch stack of plates nestled 1-1/2 inches down into their case.

At that time who could image the complex, intricate, and successful applications that were yet to come in such an intangible field as particle physics. Am enjoying your publication and the complex format of your layouts. For example the "Talk of the Lab" full page spread title, white on gray, on page 13 when viewed on the reverse side on page 14 shows a reverse mirror image again in white on gray. I couldn't help wondering if perfect symmetry was involved. Holding the page to the light I found that *perfect symmetry was broken*, the images were mismatched by 1/16 inch. Since the Lab has documented instances of broken symmetry in particle physics I can't help but wonder whether this was intentional or simply resulted from the "strings" of serendipity.

Robert C. Matter, Retired Process Engineer, Delco Remy Division (Delphi)
General Motors Corp.
Anderson, IN

MILESTONES

BORN

[redacted] Jim (TD) and Sue Kerby [redacted] Chuck Brown (PPD).

[redacted] to Jose (BD/Ops)and Sarah De La O [redacted]

[redacted] to Ray (CD/OSS) and Erin Pasetes.

HONORED

Bill Bardeen, elected to National Academy of Sciences (see story page 5).

Ruth Pordes, Barb Angelos, Shirley Jones, Stephen White, Laura Mengel, Liz Quigg, and Tom Jordan by the Illinois Math and Science Academy for being mentors.

FIRST DATA

First data recorded April 16, by the KLOE experiment at Italy's DAFNE electron-positron collider in Frascati. KLOE will study CP violation in neutral kaons.

PUBLISHED

"The Progression of the American National Record," an account of track and field records, by Dave Carey of the Particle Physics Division, with coauthors Scott Davis & Don Potts; a publication of the Federation of American Statisticians of Track.

LUNCH SERVED FROM 11:30 A.M. TO 1 P.M. $8/PERSON

DINNER SERVED AT 7 P.M. $20/PERSON

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CAKES FOR SPECIAL OCCASIONS
DIETARY RESTRICTIONS
CONTACT TITA, X3524
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

LUNCH
WEDNESDAY, MAY 19

Garden Fresh Tortellini Salad

Lemon Buttermilk Cake with Strawberries

DINNER
THURSDAY, MAY 20

Cantaloupe and Prosciutto

Grilled Swordfish with Pineapple Salsa

Roasted Mediterranean Vegetables with Balsamic Vinegar, Garlic and Herb Marinade

Pecan Torte with Crème Chantilly

LUNCH
WEDNESDAY, MAY 26

Grilled Chicken and Pickled Cabbage Salad

Cardamom Cream Cake with Fruit

DINNER
THURSDAY, MAY 27

Gnocchi with Mushroom Broth

Veal Scallopini with Creole Sauce

Roasted Potatoes with Rosemary

White Beans and Escarole

Papaya and Avocado Salad

Chocolate Almond Mousse with Madeleines

FERMI NEWS

FERMILAB
A U.S. DEPARTMENT OF ENERGY LABORATORY

FERMINEWS is published by Fermilab's Office of Public Affairs.

Design and Illustration:
Performance Graphics

Photography:
Fermilab's Visual Media Services

The deadline for the Friday, May 28, 1999, issue is Tuesday, May 18, 1999. Please send classified advertisements and story ideas by mail to the Public Affairs Office MS 206, Fermilab, P.O. Box 500, Batavia, IL 60510, or by e-mail to ferminews@fnal.gov. Letters from readers are welcome. Please include your name and daytime phone number.

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CLASSIFIEDS

FOR SALE

- ’95 Saturn SL1 4 dr sedan, 63K miles, air, cruise, dual air bags, ABS, cd player, power windows & locks, Thule car rack Asking $8,000. Will sell immediately for first offer over $7,500. Call Don, x3668 or see http://www.ese.fnal.gov/People/Husby/.
- ’93 Mercury Sable LS Sedan 4D, 90K miles, lo jack, disc player, sunroof, loaded $5,000 obo. Greg x3011 or (630) 557-2523
- ’89 Honda CRX Si, 5 spd, AM/FM cassette, 101K, A/C, sunroof, yellow. Runs great: lots of fun and good gas mileage. $3,495 obo. Call Andreas x3753 or e-mail ask@fnal.gov.
- ’68 Yamaha Grand Prix YR-2, 350 cc, 10K original miles, great shape, been sitting in garage $400. Garbage compactor almond color $20, x3011 or (630) 557-2523.
- Leer fiberglass cap for ’88 - ’98 Chevy/GMC C1500 short bed pickup truck. Exc cond. $450. Call Bill Pritchard: x3370, pritchard@fnal.gov, or (630) 859.8596.
- US divers wet suit black $50; Parkway divers vest type buoyancy compensator w/auto-inflate $75; Atomic Arc carbon skis (195) w/bindings, ski bag, poles, size 12 boots $150; king size oak waterbed frame needs mattress $50; Elvis collector plates (4) $20 ea; 2 old style military cots $15 ea. contact terry, x4572 or skweres@fnal.gov.
- Sewing table, wood (not laminate), has 3 drawers & insert for installing sewing machine as a flatbed. When not in use, the sewing machine swings down. All offers considered. Contact wb@fnal.gov.
- Whirlpool washer & dryer. Both are extra large capacity. $125 each. Lynn x2061 or garren@fnal.gov.
- Home, by Owner, DeKalb (Approx. 30 Miles West of Fermilab), immediately adjacent to I-88, 4 bdrms, 2.5 bath, large kitchen, family rm w/fireplace, full unfinished basement, 2 car attached garage, central air, large deck, fully landscaped yard, Built in 1994, $189,900. Call (815) 748-4113.

RENT

- House, Oak Park Aug 15-Jun 15, 2000. Furnished 4 bdrms, 2.5 bath, attached 2 car garage, screened porch, lrg fenced yard. Centrally located near schools, shopping, CTA, 30 miles east of Fermilab & 8 miles west of downtown Chicago. $1,950/mo + utilities (incl. Lawn service). Call (708) 386-7982 or joan@hep.uchicago.edu.
- Large bedroom plus living room, quiet residential Naperville, 20 mins from Lab. One car garage, one private bath, laundry & kitchen privileges, available June 1. $395/mo. Call x2574 or (630) 983-3575.

LOST

- Safety glasses #287 145 left at the Lederman SciEdCtr in the Computer Classroom on Daughters & Sons to Work Day; stop by or call x8258 if they’re yours.

CALENDAR

Web site for Fermilab events: http://www.fnal.gov/faw/events.html

MAY 19

Wellness Works presents: *Annual Employee Health & Fitness Day*, 11:30 – 1 Ring Road, A1.

Academic Lectures: Neutrino Physics, “The MINOS Experiment”, Gina Rameika, 11a.m. in Curia II. http://wwwppd.fnal.gov/epp_www/Academic_Lectures/Academic_Lectures.html

MAY 22

Art Series presents: *Phil Ochs Song Night*, $14. All performances begin at 8 p.m., Rasmey Auditorium, Wilson Hall. For tickets call (630) 840-ARTS.

MAY 26

Academic Lectures: Neutrino Physics, “Non-Oscillation NuMI Physics,” Jorge G. Morfin, 11 a.m., Curia II. http://wwwppd.fnal.gov/epp_www/Academic_Lectures/Academic_Lectures.html

MAY 27

Tunnel Visions Symposium: *Neutrino Beams at a Muon Collider Facility*, F. Geer, Fermilab, 1 West 3–5 p.m.

MAY 28

International Film Society Presents: Persona Dir: Ingmar Bergman (Sweden, 1966, 81 mins). Film at 8 p.m., Ramsey Auditorium, Wilson Hall, $4. (630) 840-8000. http://www.fnal.gov/culture/film_society.html

ONGOING

English Classes, Thursdays at the Users’ Center from 10–11:30, classes are free. NALWO coffee for newcomers & visitors every Thursday at the Users’ Center, 10:30–12, children are welcome. In the barn, International folk dancing, Thursdays, 7:30–10 p.m., call Mady, (630) 584–0825; Scottish country dancing Tuesdays, 7–9:30 p.m., call Doug, x8194.

http://www.fnal.gov/directorate/public_affairs/ferminews/

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