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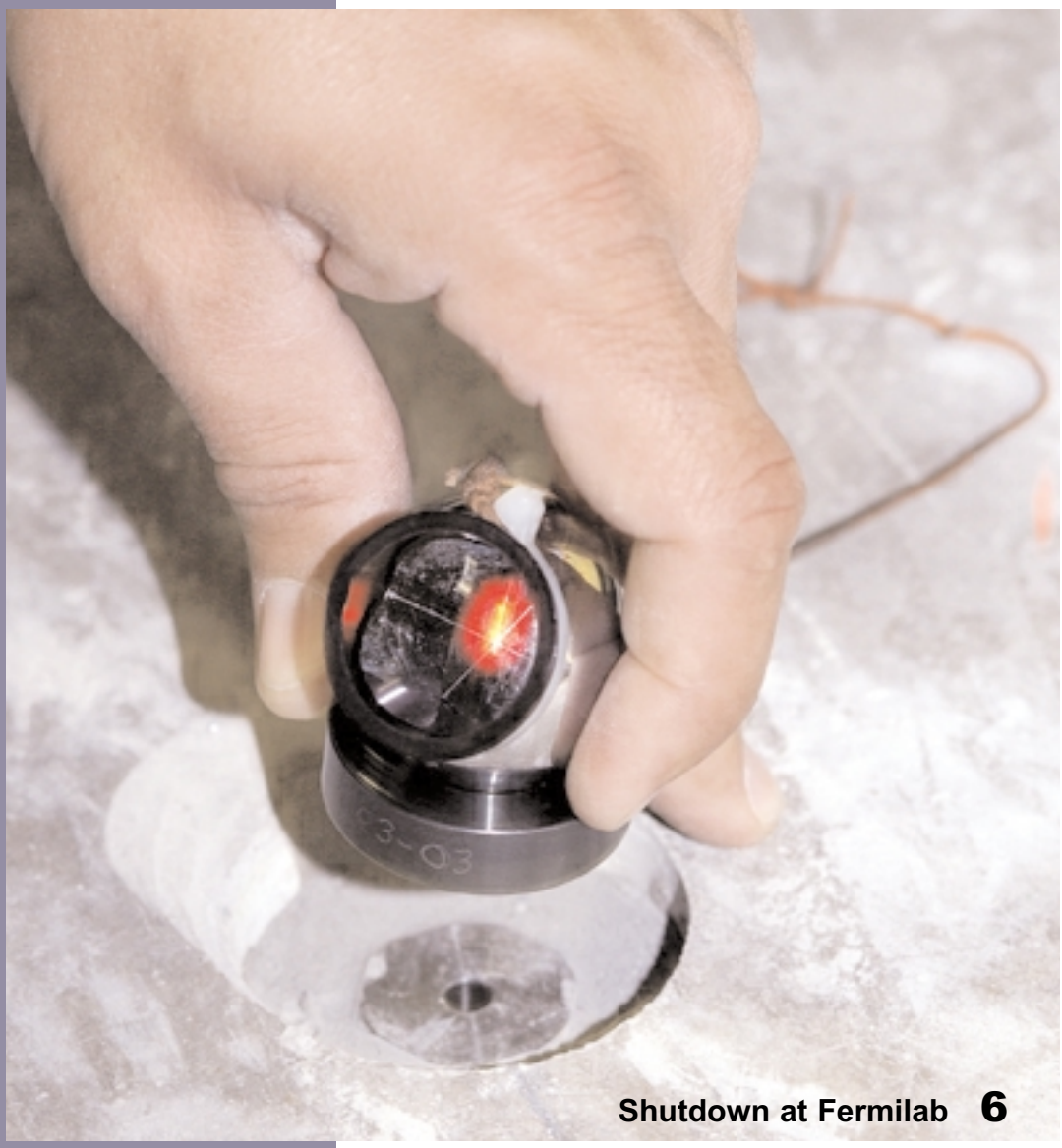

Photo by Fred Ullrich

Shutdown at Fermilab **6**

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INSIDE:

It's Time to Move On TOGETHER

by John Womersley
DZero Cospokesperson

Last month Fermilab Director Mike Witherell announced the cancellation of the CDF and DZero silicon detector upgrades for Run II. While not entirely unexpected, this announcement was a great disappointment to many of us. I have lost count of how many times I have been asked how I feel about this decision. This brief article is an attempt to answer that question. It's a very personal view, not an official statement of laboratory or experiment policy. I haven't made any attempt at spin control, and aspects of the drama are still playing out, but I hope these words will prove helpful in the long run.

When the announcement came, the first, instinctive, reaction was that the cancellation must not be allowed to happen. Personally, I have fought as hard as anyone for these projects and I did not want to see them stopped in their tracks. But there is a time for fighting and a time to move on. While the director was deliberating, I saw it as my right and responsibility to act as the strongest possible advocate for the silicon upgrade program. Now that the decision is final, for me to continue in that vein would be counterproductive. (It would be like arguing with a girlfriend who has left you; you'll never get her back that way. You have to move on.) It is time to accept what has happened, acknowledge our disappointment, draw a line under it, and focus on the future. It is important that we do not weaken the laboratory, damage our program, or divert effort from addressing the very real problems that face the lab—or from pursuing the physics we are doing here. Those of us very close to the projects may not be ready to acknowledge this yet, but to a large fraction of the high-energy physics community, the director's decision was the right thing to do.

When unwelcome things occur, there is a temptation to assign blame. Wherever beer is consumed, fingers will be pointed and the "guilty" singled out. It's bound to happen, and we all have our favorite targets in this case: Fermilab's second floor, the denizens of Germantown, the Beams Division, the collaborations themselves. But let me remind you that we all have to work together. The program needs every one of these "guilty parties": we're all hitched together, and without all of us, there is no physics program. Seen from the outside, it doesn't matter whom we blame. We high-energy physicists are all one group, and we all had a role in getting to this point.

ON THE WEB:

DZero
www-d0.fnal.gov

CDF
www-cdf.fnal.gov

Fermilab Today
www.fnal.gov/today/

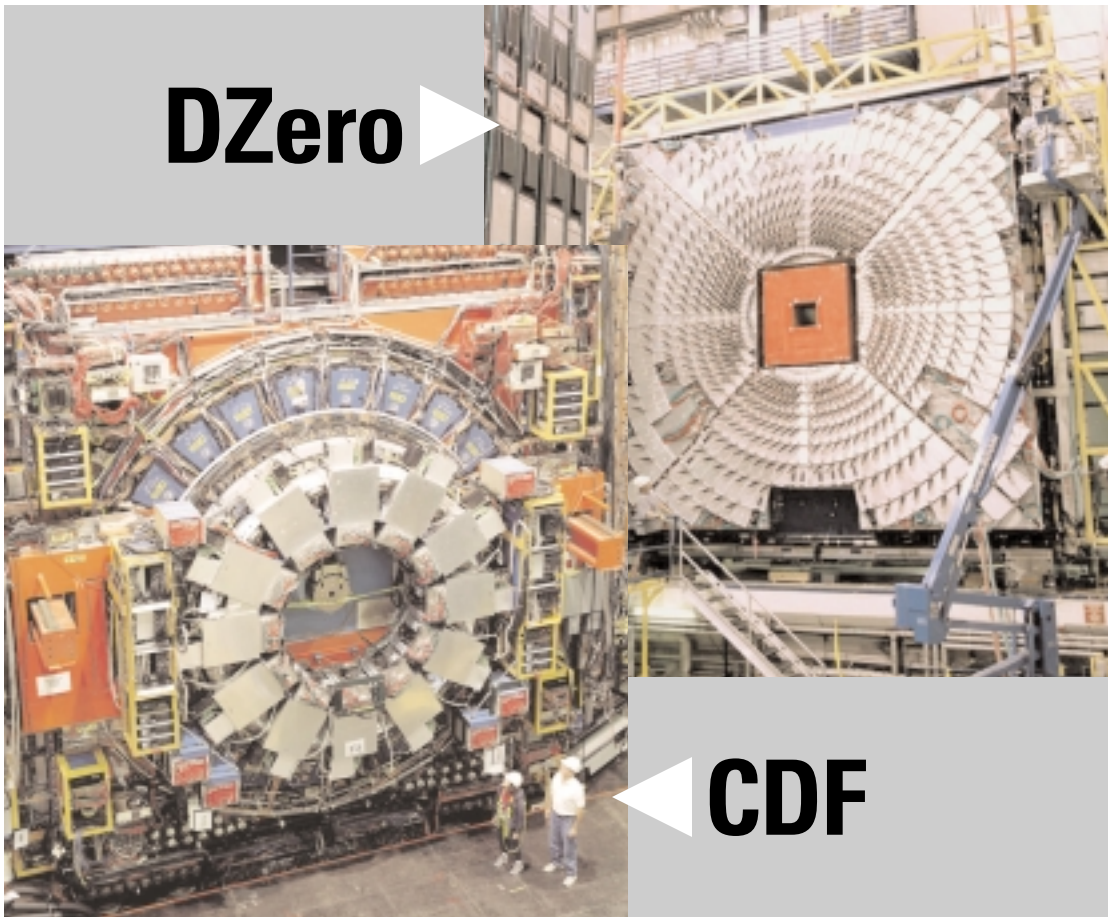
Photo by Reidar Hahn

DZero cospokesperson John Womersley: “It is time to accept what has happened, acknowledge our disappointment, draw a line under it, and focus on the future.”

Although it doesn’t help to assign blame, it is, I think, useful to draw what lessons we can from this outcome. Make no mistake, this was not a good thing to happen. No one wants to be in the situation of approving projects and then canceling them a year later. There are two lessons that I think we can learn. First, we need to consider accelerator and detector projects together. In the case of the Run II upgrades, the detector projects were approved and started, but the accelerator came under scrutiny only later. Many of the assumptions made in going ahead with the detector projects had to be revised when the accelerator was reviewed. Second lesson: when there is a window of opportunity, one has to be able to move fast. In this case, the window for the detector upgrades closes once the LHC starts doing physics. But in the current atmosphere of project management oversight, the upgrade projects couldn’t get off the ground without first going through seemingly innumerable physics, technical and project management reviews. These factors, coupled with a desire for conservative scheduling, in the end made them come online just too late to seem attractive to many people.

One of my concerns is for the enthusiastic young team of physicists who have devoted their major effort to these silicon projects for the last few years. We should be clear, as the director has been, that the cancellation in no way reflects on their performance. The detector upgrades were on time, on budget, making excellent technical progress and moving into the production phase with assurance. We should all work hard to ensure that these people’s careers do not suffer from the projects’ termination. Within DZero, we have made it clear that we want every one of them to remain engaged in the experiment, and we will take steps to encourage them to move immediately into physics analysis activities without the requirement for a lot of additional service work.

Point of View: RUN II



Fermilab photos

In arguing the case for the upgrades, I explained how this decision could, in my mind, lead to further descoping of the Tevatron program, perhaps even to its premature shutdown. Certainly the experiments do not want that; neither does the director; no one does. But I still worry for the future of our program. In the outside world, its image is compromised. We all have to get out and make the case for Run II as vigorously as we can. It is not a hard case to make: we are running the world's highest energy accelerator, and we expect fifty times the Run I dataset. We are the world's only source of W's, Z's, and top quarks. The top is the only Standard Model particle to couple strongly to the Higgs field—or whatever it is that gives fermions mass. It's a window on mass generation that should prove fascinating. After studying tens of top quarks for the last decade, we will soon have thousands of them. And this is a discovery machine: the Tevatron can roughly double our current reach in mass for supersymmetric squarks, gluinos and charginos. This is a great program!

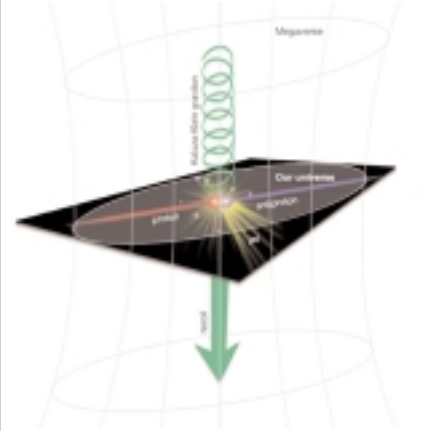
I am "on the road" this fall, making the case in university colloquia wherever I can. (In fact this is being typed in Starbucks across the street from Columbia University in New York). I hope all CDF and DZero collaborators will do the same, with colleagues, with funding agencies, in whatever forums are available. In addition, the experiments are working with the Fermilab Office of Public Affairs on a new feature for *FERMILAB TODAY*, the "Fermilab Result of the Week." It made its first appearance on September 18, and has begun highlighting the broad range of incisive physics analyses that are coming out of the Tevatron.

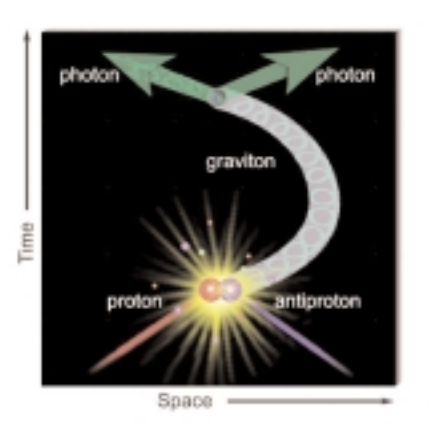
We didn't want this cancellation to happen—but now that it has, let's use it to our advantage. Let's use it to focus our own activities on making as strong a case as we can for the Tevatron, and getting the best damn physics we can out of the world's highest energy accelerator. After all, what else would we rather be doing?

Fermilab *Today* Launches Result of the Week

Fermilab's daily online news service, *Fermilab Today*, launched a new weekly feature on September 18—the Fermilab Result of the Week. Each Thursday, FT will bring readers a new scientific result from ongoing research at Fermilab. The inaugural story featured two results, one from CDF and one from DZero, both focusing on the fascinating search for extra dimensions beyond the familiar three of space and one of time. Future Thursdays will bring more forefront results from the collider collaborations as well as from neutrino experiments, astrophysics and accelerator physics research.

You can subscribe to Fermilab Today at www.fnal.gov/today/.





DZero: Particle Pairs and Monojets

The hypothesis of extra dimensions in space large enough to be detectable by existing or near-future experiments is by far the most revolutionary attempt to solve the hierarchy problem of the Standard Model. No wonder it has captured the public's imagination and inspired experimentalists around the world.

In 2000, DZero pioneered searches for extra dimensions at proton colliders by looking for anomalies in the production of pairs of electrons and photons due to the effects of gravitational interaction amplified by extra space. Two years later DZero was first to look for production of "monojets"—single remnants of a quark or a gluon recoiling against the invisible graviton disappearing in extra dimensions.

Now, with the higher energy of the Tevatron and more data, DZero continues the quest. In the new result unveiled at Lepton-Photon 2003, DZero has extended the search by looking for pairs of electrons, photons, and muons and set the most stringent limits on their existence to date.

While no evidence for extra space has been found so far, we plan to increase our sensitivity by another factor of two in the next three years.

CDF: The Bulk and The Brane

We may live in a world that has more than the usual four dimensions (one time dimension + 3 space dimensions) of our everyday experience. Indeed, one way to explain the peculiar properties of gravity is that the universe extends in 4+n dimensional space (the bulk) while we are trapped in the familiar 4 dimensional world (the brane).

Our web site illustrates a proton and antiproton colliding in the brane to send a graviton out of the brane, carrying away energy and momentum. We observe the "missing energy" signature of this escaping graviton (called a Kaluza-Klein particle), similar to the way the existence of neutrinos is inferred in collider experiments.

The result of our analysis is to constrain at 95% confidence level the value of the effective Planck Scale for 2,4, and 6 extra dimensions to be greater than 1 TeV, 0.77 TeV, and 0.71 TeV, respectively, the best result from a direct graviton emission search at the Tevatron.

Note that the Tevatron is now running at a higher energy (approximately 2 TeV) and that we will soon have many times the data sample analyzed here. This will make us sensitive to an effective Planck Scale as high as 1.5 TeV for two extra dimensions.

Shut Down

Photo by Fred Ullrich

The shims that will lift the Tevatron coils are about 100 microns thick.

COVER PHOTO:
A prism mounted inside the Tevatron tunnel reflects the light of a laser tracking system used by Fermilab surveyors.

by Kurt Riesselmann

When it comes to shutdowns of the accelerator complex at Fermilab, the definition of the American Heritage dictionary is quite misleading.

shut•down ***(shŭt′doun′) n.***
A cessation of operations or activity, as at a factory.

At Fermilab, shutdown time is the busiest time of the year. The most recent shutdown, which began September 8, is no exception. Far from cessation, more than 250 technicians, engineers, electricians, surveyors and other experts have been working in Fermilab's five accelerator tunnels since the machines were temporarily switched off during the first week of September. They are replacing magnets and adjusting coils. They are baking vacuum pipes and adding shielding. They are measuring coordinates and inserting shims. They are adding instrumentation and maintaining equipment.

For accelerators, shutdown time is the time of rejuvenation.

For the last couple of months Fermilab managers have met regularly to coordinate a large number of projects and activities. A group of about 40 people now meets three times a week to review the progress and to solve potential problems.

"The coordination is going really well," said Bob Mau, Head of Accelerator Operations and overall coordinator of the shutdown. "We have to share key resources, from equipment to manpower to space. Nobody wants to be left out."

The ten-week shutdown, scheduled to end at the middle of November, allows for the following projects to proceed:

ON THE WEB:

Fermilab Beams Division
www-bd.fnal.gov/

Proton Source Department
www-bd.fnal.gov/proton/proton.html

Main Injector Department
www-fmi.fnal.gov/

Tevatron Department
www-bdnew.fnal.gov/tevatron/

NuMI Project
www-numi.fnal.gov

For accelerators, shutdown time is the time of **rejuvenation**

Photo by Fred Ullrich

Wayne Schewe (left) provides some light while Matt Cullen is fastening a bolt after the insertion of shims in a Tevatron magnet.

TEVATRON: Giving magnet coils a lift

In 1983, the Tevatron saw the first particles whizzing through its 774 dipole magnets. Each magnet is six meters long, and a cleverly designed array of 36 bolts holds a coil of superconducting wire at the center of a liquid helium bath. In February, two groups of scientists independently found evidence that the coils—after twenty years of service—had slightly shifted.

"We observed a coupling between the vertical and horizontal magnetic fields that was ten times worse than expected," said Mike Syphers, head of the Accelerator Integration Department. "During a test, pure horizontal oscillations in the beam would quickly turn into pure vertical oscillations, something that couldn't be explained with standard alignment deviations."

Independently, Dave Harding and his group in the technical division suspected a systematic problem when they checked the support bolts of 18 magnets and compared the measurements to data sheets recorded in 1980.

"The placement of the superconducting coil relative to the iron frame is important," Harding explained. "We found that all coils had shifted in the same direction, by about five thousandth of an inch." The tiny shift explained the adverse coupling phenomenon observed by Syphers and his colleagues.

To fix the problem three crews of technicians from the Technical Division are spending the shutdown in the Tevatron tunnel. They will correct the coil positions by adding tiny shims, about 100 microns thick, to the support bolts.

"During the production of the magnets more than twenty years ago, we did this nearly a thousand times," Harding said. "We even have ten thousand shims left over from that time. But with the magnets installed in the tunnel, it is a big challenge to get to the bolts on the back side. Our technicians are essentially working blind-folded, hanging across the magnets."

Each team has practiced the task on an old magnet. Over the course of the shutdown the crews will fix 106 magnets.

Photos by Fred Ullrich

Chuck Wilson (left) and Mike O'Boyle working on the installation of TeV Net, the new surveying network in the Tevatron tunnel.

TEVATRON: Going for precision

The better you know a road, the easier it is to follow—especially when you travel close to the speed of light. Fermilab scientists need to know the exact location of magnets and other equipment to efficiently steer protons and antiprotons along the four-mile Tevatron accelerator ring. The slightest misalignment may cause a bumpy ride, leading to the loss of particles and hence the reduction of beam intensity.

Since the beginning of the lab, the Fermilab alignment group has helped scientists to provide particles with the smoothest ride possible. During the shutdown, the group will greatly improve their alignment capabilities by installing TeV Net, a new surveying network in the Tevatron tunnel.

"We plan to achieve a never-imagined accuracy," said Bob Bernstein, who leads the alignment group. "We expect the network to give us a precision of ten thousandths of an inch. We will be able to monitor whether the path in the tunnel shifts over time far better than we ever have before."

The network relies on 35 deep-rod monuments that reach more than 40 feet into the ground. Their locations are known to within 1.5 mm, using line-of-sight laser-ranging measurements and satellite-based GPS technology. Twenty-three people, including four technicians from the Particle Physics Division, three contractors and two surveyors from the Stanford Linear Accelerator Center, are working on transferring the precision coordinates from the monuments into the Tevatron tunnel, where they are installing a network of reference points. The surveyors are measuring the location of every Tevatron magnet and will use these measurements together with the network to improve the understanding of the Tevatron's particle road.

Glenda Adkins and Craig Bradford surveying the NuMI extraction point in the Main Injector tunnel.

NuMI: Building a beam line

The Neutrinos at the Main Injector group has spent the last three years excavating rock, pouring concrete and installing bare necessities like electricity and ventilation. Now the group is getting ready to install the first segments of a new beam line that will steer protons from the Main Injector accelerator to a target hall 150 feet underground. There the protons will slam into a graphite target and create large numbers of neutrinos for the Main Injector Neutrino Oscillation Search (MINOS) experiment.

"Among the first things to be installed are three Lambertson magnets," said Rich Andrews, who oversees the beam line installation. "These devices will divert protons from the Main Injector ring into the NuMI beam line."

The first stretch of the NuMI beam line will tightly fit between magnets of the existing Main Injector and the Recycler ring.

"There is a huge amount of infrastructure to work around," said Rick Ford, Andrews' deputy. "It's quite a challenge. On the order of 60 people will be involved in the underground work during the shutdown, including 20 ironworkers from a contractor. Our first task is to install a monorail for cranes that will then allow us to properly position the magnets."

The NuMI group aims to complete the installation of the major beam elements of the first 550 feet of the NuMI beam line before the end of the shutdown. Contractors supervised by lab personnel will install 29 magnets and survey workers will carry out an initial, rough alignment. Final alignment as well as the installation of the last NuMI beam line components will take place in 2004.

RECYCLER: The big bake-out

In 2004, scientists will integrate Fermilab's new storage ring for antiprotons, the Recycler, into the operations of its accelerator complex. During this shutdown, the Recycler group will take a significant step toward this goal by improving the vacuum inside the Recycler.

Water vapor inside beam pipes is one of the worst enemies of beam quality. As particles are racing through an accelerator ring, every encounter with a water molecule or other large obstacle diminishes the intensity of the beam. To combat the enemy, accelerator experts use sophisticated vacuum pumps to suck out as many impurities as possible. This, however, doesn't eliminate gas particles attached to the surfaces of vacuum pipes and pumps—particles that slowly diffuse into the vacuum. To remove the surface contamination, technicians heat vacuum equipment to about 250 degrees Fahrenheit and let it bake for several days.

Fermilab's two-mile Recycler ring consists of 27 vacuum sections, separated from each other by valves. With the help of technicians of the Technical Division and the Particle Physics Division, the Recycler group will bake out every section.

"We've divided the Recycler ring into six work areas," said Sergei Nagaitsev, head of the Recycler department. "Each area is assigned to a bake-out team of four people, led by a skilled vacuum technician."

The technicians use special heating tape, which is interlaced with electrical wire, to heat a set of pipes and vacuum pumps for four days in a row. Because the heating consumes a large amount of electrical power, only a few vacuum sections of the Recycler can be treated at a given time. The project will take ten weeks to complete, and it will determine the overall length of the shutdown.

BOOSTER: Protons to the max

The Booster is a crucial link in Fermilab's chain of accelerators. Many experiments—from CDF to DZero, from MiniBooNE to the Meson Test Facility, from the Antiproton Source to the future MINOS experiment—rely on an intense beam of 8-GeV protons that leaves the Booster. The demand for protons is so high that scientists would like to increase the number of protons that circle the Booster at a given time. The current shutdown provides the appropriate window of opportunity to make significant improvements.

In the coming weeks technicians will install—among other things—four new large-aperture magnets and a new collimation system. The new equipment should allow the Booster to handle higher beam intensities without increasing beam losses.

In addition, two new prototype radio-frequency (RF) accelerator cavities will be installed to test their viability for a possible future upgrade.

"The RF project is only possible because a large fraction of the machining was done at machine shops at a number of universities involved in the MiniBooNE and NuMI experiments," said Eric Prebys, head of the Proton Source Department. "This was an excellent example of successful collaboration between the lab and universities."

As with all other projects carried out during the shutdown, Prebys doesn't expect to see improvements on day one after the shutdown.

"The commissioning process will take some time," he said. "I'm estimating about two to three months until we take full advantage of all the improvements."

Contractors supervised by lab personnel are installing the first 29 magnets of the new NuMI beam line.

Only YOU Can Achieve a Safe Shutdown!

by Mike Perricone

One of the most recognizable advertising campaigns ever mounted has spent nearly 60 years pitching safety as an individual responsibility.

In 1944, Smokey the Bear began telling us: "Only YOU can prevent forest fires." While the environmental outlook of the message has evolved into a focus on wildfires instead of "forest fires," the key to prevention remains individual responsibility. Smokey's fuzzy-but-somber visage under the Forest Ranger hat continues to remind us that a single person, overlooking a single detail, or having a momentary lapse of attention, can cause a singular disaster.

During the lab's 10-week shutdown, that same safety message will bear constant repetition.

"No amount of structure or planning can serve as a substitute for people taking personal responsibility for their own safety, and for the safety of those around them," said Fermilab director Michael Witherell. "Much of what we're doing is emphasizing to people that they have the responsibility, and the authority, for creating a safe work environment."

"Responsibility" seems to be an accessible concept, but what about "authority?" "Authority" means an individual worker with a hammer or a wrench has the power—in fact, the duty—to stop a job if he or she has concerns about the safety of a job environment or procedure. Is it hard to convince people that they have that authority?

"No," Witherell said simply. "I think it's accepted now by everybody in the laboratory."

John Anderson, Senior Safety Officer in the Beams Division, works with those issues of responsibility and authority every day. He concurred with Witherell: the message has hit home.

"You might have had to convince people 10 years ago, but not any more," Anderson said. "I think we've instilled safety as a core value here at the lab. Safety is a line function, through the Integrated Safety Management programs, through hazard analyses, all those efforts that go toward pointing

ON THE WEB:

Beams Division–Environment, Safety and Health Department
www-bdnew.fnal.gov/esh

Smokey the Bear
www.smokeybear.com

Photo by Reidar Hahn

Getting together for a regular safety overview are (from left) Doug Moehs, Beams Division Proton Source, Barry Fritz, Beams Division ES&H, John Anderson, Beams Division Senior Safety Officer, Bob Mau, Head of Accelerator Operations, and Mike Gerardi, Beams Division Radiation Safety Officer.

out the safe environment we're trying to build for our employees. We want them to regard our department as a resource, not a police department They can come in, ask questions, and we'll help. If they need personal protective equipment, we'll research it, find it, and acquire it for them. People stop in continuously every day of the week."

For the message to reach the person on the line with impact, Anderson said it must start at the top and be relayed to each level with the same emphasis: from lab director to division and section heads and on to task leaders and individual workers. It's an especially important relay with people from all over the lab being assigned to shutdown tasks. Bill Griffing, head of the lab's Environment, Safety and Health department, has seen the communication process in action.

"When we're in a weekly scheduling meeting with division and section heads, Mike Witherell will stress coordination between groups during the shutdown, and stress the need to communicate early and often," Griffing said. "It helps a lot to have someone like [Particle Physics Division Head] John Cooper tell his people, 'you're working for somebody else now, so make sure you work safely, and if you're told to do anything that makes you uncomfortable, make sure you ask questions and don't just assume it's the safe way to do it.'"

Safety officers prepared a handout for tunnel workers stating the goal: "To complete all assigned tasks with no injuries. We will not use an urgent mission as an excuse for shortcutting safety. Help us continue our record of coordinating major accelerator upgrades with no injuries." To encourage communication, and questions, they included a list of contact people and phone numbers in ES&H. They included lists of protective equipment, and reminded workers that all material removed from any beam line must be surveyed for residual radiation.

Representatives of ES&H and of the Beams Division's Operations department meet twice weekly to go over work plans and emergency response procedures. Anderson said the same process is followed for a one-day shutdown—"there are just more pages in the worklists on a long shutdown." The lab conducted a three-week shutdown in January 2003 with no injuries, a performance everyone involved would like to repeat.

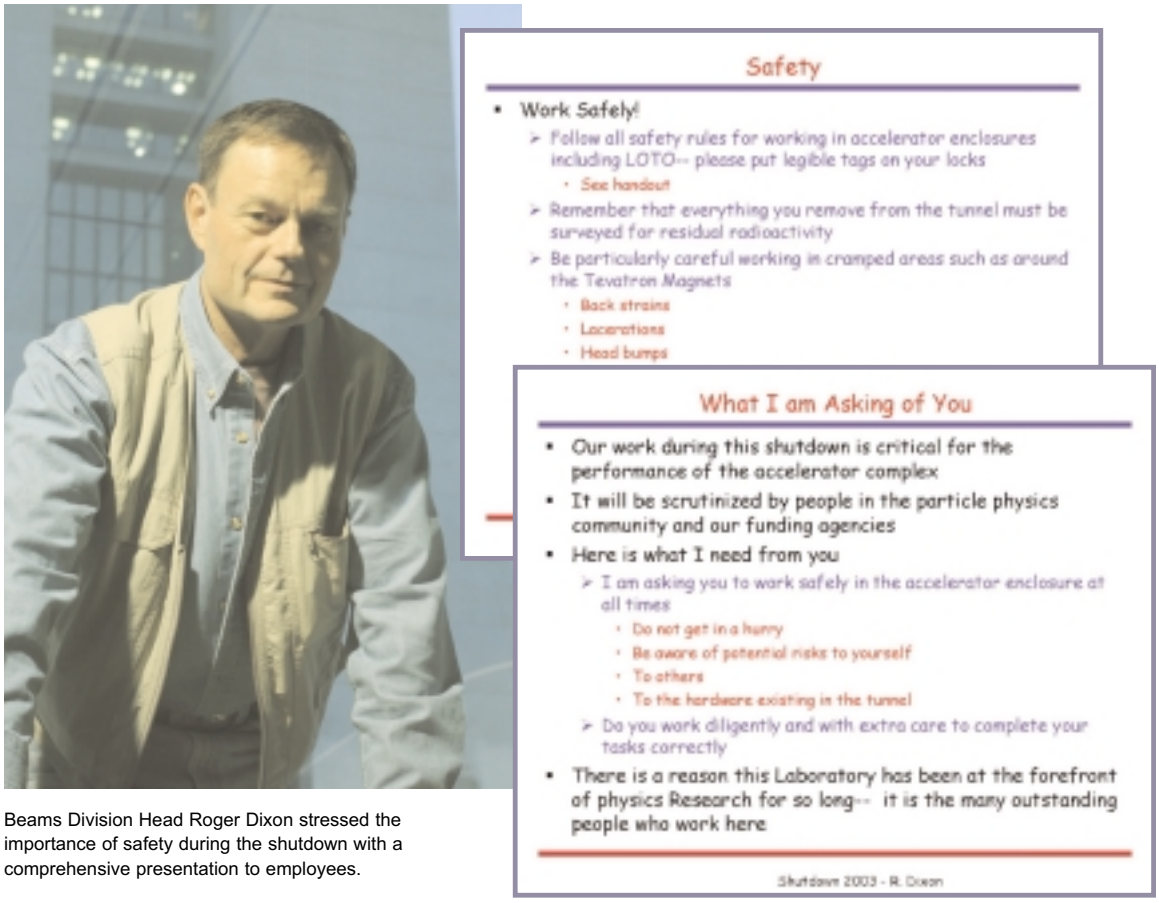


Photo by Reidar Hahn

Beams Division Head Roger Dixon stressed the importance of safety during the shutdown with a comprehensive presentation to employees.

"The shutdown presents a special challenge, because there are so many people doing work they don't usually do every day," Witherell said. "First, the tunnels are usually closed, so there isn't usually a lot of work done in them. Second, we have people from many other parts of the lab assigned to tasks in the tunnel. We want to make sure people are properly prepared and trained before the shutdown, to greatly reduce the potential risk of working at new jobs."

In fact, Anderson said the plans for the current shutdown began during the last shutdown: identifying tasks, assessing resources and staffing needs, and asking help from other divisions and sections. Task managers, project leaders or crew leaders submitted work lists of all the jobs planned during the shutdown. Anderson pointed to the preparation—of people and process—as the critical factor in January's injury-free shutdown.

"Job planning is truly one of the keys to doing work safely," he said. "Task managers will sit down and think about the work to be done. They'll talk with workers, planning how the job is to be done, and working through all the steps. They'll conduct a hazard analysis process to identify all the steps that are going to occur, identify all the safety issues associated with those steps, plan for proper safe conditions and identify the proper equipment for the task. Job planning is truly the key."

If job planning is the key to safety, attention to detail is the key to job planning. As Beams Division Radiation Safety Officer (RSO), Mike Gerardi is responsible for assessing and monitoring the radiological conditions in the division, and for implementing the controls necessary to comply with federal, state, and Fermilab regulations—and the lab regulations are the most stringent. No employee or contractor may receive more than 100 millirem of radiation in any week. Task managers are required to turn in weekly dosimeter reports for members of their work crew.

"A shutdown of this duration, utilizing such a large force of workers, can mean the accumulation of a significant collective dosage," Gerardi said. "As preparation, I'll review the work lists to determine the controls needed for all the proposed jobs, based on dose rates in the areas where the work is to be completed. Some jobs will require formal ALARA [As Low As Reasonably Achievable] Plans to minimize the absorbed doses of workers performing the tasks."

Photo by Fred Ullrich

In the Main Injector tunnel, Mike Petkus (left) of Beams Division, Mike Mascione of Particle Physics Division and a Taft subcontractor perform the hazard analysis for Lambertson magnet installation.

In this shutdown, the Booster collimator installation, the Linac Lambertson magnet replacement, and the exchanging of a four-magnet dipole string were earmarked for ALARA planning and continuous radiation safety coverage. Gerardi went through the list of radiation safety preparations for installing the Booster collimators:

■ Meetings with members of the Proton Source Department, Mechanical Support Department, ES&H Department, FESS, engineers, physicists, Operations, Alignment, Instrumentation, Controls as well as members of other divisions and sections, to discuss the logistics;

■ The meetings produced a detailed installation plan, which was used as a basis for developing a 40-step ALARA plan taking into consideration radiation rates in the areas, the number of personnel required for each step, and the duration of each step.

■ The installation plan included an estimate of the overall exposure necessary to complete the job.

■ The planners developed a continuous radiation safety coverage plan, installed temporary shielding, added dosimetry instruments and other special equipment, and worked to minimize the time required on individual tasks, all to aid in reducing the overall exposures.

"The level of detailed safety planning for a shutdown is really quite impressive," Witherell said.

"It's something that people outside the process—even people in the lab who are outside the process—can overlook."

But while the work is going on, Anderson said, somebody usually is looking.

"Safety officers typically tour work areas regularly," he said, "wandering through the enclosures looking at activity on a daily basis. Usually, a couple of times a week we'll have outside visitors. For example, representatives from the Department of Energy will go on tours with us, to look at work activities. Occasionally, we'll get a worker coming in who says something just doesn't seem right. When that happens, we'll go out and review things immediately."

Yet as Witherell pointed out, no amount of preparation can replace a personal sense of responsibility.

"We've tried to let everyone know that we believe we've given everyone all the necessary equipment to do their jobs in the tunnel safely," Anderson said. "But if they think they're missing something, or if they don't understand something, stop and ask. Because if something doesn't sound right, it probably isn't."

MOVING UP– And Around

For Dan Johnson, following the action is a Fermilab tradition

by Elizabeth Clements

In 1983, Bob Mau, Head of Accelerator Operations, wrote in a letter to Dan Johnson: "I would like to thank you for volunteering for a tour of duty with the Accelerator Operations group and commend you for the fine job you did while you were with us…I trust that as commissioning of the Saver progresses, you will take personal pride in each accomplishment, because you played a role in its success."

Photo by Fred Ullrich

"My job sometimes gets hectic and crazy, but it's fun," says Dan Johnson. "Sometimes things run like clockwork, and sometimes everything gets all messed up. There is always something changing, though, which is what I like about Operations so much."

At the time, Johnson was an Operator I in the Operations Group of the Research Division (now the Particle Physics Division). He is now the Deputy Head of Accelerator Operations, and 20 years later this letter is posted on a bulletin board in his office.

"I recently found this note that Bob Mau sent me in 1983 when I was first farmed out to help another group during a shutdown," Johnson said. "This was back when the Tevatron was being commissioned, and I was over to work shift with accelerator operators and install Main Ring correctors."

As the current shutdown again demonstrates, moving staffers to where they're most needed is an often-told story at Fermilab.

"Back when I hired into Neutrino Operations," Johnson said, "there were also Meson and Proton Beam Line Operations. During shutdowns, we would work for the support groups as a main manpower resource."

Johnson had just finished technical school in electronics when he left his home of New Castle, Pennsylvania on Mother's Day of 1981 to start as an Operator I in Beam Line Operations. He planned to stay at Fermilab for a few years, gain some experience and move on to something else. But his plans changed.

"The lab offers a great continuing education program, so after I was here for about a year, I went on to get a B.S. in Computer Science and then my M.S. in Computer Science. I got the B.S. degree while I was working rotating shifts, so it took a little longer than usual," said Johnson. "Twenty-some-odd years later, I'm still here, and to this day leaving home on Mother's Day is still a topic of discussion with my mother."

At that time, operators were designated as technicians, so Johnson was hired as a Technician I and became a Technician II in 1982. Meson, Neutrino, and Proton Operations were merged to form Research Division

ON THE WEB:

Fermilab Beams Division
www-bd.fnal.gov

Operations Department
www-bdnew.fnal.gov/operations

PROFILE IN PHYSICS

Operations in 1983. The title of Operator came about in 1984, in line with titles in Accelerator Operations. Johnson became an Operator II and an acting crew chief in 1984, and just kept on moving up. As Johnson's position evolved in Beam Line Operations, the physics at Fermilab was also going through a transition of its own.

"Once we weren't running fixed-target anymore, we had machine operators with nothing to operate," Johnson said. "That led us to go over to the collider facilities at CDF and DZero. But when they weren't running, our people had nothing to do. Money was tight and the accelerators got priority. It made sense to merge Beam Line Operations and Accelerator Operations into one group. It was just a natural progression."

Beam Line Operations and Beam Line Cryogenic Operations merged in 1992, and Beam Line Operations merged with Accelerator Operations in 1997. After the two groups became one, Johnson became deputy head of accelerator operations, joining associate head John Crawford and Bob Mau.

"The combining of the groups could not have been done without Dan," Mau said. "John, Dan and I determined very early on that the three of us would always need to speak as one voice. Dan was very instrumental in making things work."

Crawford, who divides the workload with Johnson, agrees with Mau. "Dan immediately fit right in here," he said. "To put it simply, I don't know how things could work much better."

Mau, Johnson and Crawford, who have all been working in Operations for twenty years or more, admit that staying in Operations this long is a rare thing.

"We have a fairly high turnover rate because of the shift work," said Mau. "While most people are sleeping or at home with their families or opening presents on Christmas day, our operators are here watching over the machines. But every night, when you come into work, there is something new. For an operator, you come in, and you have a plan, and the plan goes to hell. There is some excitement in that."

Johnson agrees that the constant daily change is his favorite part about working in Operations. "My job sometimes gets hectic and crazy, but it's fun," he said. "Sometimes things run like clockwork, and sometimes everything gets all messed up. There is always something changing, though, which is what I like about Operations so much."

During a shutdown, the pace slows for operators. Johnson explains that the pressures of running the Tevatron and other machines every day are gone, but operators are kept busy with such projects as writing software, building hardware, tunnel work, training, editing training manuals and helping groups across the lab.

"I think that it is nice when people get called in, and they can say that I got to help work on this project," Johnson said. "I still have the letter that Bob Mau sent me in 1983, so it must mean that there is some pride in helping things get done and making them a success."

But Mau, Johnson and Crawford all agree that the best of times is when the machines get turned back on.

"The real exciting time for Operations is when it is time to turn the machines back on after a shutdown," Johnson said. "It is really good to see the whole lab get together to work on something, just like we did in '83 when I was called to work on the Tevatron. Hopefully, we will follow up with letters that people can pull out twenty years from now, the way that I did."

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Highlights of Gilbert & Sullivan Opera a la Carte

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LUNCH WEDNESDAY, OCT. 1	LUNCH WEDNESDAY, OCT. 8	LUNCH WEDNESDAY, OCT. 15	LUNCH WEDNESDAY, OCT. 22	LUNCH WEDNESDAY, OCT. 29
Catfish Vera Cruz *Green Rice* *Jicama and Pepper Salad* *Baked Apples in Rum Sauce*	*Moroccan Salmon with Tomato Mint Relish* *Chive Cous Cous* *Almond Baklava*	*Cheese Fondue* *Salad of Field Greens* *Peaches with Raspberry Sauce*	*Chipolte Turkey Cutlets with Charred Corn Salsa* *Rice and Pigeon Peas* *Ice Cream with Spiced Fruit Compote*	*Northern Italian Lasagna* *Caesar Salad* *Orange Caramel Flan*
DINNER THURSDAY, OCT. 2	**DINNER THURSDAY, OCT. 9**	**DINNER THURSDAY, OCT. 16**	**DINNER THURSDAY, OCT. 23**	**DINNER THURSDAY, OCT. 30**
Shrimp Bisque *Quail in Wine Sauce* *Steamed Rice* *Vegetable of the Season* *Kirsch and Tart Cherry Souffle*	*Tortilla Soup* *Star Anise Pork Tenderloins* *Vegetable Medley* *Apple Strudel*	*BOOKED*	*Steamed Mussels with Lemon Saffron Sauce* *Veal Medallions with Morels* *Steamed Potatoes* *Vegetables of the Season* *Mocha Cake*	**Halloween Mystery Dinner** *Midnight Ghoul* *Skeleton Bones* *Frankenstein's Fingers* *Ghost Clouds with Dracula's Dream*

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