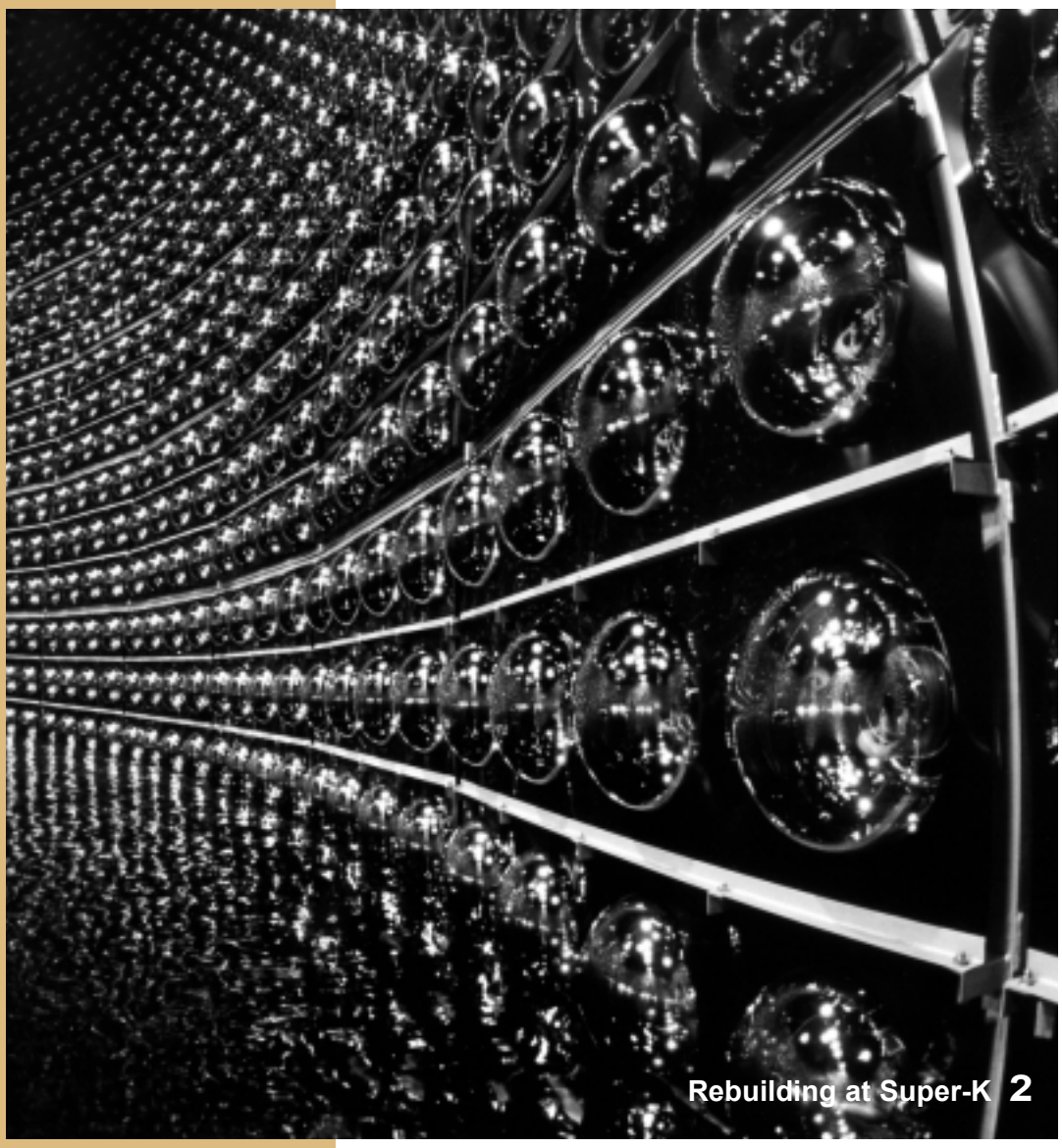
FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY



ICRR (Institute for Cosmic Ray Research), The University of Tokyo

Rebuilding at Super-K 2

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INSIDE:

Totsuka: 'We Will Rebuild the Detector' After Shattering Setback at Super-K

by Kurt Riesselmann

The implosion of thousands of light detectors inside the Super-Kamiokande experiment on November 12 rattled the particle physics community around the world.

The accident at the Kamioka Observatory, an underground laboratory in Kamioka, Japan dedicated to neutrino research, devastated more than half of the 11,146 photomultiplier tubes inside the cylindrical, 41-meter high Super-Kamiokande chamber. The destruction presents a major setback in unraveling the secrets of a ghost-like particle called the neutrino. The Super-Kamiokande collaboration, consisting of scientists from Japan and the U.S., made worldwide news when it announced evidence for neutrino mass in 1998.

"Super-K is the flagship of neutrino physics in the world," said Janet Conrad, a neutrino expert at Columbia University. "While there is a fleet of other neutrino experiments, this is the leading one."

Technicians had emptied the tank for cleaning and had replaced a few hundred photomultiplier tubes (PMT), each 22 inches in diameter. They were in the process of refilling the tank with 50,000 tons (13 million gallons) of purified water. The water level had reached the 41st of 51 rows of PMTs when almost all the tubes in the submerged rows—except for five rows directly below the surface—imploded, researchers at the facility told a newspaper.

"People in the nearby control room heard the terrible sound of the PMTs imploding clearly," said Jeffrey Wilkes, cospokesperson for the U.S. K2K collaboration. "About seven thousand PMTs were destroyed."

Conrad, who is cospokesperson for the new MiniBooNE neutrino experiment at Fermilab, linked the apparent chain reaction inside the Super-K tank to the large amount of energy released when a PMT surrounded by high-pressure water implodes. Once the exterior of a PMT collapses, water rushes in to fill the vacuum inside the tube. As streams of high-speed water collide, a powerful shockwave leaves the PMT, perhaps capable of turning debris into high-speed projectiles that can destroy adjacent tubes, causing a chain reaction. A Super-K scientist, familiar with underwater video footage taken after the incident, reported that the "storm" inside the tank had twisted metal components of the tubes and ripped chunks of plastic out of thick plates. The steel support structure, however, appeared largely unaffected and sound.

SUPER-K HISTORY

1990
Construction of Super-Kamiokande begins, creating detector with 50,000 tons of water and 11,146 PMTs

APRIL 1996
Super-K, a Japan-U.S. collaboration, begins taking cosmic ray data

JUNE 1998
Super-K creates headline news by reporting strong evidence for neutrino mass; President Clinton refers to Super-K in commencement address at MIT

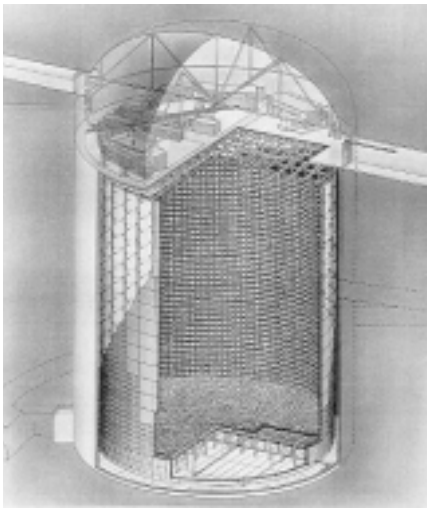
JANUARY 1999
Completion of neutrino beam line at KEK laboratory, 250km from Kamioka

MARCH 1999
K2K experiment, a Japan-Korea-U.S. collaboration, starts taking data, expects to operate until 2004

JUNE 1999
K2K celebrates: Super-K detector observes first neutrino generated at KEK

JULY 2001
K2K collaboration presents first significant data on neutrino-oscillations: 44 events observed compared to 64 expected

NOVEMBER 12, 2001
Thousands of photomultiplier tubes implode inside Super-K



During a scheduled upgrade, technicians replaced a few hundred defective photomulitplier tubes inside the Super-Kamiokande detector, which is 41 meters high and 39 meters in diameter. About 7,000 of the 11,146 PMTs were destroyed on November 12.

ICRR (Institute for Cosmic Ray Research), The University of Tokyo

At a press conference, Japan's Science Minister Atsuko Tohyama said, "we would like to do all we can do to make it possible for the research to be conducted as before the incident." Tohyama, who heads the Japanese agency funding the experiment, made it clear that the government would fully support financially the reconstruction of Super-Kamiokande.

Yoji Totsuka, director of the Kamioka Observatory, expressed his deep regrets to the Japanese, U.S. and Korean people who have generously supported the Super-Kamiokande experiment. But he showed confidence in the future of the experiment.

"We will rebuild the detector," he said. "There is no question."

Totsuka outlined a preliminary plan of recovery. Within a year he plans to resume the K2K experiment that, since 1999, has used the Super-K detector to study neutrino beams produced by accelerators at the KEK laboratory, 250 km east of Kamioka. To accomplish this goal, scientists would spread out the still functional PMTs and add 1,500 new ones to obtain a 20 percent coverage of the detector walls, half of the original capability.

"This is sufficient for experiments detecting high-energy neutrinos produced by powerful accelerators, like the K2K experiment," said Conrad. "To get good results for atmospheric and solar neutrinos you need more. There are lots of open questions that Super-K was working on."

According to Totsuka, it may take three years to refurbish the whole Super-K detector.

John Beacom, a Fermilab theorist specializing in neutrino physics research, emphasized the need to regain the capabilities of the K2K experiment.

"K2K was beginning to provide a first direct test of the atmospheric neutrino oscillation result obtained by Super-K," he said. "It is extremely important that they rebuild."

Only a few months ago, on July 10, the K2K collaboration had announced their first significant results on neutrino oscillations involving a man-made neutrino beam. Over a two-year period scientists recorded 44 muon neutrinos from the KEK accelerator compared to an expected number of 64. Physicists attributed the discrepancy between these numbers to neutrino oscillations, the transformation of some muon neutrinos into other types of neutrinos that cannot be detected by the Super-K detector. The existence of neutrino oscillations implies that neutrinos must have mass.

"As an experimental particle physics laboratory, Fermilab shares the pain at this great loss for our field," said Mike Shaevitz, associate director at Fermilab. "Super-K led the way to a new level of understanding. We offer our solidarity at this difficult moment and our hope and encouragement for the soonest possible recovery from this terrible setback."

On the Web:

K2K News
http://neutrino.kek.jp

About the K2K experiment:
http://neutrino.kek.jp/intro/k2k.html

The Kamioka Observatory
www-sk.icrr.u-tokyo.ac.jp

The KEK Laboratory
www.kek.jp

"But enough about **HIGH-ENERGY PHYSICS.**

Let's talk about YOU.

What do YOU think about **HIGH-ENERGY PHYSICS?"**

by Judy Jackson

As U.S. high-energy physicists chart the course for their future, they must first reach agreement among themselves on a road map to the revolutionary new physics that nearly all agree lies ahead. Although converging on a plan within their own ranks is no easy task, it is child's play compared to the next step: persuading the rest of the world that the scientific promise of twenty-first century particle physics is worth the cost.

Particle physics moves forward on technology that creates ever-higher energy; and, as the energy gets higher, the cost goes up. The tolls are high on the road to the future of particle physics. To turn their map into reality, therefore, particle physicists must successfully make the case for their science to many audiences, including federal funding agencies and Members of Congress. Moreover, they must do so in a world profoundly changed, since September's terrorist attacks, from the one they have known.

One key constituency that particle physicists must address as they plan for the future is not in Washington but much closer to home: their colleagues down the hall. Although high-energy physicists are sometimes accused of forgetting it, there *are* other fields of physics. Besides particle physics, university physics departments comprise a dynamic mix of experimentalists and theorists in fields from astrophysics to solid-state physics to optics. What are their views on high-energy physics? What do they think of its prospects? A recent visit to the physics department at the University of Michigan provided some eye-opening answers.

Roy Clarke

With 50 Fermilab experimenters, the University of Michigan in Ann Arbor fields the third-largest user group at the laboratory. Michigan physicists collaborate on both CDF and DZero, Fermilab's big collider experiments, and on MiniBooNE. Besides its depth in particle physics, the Michigan physics department has strong groups in solid state and condensed matter physics; astrophysics and atomic, molecular and optical physics. Last September, just as the new academic year was getting under way, four Michigan physicists *not* of the particle persuasion agreed to share their perspectives on high-energy physics. They didn't speak for the entire department, just for themselves. And Michigan is only one university—albeit an eminent one—among the nation's hundreds of research institutions.

Photo courtesy of the University of Michigan

The University of Michigan's Randall Laboratory, home to scientists from many fields of physics.

Obviously, the opinions of four scientists don't constitute any sort of physics community survey. Nevertheless, at a moment when U.S. particle physicists are preparing to come forward with a plan for the future, their views are enlightening.

Roy Clarke came to Michigan 20 years ago as part of a "first wave" of condensed-matter physicists, with a charter to build a strong solid-state physics effort in Ann Arbor. Today, he works on an experiment using intense x-rays from Argonne National Laboratory's Advanced Photon Source. Clarke, making a point that all four scientists mentioned, contrasted his 20-person experiment at the APS with huge particle physics experiments.

"In solid-state physics, the single investigator grant is the norm—a couple of post-docs and a principal investigator."

Roberto Merlin, a solid-state experimentalist who arrived in Ann Arbor at about the same time as Clarke, further emphasized this difference.

"I could not work in high-energy physics," Merlin said. "I am dismayed by the pack mentality. It is very different when I am an independent contractor, where I can do what I want to do. I can argue the science with my peers, as opposed to particle physics, where there is a mere handful of experiments and the options are limited."

Department Chair Ctirad Uher

Theorist Len Sander is a statistical physicist who works on diffusion-limited aggregation, which he described as the fundamental processes of condensed matter physics regarded as collective phenomena.

"More is different," Sander said. "The fundamental phenomena in particle physics are simple. But 'fundamental' is in the eye of the beholder. Collective phenomena are things where new phenomena arise when many particles are involved. It involves a different kind of reasoning and a different view of the world."

And in Sander's view of the world, the collective phenomenon of big particle physics experiments represents an extreme.

"What do YOU think…"

"They are about as far as you can go in that direction," Sander said. "It is not easy to distinguish one researcher from another in the big particle physics collaborations."

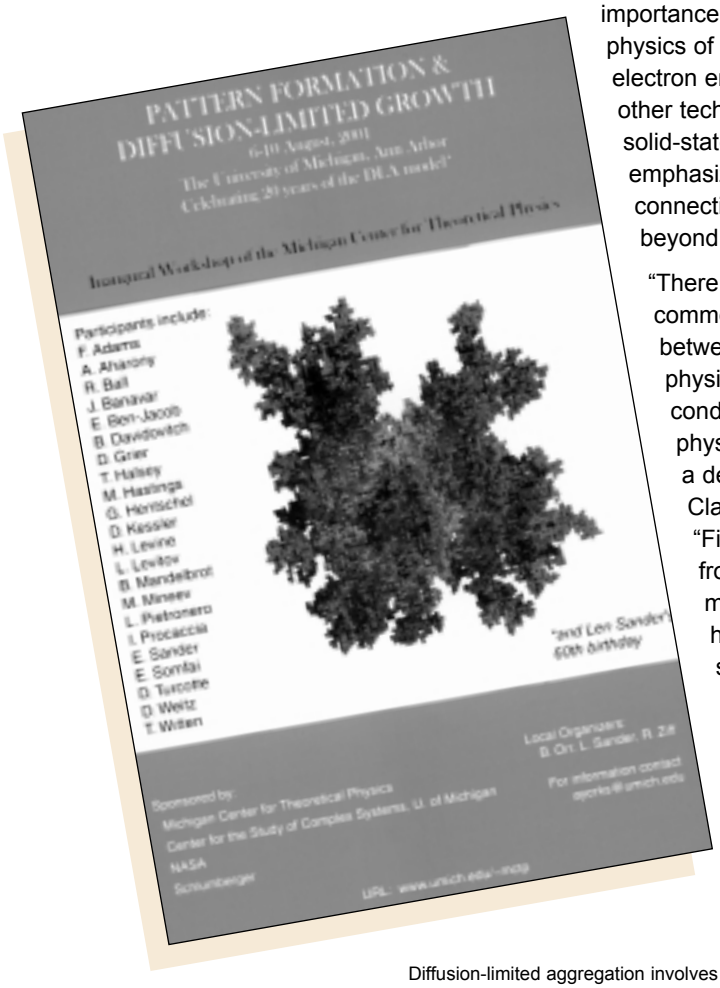
All the Michigan scientists pointed to the synergy of particle physics with other fields of physics.

"This department has embraced many areas," said Physics Department Chair Ctirad Uher. "We celebrate success in any area of physics. Interactions are always helpful."

All four gave credit to the critical contributions particle physics has made to their fields, noting as well that "it goes both ways."

Clarke cited the importance for particle physics of laser-induced electron emission and other techniques from solid-state physics, but emphasized that the connection goes far beyond technology.

"There is much common ground between particle physics and condensed matter physics at quite a deep level," Clarke said. "Field theories from condensed matter physics have had a significant impact on theoretical structures of particle physics."



Diffusion-limited aggregation involves "a different kind of reasoning and a different view of the world," from particle physics, said Michigan Theorist Len Sander.

But when it comes to connections among scientists, some Michigan physicists saw problems.

"The high-energy physics community is still not connected," Sanders said. "Although the younger people, the younger experimenters seem to be a different breed; they talk to colleagues in other fields of physics. You can relate to them as scientists. But the leadership is still the same."

Len Sander

Merlin agreed.

"Some younger high-energy people do come to condensed-matter seminars," he said. "There is a big difference between the young and the older generation."

When asked about their high-energy colleagues' hopes for the future, including the possibility of building a future accelerator, the Michigan physicists' message could not have been clearer. And, in case anyone was wondering, no, they have not forgotten the Superconducting Super Collider. Sander put it most bluntly.

Roberto Merlin

"I remember the SSC," Sander said. "You failed to attract the support of the rest of the physics community. There was a feeling of arrogance, of 'we don't need you.' You should have brought the condensed matter people into the plan.

"I am unhappy with the aggressiveness and the hyperbole of the high-energy physicists who were committed to their lobbying effort. If the SSC was not funded, the message went, it would be the end of particle physics in the U.S. Yet, today, particle physics seems just fine. When the dust settled, we learned that even other particle physicists had serious reservations that they kept to themselves."

As for how to do things differently this time, all four Michigan physicists had the same advice: Talk to your colleagues about the science you want to do.

"Once you start talking about a few billions," Merlin said, "you would be wise to spend time talking to

What the author lists reveal: The four authors, including University of Michigan physicist Roberto Merlin, of a paper on solid-state physics contrast with the hundreds on a particle physics experiment.

the rest of the field. It should be properly done, maybe through the National Academy of Sciences. It is unwise to turn off your fellow physicists."

It's not that they don't support high-energy physics; they do. Clarke decried the idea that support for one field of physics comes at the expense of others.

"In high-energy physics, as in every field," Clarke said, "we need to look at the scale and the science of a project and compare it with other projects that are being promoted. It is not true that funding that goes to one branch of science gets taken away from another. Internal sniping has never done any one any good, and it never will. Physicists spend too much time in their own labs and not enough time talking to other people."

Uher concurred.

"As long as funding goes to science," he said, "that's good.

But they do want to understand the science. The words of the Michigan department chair are likely to resonate for particle physicists in university departments and laboratories far beyond Ann Arbor.

"When the plan for the future of high-energy physics goes out to the general population," Uher said, "it should have community input. First the high-energy physicists should unite among themselves and come up with the right project. Then they should sell it to the rest of the science community. If the fundamental science is important, the scientific community will support it. Particle physicists have to articulate the project's benefits, to show how much it will advance science. Their task will be to excite intellectually their scientific colleagues. Without that, they will be dead in the water."

On the Web:

University of Michigan Physics Department
www.physics.lsa.umich.edu/nea/

Witherell: 'We will be able to do a lot' with FY02 budget

Lab Makes The Numbers Add Up

by Mike Perricone

House Speaker Dennis Hastert

In a time of national uncertainty, Fermilab's $307 million budget for FY2002 will offer these guarantees:

- a continual experimental run without long scheduled shutdowns for Collider Run II of the Tevatron;
- an abundance of new and long-awaited physics data;
- completing MiniBooNE construction within six months, as scheduled;
- full funding for NuMI this year, according to the project's new baseline;
- a good start on accelerator upgrades for the ongoing Tevatron run.

"We have a lot to get done," said Fermilab Director Michael Witherell. "But we can get all this done within this budget. And we'll start producing physics results that people have been anticipating for a long time."

Speaker J. Dennis Hastert, Jr. announced the lab's budget on Nov. 1, after the U.S. House of Representatives passed the Energy and Water Appropriations Act that had been adopted in the conference committee with the Senate.

"High-energy physics, and the work at Fermilab in particular, continues to enjoy strong support in Congress," said Hastert, whose 14th Congressional District in Illinois encompasses Fermilab. "As Speaker, I am committed in protecting the United States' leadership position in this field, and to maintain Fermilab's position as the world's pre-eminent high-energy physics laboratory."

The Fermilab appropriation represents an increase of approximately six percent from FY01 funding, compared to an increase of 0.6 percent in the area of High Energy Physics, and an increase of 2.1 percent in the Office of Science, within the Department of Energy. The presidential budget request had initially proposed a $25 million cut for the Office of Science, but the conference committee added $88 million to reach a new total of $3.018 billion. Within the Office of Science, the High-Energy Physics budget

House–Senate Conference on Department of Energy R&D in the FY 2002 Budget *(budget authority in millions of dollars)*

FY 2001 Estimate represents previous year's approximate actual expenditures: FY 2002 Request represents the original amount in the President's budget request; FY 2002 Conference represents the amount settled in negotiations by the House-Senate Conference Committee.

			Action by House-Senate Conference				
	FY 2001 Estimate	FY 2002 Request	**FY 2002 CONF.**	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
DOE Appropriations Containing R&D:							
1. Energy Supply R&D	409	284	**417**	133	46.8%	8	2.0%
2. Fossil Energy R&D	396	296	**406**	110	37.3%	10	2.6%
3. Energy Conservation	441	316	**454**	138	43.8%	14	3.1%
4. Science	2,955	2,930	**3,018**	88	3.0%	63	2.1%
5. Atomic Energy Defense Activities	3,499	3,542	**3,656**	114	3.2%	156	4.5%
6. Clean Coal Technology 1	0	0	**0**	0	- -	0	- -
7. Radioactive Waste Management	45	31	**31**	0	0.0%	-13	-29.9%
Total DOE R&D	7,744	7,399	**7,982**	583	7.9%	238	3.1%

	FY 2001 Estimate	FY 2002 Request	**FY 2002 CONF.**	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
4. Science							
High Energy Physics	702	706	**706**	0	0.0%	4	0.6%
Nuclear Physics	355	355	**355**	0	0.0%	0	0.0%
Fusion Energy Sciences	245	245	**245**	0	0.0%	0	0.1%
Basic Energy Sciences	984	997	**1,004**	7	0.7%	20	2.0%
(Spallation Neutron Source)	*278*	*291*	***291***	*0*	*0.0%*	*13*	*4.8%*
Adv. Scientific Computing Res.	166	163	**158**	-5	-3.1%	-8	-4.6%
Biological and Environmental Res.	481	442	**527**	86	19.4%	46	9.6%
Energy Research Analyses	1	1	**1**	0	0.0%	0	2.5%
Multiprogram Lab Support	22	22	**22**	0	0.0%	0	0.0%
TOTAL Science	2,955	2,930	**3,018**	88	3.0%	63	2.1%

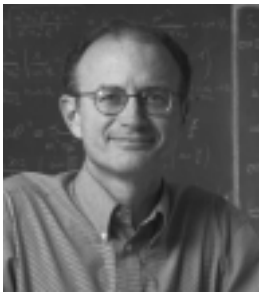
Funding charts courtesy of AAAS.

of $706 million was identical to the request, up $4 million from FY02.

Witherell emphasized that all the budget numbers must be viewed in the context of altered national priorities following the terrorist attacks of September 11. The conference on the Energy and Water bill took place after the attacks, and Witherell noted, "understandably, there had been a major change in Washington, D.C. that affected almost everything in the budget." He pointed out that the lab had done well despite cuts made in other areas of the DOE budget, crediting the high-visibility experimental program at the Tevatron. He estimated the lab could expect "the better part of a year" without long scheduled shutdowns in Collider Run II.

"Within this budget," Witherell said, "we will have lots of running time and we will generate lots of new data that people have been waiting for. The luminosity will be increasing steadily through this time. The detectors are getting ready to settle into a steady physics run. That's guaranteed. We can look forward to a lot in this time."

Beyond the guarantees for the Fermilab experiments, the larger perspective for the field and for the lab remains virtually unchanged from a year ago.



Michael Witherell

Witherell: 'We will be able to do a lot' with FY02 budget

"Unfortunately, the field of high-energy physics has lost ground to inflation in a year when it has many things to do," Witherell explained. "As a whole, the field of high-energy physics is going to have a difficult year."

Witherell further explained that the lab's budget would not cover all its plans, necessitating what he called "a hard look" at the way the lab would cover its commitments.

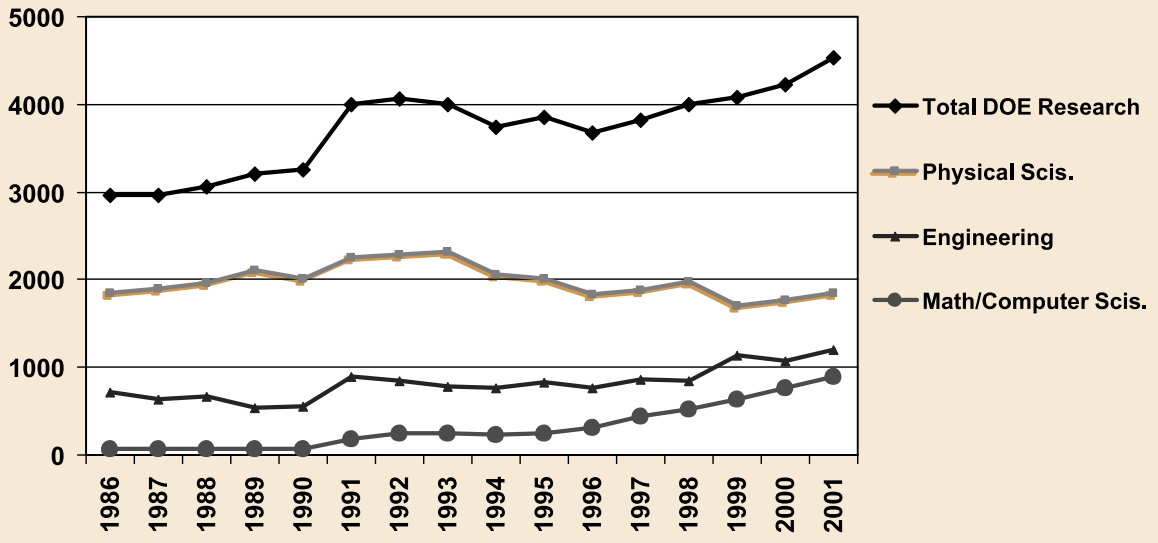
"We are giving the experiments guidelines on what funding is available," he said, "and asking them to adapt their needs to fit what's available."

For example, the CDF and DZero collider detectors have recently submitted their Technical Design Reports for their Run II detector upgrades, to the lab's Physics Advisory Committee. There is also a new Technical Review Committee for those upgrades, reporting directly to the Director. Chaired by Jim Pilcher of the University of Chicago, this "very good group of technical experts" will form a standing review body for the life of the project.

"They'll hold their first meeting in December, and that's when we'll take our first in-depth look at this challenge," Witherell said.

NuMI, the Neutrinos at the Main Injector project, was the subject of an in-depth look by the Lehman Review Committee in September. That review approved changes in the project required by cost increases and schedule delays. The re-baselining will incorporate some $30 million in increased costs and five months in construction delays. NuMI's funding level for FY02 is unchanged, but the new baselining will mandate increases in FY03 and FY04.

As a whole, the DOE budget increased by more than $1.7 billion in the conference committee, according to data compiled by the American Association for the Advancement of Science. The original request had made substantial cuts in areas of DOE research and development, including Energy Supply (-$25 million), Fossil Energy (-$100 million) and Energy Conservation (-$125 million). The conference committee restored all those cuts, and added modest increases for a total of $20.835 billion.



Source: National Science Foundation, SRS, *Federal Funds for Research and Development Historical Tables 1970--2001,* 2001.
Basic and applied research only. Development and R&D facilities are not classified by discipline. FY 2000 and 2001 data are preliminary.
OCT. '01 © 2001 AAAS

In HEP, the appropriation of $706 million continues the trend of “flat” funding in effect for more than 15 years. In constant FY01 dollars, according to AAAS figures, DOE research funds have increased by about 50 percent since 1985. However, the physical sciences have remained at virtually the same level over that time. When the FY01 budget was announced around this time a year ago, voices throughout HEP and the entire science community spoke of the need to do better in FY02 and in the following years.

Nobel Prize-winner Harold Varmus, president of Memorial Sloan-Kettering Cancer Center and former director of the National Institutes of Health, wrote a widely quoted Op-Ed piece in *The Washington Post* (Oct. 4, 2000) describing the importance of science and research to what was then a budget surplus. Varmus cited the need to increase research funding for the physical sciences as well as the biomedical sciences.

The times and funding conditions have changed immeasurably in the ensuing year, and Witherell acknowledged both the lab and the sciences must adapt.

“We will be able to do a lot with this funding,” he said. “A year from now, we’ll be seeing a lot of preliminary analysis of Fermilab data going on. The best way for us to make our case for funding in subsequent years is on the basis of experiments running successfully and getting results.”

On the Web:

U.S. Department of Energy
www.energy.gov

American Association for the Advancement of Science
www.aaas.org

Photo by Reidar Hahn

Particle physics collaborations numbering in the hundreds, such as Fermilab’s DZero experiment, have been eagerly awaiting data from Collider Run II of the Tevatron. One of their hopes is to see signs of the Higgs mechanism, shown in a three-dimensional computer simulation of a Higgs event from CDF Monte Carlo data.

AFTERGLOWS
The Hard Way

Fermilab scientists find the glow without the burst—a first

by Judy Jackson and Mike Perricone

Combining the newest of astronomical instruments with the most venerable techniques of patient attention to detail, scientists at the Department of Energy's Fermi National Accelerator Laboratory, the University of Chicago and other institutions believe they have made the first optical observation of a gamma ray burst afterglow unprompted by prior observation of the gamma ray burst itself-a so-called "orphan afterglow."

This unprompted observation has significance for astrophysicists because it helps them distinguish among competing models for the mechanism of these phenomenally powerful cosmic explosions.

"A gamma ray burst lasts for just seconds," said Fermilab astrophysicist and David N. Schramm Fellow John Beacom, a collaborator in the research. "But it produces an afterglow that lasts for a week or so, and that astronomers can see as a bright object in optical telescopes. The trick in seeing an afterglow comes in knowing where to look. All previously observed GRB afterglows have been found as follow-ups to observations from satellite-borne gamma ray detectors. Finding the glow without the burst is a first, and it's an important clue to how gamma ray bursts work."

Astrophysicists believe that gamma rays are emitted in two narrowly focused jets in opposite directions from the site of the GRB. But there are competing views on the directionality and extent of the afterglow. If the GRB jet were not pointing right at you, would you see its afterglow? Some models predict that the afterglow takes the same focused direction as the burst itself; others predict it might be isotropic, emitting light in all directions. The observation of an orphan afterglow supports the isotropic model, because now observers have seen the glow without first seeing the gamma rays themselves, meaning the gamma ray jets likely emerged in a different direction.

In a meticulous examination of data taken in 1999 and 2000 by the Sloan Digital Sky Survey, a project to create a three-dimensional map of the universe, the researchers located an object about 100 times brighter than the brightest known supernova. The object was associated with an otherwise normal galaxy about six billion light-years away. Based on its colors, the astronomers thought the bright object might be a quasar. But when they looked at data taken about a year later, they found that the brightness had faded by a factor of at least 10. Since quasars don't vary that much in brightness, the observers knew they had found something unusual, neither supernova nor quasar but a "highly luminous optical transient."

Photo by Reidar Hahn

They found the afterglow (from left): Jim Annis, Brian Lee, Brian Wilhite, Dan Vanden Berk, John Beacom.

"When we saw that it had faded so much, we knew it couldn't be a quasar," said Fermilab astrophysicist Dan Vanden Berk. "Another class of very bright objects whose luminosity varies is a gamma ray burst afterglow. When we calculated the object's luminosity from our knowledge of its distance, that was our first hint that we might be looking at a GRB afterglow."

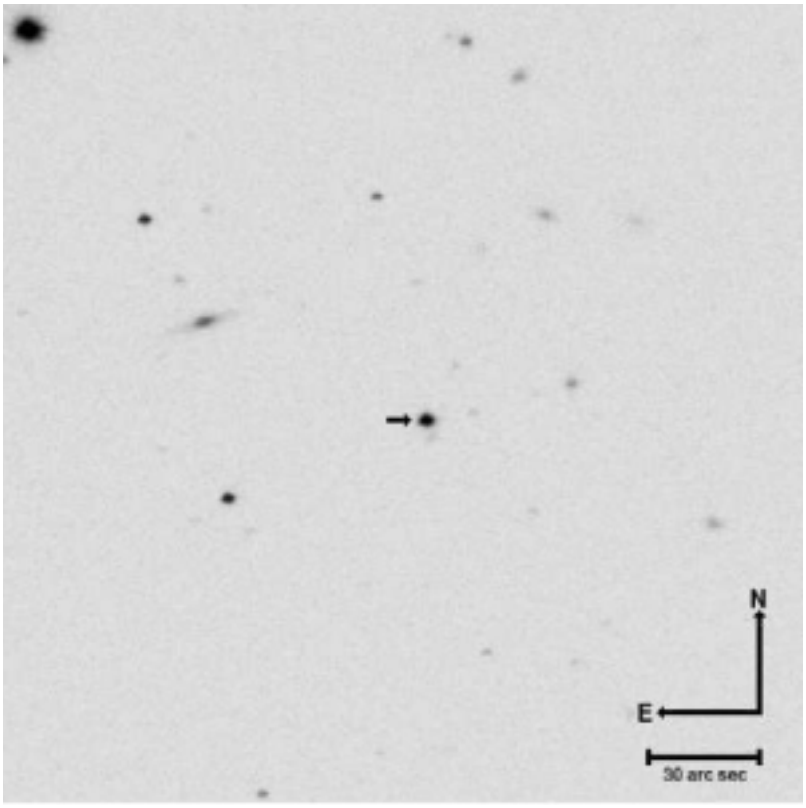
When the observers found that the pattern of intensity in the object's colors closely matched the typical pattern for a GRB afterglow, their conviction grew that they had indeed found an orphan afterglow.

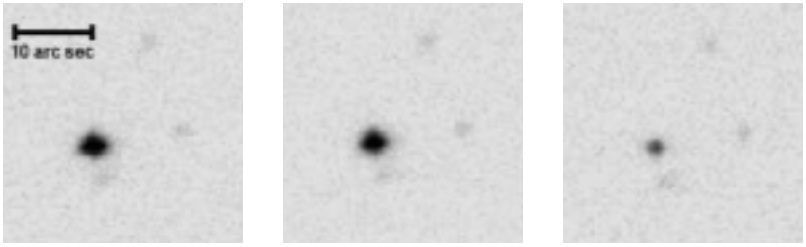
"All of these pieces-brightness, transience and characteristic colors-came together to spell 'afterglow,'" said Fermilab astrophysicist Kev Abazajian, a collaborator. "Other celestial objects have some of these characteristics, but a GRB afterglow combines all three."

Their observation was a marked departure from usual afterglow sightings. Although gamma ray bursts have been detected for more than 30 years, all the GRB afterglows on record have been prompted by gamma ray detection by satellites. When they detect a gamma ray burst, the satellites pass on the alert to ground-based astronomers, telling them when and where they should begin searching for the burst's optical afterglow. Even with the satellite prompting, afterglows are very hard to spot. Although astronomers have detected thousands of GRB's, only about 20 afterglows have been observed so far. Finding an orphan afterglow, one without a previously observed GRB, is much more difficult.

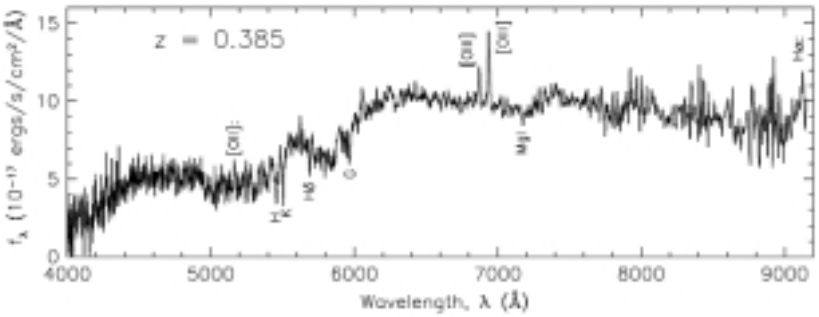
"Astronomers have searched for orphan afterglows for years," said Fermilab astrophysicist Brian Lee. "It took the capability of the Sloan Digital Sky Survey to give us a realistic chance of seeing one."

AFTERGLOWS





Above: Finder chart image containing the optical transient, SDSS J124602.54+011318.8, from 1999 March 20. Also shown are three magnified images from 1999 March 20, 1999 March 22, and 2000 May 5, respectively. In the first two magnified images, the optical transient dominates, and in the last, only the host galaxy can be seen. In these negative images, more luminous objects are darker and larger. Below: The spectrum of the host galaxy taken approximately one year after the optical transient. The results are typical of a normal galaxy at that redshift.



The SDSS is designed to peer deeply into wide swaths of the sky, compiling a definitive map of more than 100 million celestial objects, including galaxies and quasars. SDSS can gather images in five wavebands, analogous to photographic filters, to select interesting objects (such as quasars) for spectroscopic follow-up. The spectra reveal the identities and redshifts of celestial objects, the key to determining their distance from earth, and hence their brightness. The SDSS telescope's unique combination of features—its wide field of view, its reach in seeing faint objects, and its simultaneous images in five wavebands—enables it to discern luminosities in different colors and effectively screen out background images.

Even using the Sloan Data, finding the afterglow was a painstaking process. Vanden Berk, Lee, and astrophysicists James Annis of Fermilab and Brian Wilhite of the University of Chicago sifted through thousands of digital images taken in the course of more than a year of observations with the 2.5-meter SDSS telescope at Apache Point Observatory in New Mexico. They used a technique developed by Vanden Berk to winnow the data to manageable size by selecting for color and then looking for fading brightness.

University of Chicago astrophysicist Don Lamb, a collaborator, pointed out that SDSS has so far collected only a small fraction of the data it will ultimately amass, opening the possibility for identifying more orphan afterglow candidates, and thus shedding more light on gamma ray bursts.

"Gamma ray bursts are like bright beacons," Lamb said, "telling us that if we look in their direction we will learn something very interesting and important about cosmology and the universe."

The researchers have submitted their results for publication to The Astrophysical Journal. They also announced their results Wednesday, Nov. 7 at the Woods Hole 2001/Gamma Ray Burst and Afterglow Astronomy workshop in Woods Hole, Mass.

On the Web:

Abstract, preprint and accompanying images
www.arxiv.org/abs/astro-ph/0111054.

Sloan Digital Sky Survey
www.sdss.org

LETTERS TO THE EDITOR

To *FERMINEWS*:

I enjoyed your article about the introduction of Kerberos to Fermilab. One aspect of the story that you missed was the importance of Yolanda Valadez in implementing the plan of the Computing Division gurus like Matt Crawford. She's the one who gives everyone their cryptocards and helps them set up their passwords. She has enormous patience with all the users who come and say "I've lost my cryptocard" or "I have forgotten my password". It is sometimes amusing to see how much this Kerberos transition has brought the bright minds of Fermilab to their knees. Who picks them up? Yolanda. You could write a very nice human interest piece on her, alone. Another person who has been very helpful is Ann Heavey who has written a lot of the documentation and has given some of the presentations at the brown bags. She never got mentioned in the article. She has been a big help to Yolanda.

Liz Quigg

Yolanda Valadez

To *FERMINEWS*:

Hello and *Assalamu Alaikum*. In Karachi, I receive your newsletter every two weeks. I have found it great. In the recent issue, I liked the Q & A about particle physics. I also liked reading the special segment about Tim Toohig, the man of Science and Spirituality. I pray to Allah for your success and all the members of Fermilab.

Regards,
Suhail Yusuf
Karachi, Pakistan

CALENDAR

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

The Christmas Schooner

December 1, 2001
$17 ($9 ages 18 and under)

Experience the warmth, love, hardship and resilience of the Stossel family, German immigrants living in Chicago in the 19th century. This original musical tells the true story of a group of hardy souls who braved ferocious winter weather to deliver Christmas trees to the people of Chicago after the Great Chicago Fire. Hailed by the Chicago Tribune as "one of the best of the alternative family shows in the Chicago area," this production, filled with great music and dance, is perfect for the entire family.

Call 630-840-ARTS or visit the Web at: www.fnal.gov/culture

ONGOING
NALWO

Free English classes in the Users' Center for FNAL guests, visitors and their spouses. The schedule is: Monday and Friday, 9:30 a.m. - 11:00 a.m. Separate classes for both beginners and advanced students.

Lunch served from 11:30 a.m. to 1 p.m.
$10/person

Dinner served at 7 p.m.
$23/person

Chez Léon Menu

For reservations, call x4512
Cakes for Special Occasions
Dietary Restrictions
Contact Tita, x3524
http://www.fnal.gov/faw/events/menus.html

Lunch
Wednesday, November 28

Mexican Lasagna
Jicama and Pepper Salad with Lime Cilantro Vinaigrette
Roasted Banana and Pineapple with Vanilla Ice Cream

Dinner
Thursday, November 29

Ravioli with Sage Cream Sauce
Monkfish with Cognac Wine Sauce
Barley and Mushrooms
Oven Roasted Beets with Wilted Greens
Fresh Fruit Cake

Lunch
Wednesday, December 5

Dominican Luncheon
Ropa Vieja (Shredded Flank)
Arroz Blanco (White Rice)
Platanos Maduro (Plantains)
Ensalada Criolla (Salad)
Pudin de Pan con Salsa de Pasas al Ron (Bread Pudding with Rum Raisin Sauce)

Dinner
Thursday, December 6

Indian Spiced Phyllo
Smoked Salmon Napoleons
Grilled Rack of Lamb
Green Beans with Balsamic Glazed Onions
Celery Root and Potato Mash
Preserved Lemon Apricot Cake

FERMI NEWS

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The deadline for the Friday, December 14, 2001, issue is Tuesday, December 4, 2001. Please send classified ads 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

■ '97 Pontiac Grand Prix GT SE, 4 door, has every option except leather interior. 62K miles, 30K mile left on warranty. Excellent condition, white exterior w/gold trim, gray cloth interior, $13,500 Call Ed, X6300, home 630-665-6674, dijak@fnal.gov.

■ '95 Ford Aerostar 7 passenger van. Air, power windows, locks, AM/FM cassette. Full size spare. No rust. $6,000 o.b.o. call Bonnie x8056 or email alcorn@fnal.gov.

■ '93 Nissan Sentra XE, silver-grey, 2 door, 5 spd. 116k miles, 6 CD changer/cassette, cruise control, power-steering, flip-up roof. Runs great. $2,250 o.b.o. Call Onne at x2177 or 630-7530487, or email opeters@fnal.gov.

■ '93 Chrysler Concorde 61K miles, good condition $3000, Ronald Jedziniak x840-3101, jedziniak@fnal.gov

■ '89 Pontiac Grand Am LE Coupe, 2 dr., 110,796 miles, automatic, AC, cruise, AM-FM cass., flip up sun roof. Owned by mechanic - runs great. Perfect as a to-and-from-work car. $1,500 o.b.o. Sue x3876 or freund@fnal.gov

■ '89 Dodge Grand Caravan LE. 7-passenger minivan used as commuting van. Family thinks peeling paint is too ugly, but very reliable, secure car. Luxury Edition means lots of extras. Rear heat keeps you warm in winter. V6 3.3L engine with 160K miles. Asking $2,000. Call Dane at x4730 or dane@fnal.gov

■ Hedman Hedders for '67-'81 Pontiac Firebird or T/A, V8, new in the box, $75 o.b.o., call Ed X6300, 630-665-6674, or dijak@fnal.gov

■ Tires/wheels: set of four (4) Nitto NT450 225/45 ZR 17″ mounted and balanced on KMC Evolution 17x7 wheels. These will fit any 5-lug front wheel drive vehicle. 10K miles on tires, stored winters, includes locks & nuts, $1150, Call Ed X6300, home 630-665-6674, dijak@fnal.gov.

■ Room to rent in private home, laundry privileges, close to Fermi, man or woman. Call Sheila at 393-4473.

■ Furniture refinishing and restoration. Pick-up and delivery service available. Call 815-695-5460. Mary x3762.

■ Large two-bedroom/two-bathroom apartment in Naperville is currently available for only $750/month. Sub-lease time is flexible. You can contact Emanuela Barzi by email (barzi@fnal.gov) or phone (office: x3446, home: 4840)

■ Men's Seiko dress watch, navy blue dial, silvertone. Super thin sapphire crystal, date window, 5 year battery, water resistant, extra links. Cosmetically perfect, worn twice. Almost two years left on three year warranty. Retail $300, will sell for $175. Have receipt, case, box and all tags. x8232 or jhuite@fnal.gov on M,T,W, or 630-892-7865 rest of the week.

■ Playstation 2 controllers games, excellent condition $100 for all cullen@fnal.gov x3211.

■ Hoosier cabinet by Sellers circa 1920, all original etched glass panel upper doors and hardware. Roll-up door over spice rack w. original jars, white porcelain retracting work top, tin bread-box drawer, working 50# flour bin/sifter. Excellent cond., $1,000 firm. Breakfast/dining set. Willet solid golden maple hutch, drop leaf oval table (seats 6-8 when leaves up) w. pads and 4 chairs, from Lancaster PA. Must see to appreciate $975. Matching dough box stand $75. Quilt, machine-pieced blue & wht. log cabin, hand tied, restored filling, full-size circa 1940 w. the original backing and front. Wonderful Christmas or wedding gift, $250. 26″ Raleigh women's 5sp. Bike w. speedometer and 26″ Schwinn 3sp. men's bike, both w. baskets, bottle holders, racks, lightly used by seniors asking $125 ea. Toro snow blower, electric, light weight, like new, $60. All the above privately owned, no dealer. Furniture pictures posted at WH1W. Call 630-554-0119 for appt. to see.

■ TV stand, wood, drawer & shelf [pegs missing for shelf] $25 o.b.o., file cabinet, metal, 2-drawer, black/brown, no key for lock, $15 o.b.o., drink stand/end table, wood, $15 o.b.o., dumbbells, metal, 10-lb pair & 5-lb pair, $5/pair o.b.o., pancho, Southwestern pattern, soft material, $10 o.b.o., area rug, black/white/gray, about 8ftx5ft, $20 o.b.o., computer monitor, 15in, $40 o.b.o., keyboard & mouse, PC, $15 o.b.o., Fisher stereo system, receiver w/equalizer, CD player [newer than original system], dual-tape deck [groans, but sounds ok], 1ft pair of speakers, 4ft pair of speakers, $85 o.b.o., digital photos of items available upon request. mclayton@fnal.gov

■ Sewing machine w/ 4-drawer desk, Brother Pacesetter model XL711 (c. 1972). Needs oiling. Includes many spools of thread, bobbins, needles, and more (sorry no instruction booklet), $75. Yellow wave slide for child's play fort, used, $10. Contact Bob x4700, brooker@fnal.gov.

WANTED

■ Babysitter wanted: I am looking for a part-time (a few evenings per month) babysitter for a very smart and cute 3-month old boy in Batavia. You can contact Emanuela Barzi by email barzi@fnal.gov or x3446, home 4840.

OLD FASHIONED CHRISTMAS TREE HUNT

■ Marion Abbey, Batavia. Beginning November 23, the day after Thanksgiving jolly tree hunters are welcome to come and chop down their very own Christmas tree. Open everyday including Sunday from 9:00 a.m. to dusk. Tree prices $20, $25, and $30. For more information please call 630- 897-3011 for a recorded message.

MILESTONES

APPOINTED

■ Christopher W. Leeman, as Director of the Department of Energy's Thomas Jefferson National Accelerator Facility.

HONORED

■ Fermilab physicists Peter Limon and Bill Foster, with Employee Performance Recognition Awards, for their work on the design report for a Very Large Hadron Collider.

ELECTED

■ Benn Tannenbaum, CDF collaborator from UCLA, as chair of the Fermilab Users Executive Committee.

RETIRING

■ William Williams, ID 1623, PPD-Electrical Engineering Dept., December 31.

LABNOTES

Barn Dances Move Off Site

Due to limited public access onto the Fermilab site, the Barn Dances have moved to the Warrenville Community Building, 3S240 Warren Road. The Dances are held on the second Sunday evening of each month from September through June at 6:30 PM, and on the third Sunday afternoon of each month from November through April at 2:00 PM. For more information, including a map and driving instructions to the new location, see our Web page at http://www.fnal.gov/orgs/folkclub or contact Dave Harding (x2971, harding@fnal.gov) or Lynn Garren (x2061, garren@fnal.gov).

FNALU Strong Authentication Reminder

On Tuesday, December 4, the FNALU cluster will be converted to strong authentication "strong mode". On that day, access will be restricted to Kerberos or CRYPTOCard authentication. Non-Kerberos authenticated ssh access with an AFS password will no longer be permitted. Please see http://www.fnal.gov/docs/strongauth/misc/fnalukerberos.html for more information.

Accident

To the person that ran into my parked red Subaru on 10/30, please contact me at swang@sdss.fnal.gov or (630)942-0853. I know you were in a hurry. I also have faith that you'll do the right thing and contact me. Shu-I Wang.

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