FERMI NEWS

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Main Injector **2**

Photo by Reidar Hahn

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INSIDE:

A Banner Day ★ for the ★ Main Injector

by Mike Perricone

U.S. Secretary of Energy Bill Richardson welcomed Fermilab's newly-completed Main Injector as a national prize, but he also held it up as an international example.

"The key to the success of this project is international collaboration. It would be a shame to stop that," he proclaimed, countering the calls in Congress for limiting international access to the Department of Energy's national laboratories.

"There are some who are proposing," Richardson said, "that, in the name of national security, we should restrict our ability to attract the world's finest scientists to our laboratories. This would be unwise, and we will fight it all the way."

Richardson shared the podium with fellow guest speakers Dennis Hastert, Speaker of the U.S. House of Representatives, and George Ryan, Governor of Illinois, at the June 1 ceremonies for the dedication of the $260 million accelerator, a seven-year project that was completed on time and under budget.

Culminating the dedication ceremonies, Richardson and Hastert shared the duties of formally placing the Main Injector in operation under the guidance of Steve Holmes, Project Manager for the Main Injector since its inception. Richardson and Hastert each turned a ceremonial key at a special podium on stage, engaging the safety system in the tunnel. Then each in turn pushed a key on a computer, displaying the introduction of beam into the Main Injector, its acceleration to 120 GeV (billion electron volts) for antiproton production, and its acceleration for 120-GeV fixed-target operations.

The day's follow-up festivities were replete with the Batavia High School marching band, and a Lab-wide picnic held that afternoon outside Wilson Hall and in the building's banner-bedecked atrium—with Richardson sharing in a hot dog and hamburger lunch and talking baseball with an impromptu cross-section of Lab employees, as well as conferring with Lab officials and dignitaries.

Hastert, who represents the 14th Congressional District of Illinois where the Lab is located, said the Main Injector "ensures that Fermilab is THE place in the world to conduct high-energy physics." Richardson emphasized that the Main Injector "will provide scientists the tool that opens new thresholds of discovery in the physics of elementary particles."

Richardson said that DOE would tighten security at some national laboratories and dismiss some personnel over the allegations of passing classified information to China. But he used the Ramsey Auditorium stage as a pulpit for preaching the value of the international exchange of ideas and knowledge. He also preached the economic benefits of international collaboration.

Cover photo: Secretary of Energy Bill Richardson (left) and Speaker of the U.S. House of Representatives Dennis Hastert (right) turn the keys to prepare the Main Injector for beam. Directing the process is Steve Holmes, Fermilab's Main Injector Project Manager.

Richardson champions INTERNATIONAL SCIENCE at the DEDICATION of the $260 MILLION ACCELERATOR.

Photos by Reidar Hahn

▲ Director-designate Mike Witherell (left) and Secretary Bill Richardson look forward to the dedication ceremonies.

▲ Fermilab Director John Peoples (right) escorts Speaker Hastert into Wilson Hall.

"One of the reasons this project was brought in on time was because its commissioning was so short," Richardson said. "The final engineering phase of a machine this large and this powerful is an art. It was expected to take up to a year. But under Dr. Shekhar Mishra—of India—the commissioning team completed its work in two months, saving millions of dollars. That is remarkable. Dr. Mishra, thank you."

Richardson emphasized that there were no security problems at Fermilab, which conducts no classified research. He noted that roughly half of Fermilab's 2,700 researchers come from 20 different countries, including Russia, China, India, Israel, Taiwan and the Ukraine.

"At a time when some may question the value of scientists from other countries and the ways they benefit America," he continued, "I say let them visit Fermilab, and meet Dr. Mishra; and meet the head of our Computing Division (Mattias Kasemann), who is German; and the head of Theory (Keith Ellis), who is British. The great scientist Isaac Newton understood that the laws of physics should be universal. They are equally valid here in Illinois as they are in Europe, in Asia, and on the moon. The human drive to understand the basis of all matter, and the fate of our cosmos, is universal."

▲ Secretary Richardson said those who doubt the importance of international contributions to science should "come to Fermilab and meet Dr. Shekhar Mishra," the Main Injector commissioning chief.

Photo by Jenny Mullins

▶ Project Manager Steve Holmes and Illinois Governor George Ryan enjoy a light moment with Universities Research Association President Fred Bernthal (right) in the Atrium Main Injector display.

Richardson's comments were welcomed by the internationally-diverse audience of nearly 800 Fermilab staffers in Ramsey Auditorium. Also welcomed were the comments of Gov. Ryan, who invited the Secretary to return any time, "and if you want to bring more money, that's even better."

We needed to have **FERMILAB** working on something positive, to bring the **best people** and the **best minds** here, to give Fermilab a **FUTURE**.

The recently-elected Ryan announced the formation of an Internet-based "clearinghouse" that he hopes will help Illinois improve its share of federal tax dollars. Businesses and local governments can use the Web site (http://www.state.il.us/fedclear/) to learn about federal grants and how to become suppliers of goods and services to the federal government.

"For too many years," Ryan said, "Illinois has struggled to receive our share of federal money."

Fermilab Director John Peoples pointed out that a $2.2 million challenge grant from the State of Illinois gave the Main Injector a jump-start in 1991, allowing the Lab to begin the preliminary design process.

Hastert's involvement with Fermilab goes back to his earliest days in Congress, and his connection to the Main Injector stems from the aftermath of a major science project that Fermilab and Illinois lost—the Superconducting Super Collider, which was eventually discontinued and dismantled by Congress when costs rose from an estimated $5.9 billion to more than $10 billion.

But when Texas was chosen as the site for the SSC in 1989, "the future for Fermilab looked pretty bleak," Hastert recalled.

That prompted a series of meetings, and the growth of a close collaboration, between Hastert and Peoples, to formulate a plan for Fermilab's future, a future that soon came to hinge on the construction of the Main Injector. The proposed accelerator would greatly increase the number of proton-antiproton collisions in the Tevatron, clearing a path for new discoveries at the world's highest-energy particle accelerator. The Main Injector would also allow Fermilab to run the Tevatron concurrently with fixed-target experiments, which its predecessor, the Main Ring, was unable to do.

Hastert and Peoples began a concerted joint effort to bring the message to the Bush Administration in Washington, D.C., beginning with the Office of Management and Budget. Hastert wanted a new project for the national laboratory in his district, and knew the importance of making that project part of what he called "the jargon of Congress."

"We needed to have Fermilab working on something positive, to bring the best people and the best minds here, to give Fermilab a future," Hastert said. "Ironically, the SSC kind of faded away. It was so big, it was taking up so much funding, that no other science was taking place. And ironically, one of the goals of the SSC was to discover the top quark—I asked John Peoples to sit down and explain it to me, and I can tell you, it took some explaining, because I only got a C+ in physics. But lo and behold, the top quark was discovered here (in 1995) long before it was supposed to be discovered in Texas."

When ground was broken in 1993 for the Main Injector project, Hastert handled one of the shovels.

"In early 1990s, a young Congressman from the 14th District of Illinois took up the cause of the Main Injector at Fermilab, and he has never let it go," Peoples said.

Peoples recalled that an original project of the Lab, construction of the 400 GeV accelerator, was also completed on time and on budget, and in fact "gave the taxpayers something extra." The finished accelerator doubled the original design specification of 200 GeV. The Main Injector followed that tradition of giving something extra:

Photos by Reidar Hahn

also completed within the original budget and schedule is a companion accelerator, the Antiproton Recycler, which will greatly aid the Lab's creation of costly antimatter for collisions in the Tevatron.

The Main Injector project has virtually spanned the directorship of Peoples, who hands over leadership of the Lab to Mike Witherell on July 1. Though stepping down as director, Peoples will remain active at the Lab as chief executive officer of the Sloan Digital Sky Survey. Each of the guest speakers lauded his work.

"I want to say something about John Peoples," Richardson said, "not just the accomplishment of building the Main Injector on budget and on time, but for the work John has done for his country and for science. We know he's stepping down but not leaving, that he has plans for the future in astrophysics. But today, John, the nation honors you."

Peoples was given a standing ovation. Yet while he was honored for his past work, Peoples had his eye on the future from the start of the day's activities. As he introduced the program, the Director noticed a newspaper photographer working near the foot of the stage with an infant strapped onto his back.

"We welcome our honored guests," Peoples said, pausing and addressing the baby, "of all ages. We need physicists for the future, so keep at it!"

Photo by Jenny Mullins

For the day's celebration, the Wilson Hall Atrium was transformed into a giant picnic for a Laboratory-wide party that lasted through the afternoon. The Batavia High School marching band provided an energetic start, and employees gathered at picnic tables outdoors as well as in the Atrium. Also enjoying the picnic fare were (left to right) Mishra, Witherell and Richardson.

ONLY CONNECT

PARTICLE PHYSICS AND ASTROPHYSICS MAY STAND AT OPPOSITE ENDS OF THE UNIVERSE, BUT RESEARCH SHOWS THEM INEXTRICABLY LINKED.

by Sharon Butler

Fifteen years ago, in 1984, when Fermilab held its first Inner Space-Outer Space conference, scientists were just beginning to explore the interface between particle physics and cosmology. As they tugged at the internal structure of the atom, to paraphrase explorer John Muir, they discovered that it was hitched to the other end of the universe.

"That conference was a 'coming out' party for the field," said Rocky Kolb, deputy head of the Theoretical Astrophysics Group at Fermilab,

Last month, Inner Space-Outer Space II took place, filling Fermilab's main auditorium again with nuclear, high-energy, low-temperature and cosmic-ray physicists; with cosmologists and astronomers; and with senior officials from the National Aeronautics and Space Administration, the U.S. Department of Energy, and the National Science Foundation, the federal agencies that fund the scientists' research.

Fifteen years after the first conference, said Kolb, the interdisciplinary field of particle physics and cosmology is now "perhaps not matronly, but at least mature."

As Director Emeritus Leon Lederman put it in his book *The God Particle*, particle physics and astrophysics "have been fused to a new level of intimacy."

The conference was held in honor of David Schramm, an eminent cosmologist and theoretical astrophysicist who died in a plane crash two years ago. As the program for the conference noted, Schramm's research covered many topics in theoretical astrophysics and cosmology and "was always daring and original, and often ahead of its time." Perhaps his most stunning work was a prediction from cosmology of the number of families of fundamental particles—work that was instrumental in unifying the fields of cosmology and elementary particle physics.

The four days of meetings made clear that times have changed since 1984. The COBE satellite has discovered tiny fluctuations in the microwave background radiation, evidence of irregularities in the distribution of matter left over from particle interactions in the earliest moments after the Big Bang. Sky surveys have probed even farther into the basement of time, capturing stars as distant as a redshift of 5. Inflation theory was just in its infancy in 1984, having been proposed just three years earlier; now it is the standard cosmological model.

Mysteries remain, however, and were the subject of plenary talks, parallel sessions, and breaktime discussions over pastry and coffee. No one yet knows, for instance, what dark matter is. Scientists are certain it exists: they see the distortions in the orbits of stars that only the gravitational pull of some invisible mass could explain. But the nature of dark matter remains a puzzle.

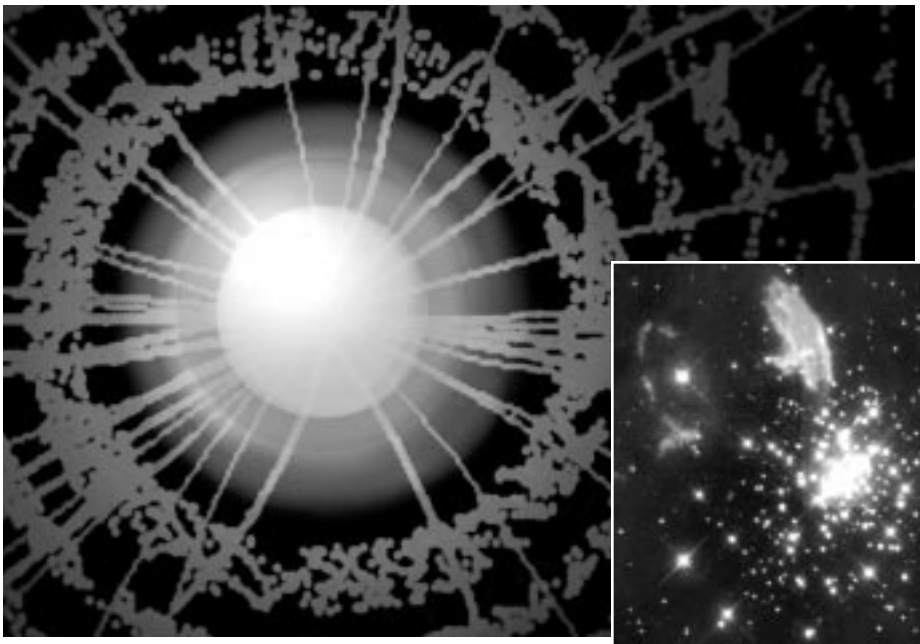
Keith Olive, *University of Minnesota*

Craig Hogan, *University of Washington*

Roberto Peccei,
University of California, Los Angeles

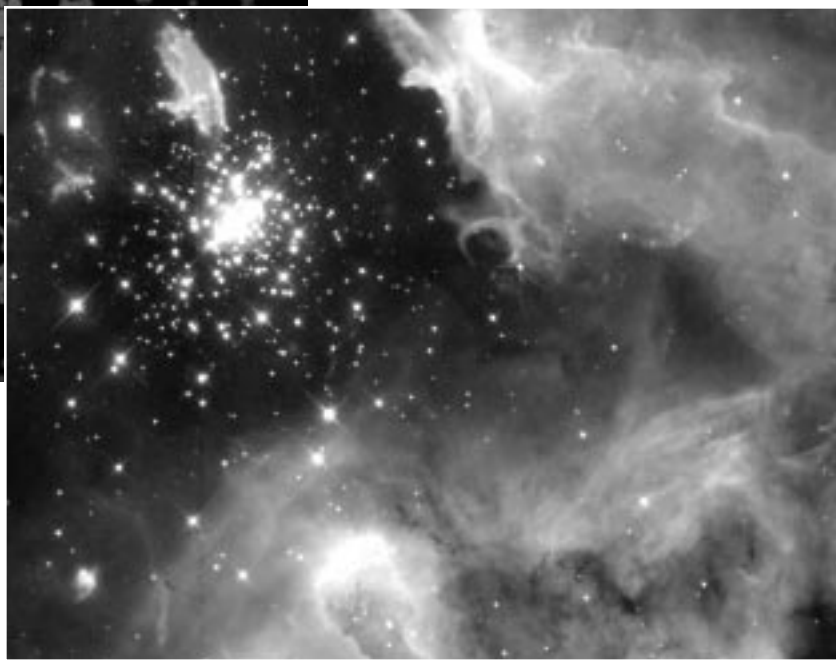
INNER SPACE ...

Artist's rendition of the electronic signature of a proton-antiproton collision, with particle tracks emerging from the center of the collision.



OUTER SPACE ...

The giant galactic nebula NGC 3603.



Is it made up of WIMPS (weakly interacting massive particles)? Or neutrinos? Or maybe supersymmetric particles? Bedeviled by such questions, astronomers are as eager as particle physicists for Fermilab's Run II to begin—the next run of the Tevatron accelerator, at still higher luminosity. If the much-theorized-about supersymmetric particles are found, and their masses calculated, astronomers could determine whether they might be hefty enough to account for dark matter, or at least some part of it.

Findings in astronomy also spur research in particle physics. Recent studies of supernovae have demonstrated that the expansion of the universe is not slowing down, as everyone expected it eventually would; it is, instead, speeding up. The observations have set theorists in particle physics to work on the "missing energy," or the cosmological constant (the "cosmo-illogical constant," as Kolb irreverently calls it), to try to account for this acceleration.

What hasn't changed since 1984, then, is the conviction that particle physics and astronomy are inextricably linked, and that discoveries in one advance the frontiers of the other.

John Ellis, *CERN*

Photos by Reidar Hahn

Joe Lykken, *Fermilab*

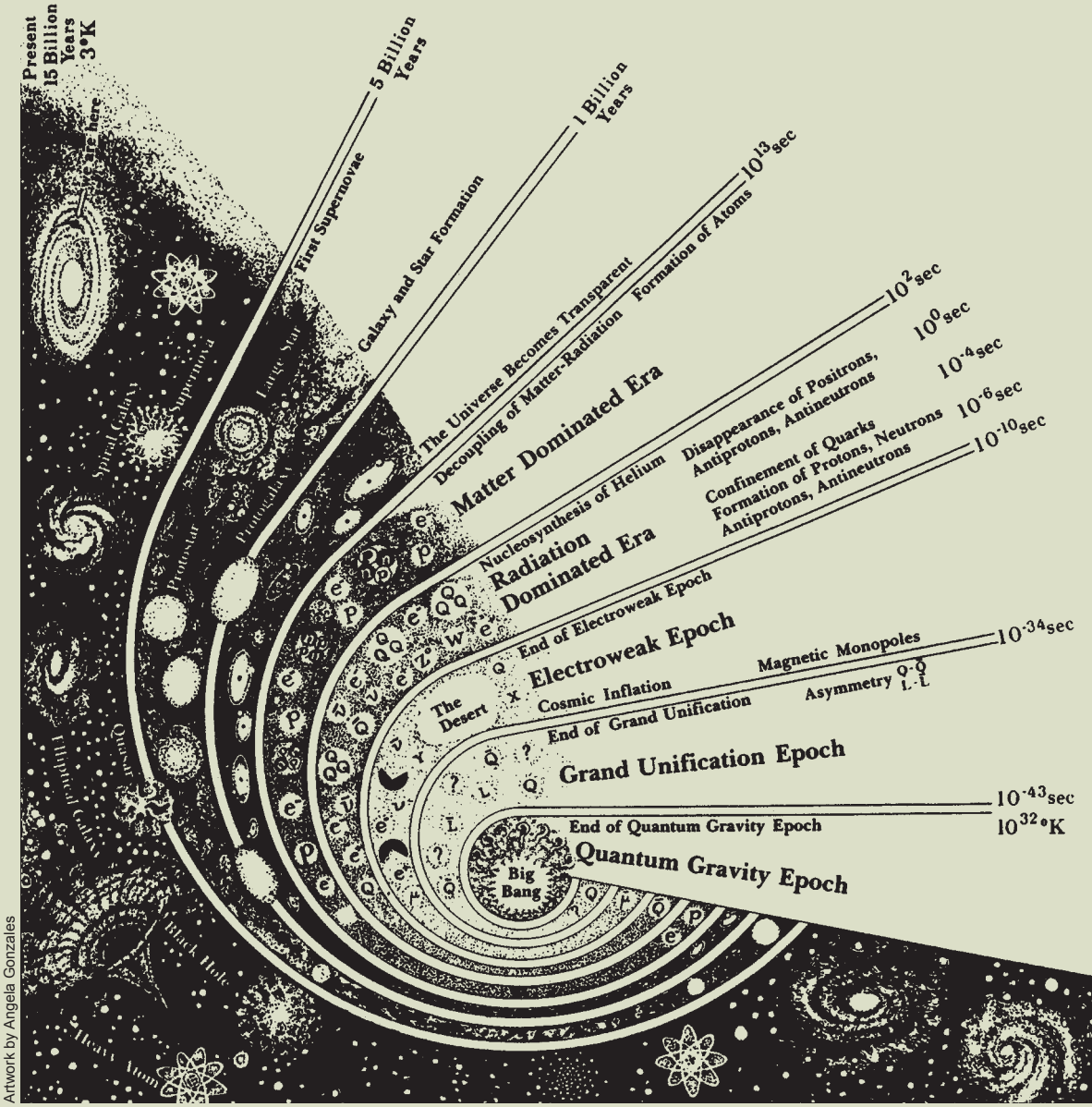
Frontiers of Particle Physics:

Ernest Moniz, undersecretary at DOE.

Daniel Goldin, administrator of NASA.

Photos by Reidar Hahn

Robert Eisenstein, assistant director for mathematical and physical sciences at NSF.



Artwork by Angela Gonzales

A history of the universe, from the days of the primordial soup of elementary particles some 15 billion years ago to present day.

Right Here on **Terra Firma**, and Out in **Space**

by Sharon Butler

At a special session at the Inner Space-Outer Space conference held last month at Fermilab, officials from the three largest funding agencies for the physical sciences weighed in with support for research on both fronts. As one of those officials put it at a press conference, "no one agency can do it all."

"The Inner Space-Outer Space concept," said Bob Eisenstein, assistant director for mathematical and physical sciences at the National Science Foundation, "is that an ultimate understanding of the physical laws that govern the universe can only be realized by investigating both the smallest and the largest structures in nature, namely, subatomic particles and the universe itself.

"…The processes examined with our most advanced high-energy colliders and heavy-ion accelerators are necessary to understand the evolution of the universe; and, yet, some of the most elementary processes in nature can never be produced on earth and require instead using the universe itself as the ultimate high-energy collider."

Ernest Moniz, undersecretary at the U.S. Department of Energy, lauded the colliders and accelerators that have enabled scientists to piece together an understanding of the fundamental constituents of matter. Indispensable tools in Inner Space-Outer Space, they give physicists a concentrated beam of particles, under controlled conditions, to test their theories with scientific authority. But these same tools, Moniz emphasized, have been useful in understanding the large-scale flow of ocean currents and in enhancing geological storage of toxic wastes—in areas as diverse as national security, energy and environment, and environmental remediation.

"Our investment in this technology over the decades has been an essential one," Moniz said.

While DOE has built laboratories here on earth, Dan Goldin, administrator of the National Aeronautics and Space Administration, was heady with the possibilities of using space as a possible new laboratory for particle physics as well—a "Cosmic Laboratory." That laboratory could provide access to energy scales unattainable in the highest-energy accelerators of today.

"Are you interested in probing the first 10^{-38} seconds of the Big Bang, corresponding to energies of the Grand Unified Theory scale? We might do that by measuring relic gravitational radiation," he said. "…Evaporating black holes may tell us something about quantum gravity or string theory…. If you want to study bulk nuclear matter or even quark matter, then neutron stars are your laboratory! X-rays and gamma rays are your probes!"

"My point," said Goldin, "is that we should expand our horizons and think of new ways to answer the fundamental questions of physics in space."

"Think of visionary new experiments to test your theories," Goldin urged the scientists. "You are the experts."

And meanwhile, emphasized Eisenstein, whose agency has long supported research in both particle physics and astronomy, "there's an awful lot one can learn right here on terra firma."

"Progress in understanding inner space and outer space has been exhilarating over the last century," he said. "Yet there is good reason to believe that the best is still to come."

Tom Peterson's Dewar Debut

Photo by Reidar Hahn

Tom Peterson, beside the vertical magnet test facility.

by Sharon Butler

Tom Peterson started out as an amateur lepidoterist and ended up a professional engineer and an internationally recognized expert in the science of the very cold. But he still watches butterflies.

In fact, any lunchtime you may see him biking over to the Margaret Pearson Nature Trail, in the new prairie, and hanging about the summer flowers, where he recently spied a Pipevine Swallowtail. It is a lovely butterfly with iridescent blue wings, one he's never seen before in these parts.

But more often than not, Peterson is holed up in a trailer office behind the Industrial Building Complex, his bicycle parked in front while he labors over designs for cryogenic hardware inside.

His work on a vertical magnet test facility just brought him an employee recognition award.

The test facility is a vertical vat holding a helium bath, into which magnets are lowered, one at a time, for performance testing. It will be used—indeed, has already been used—to test prototype superconducting magnets for the Large Hadron Collider, now under construction at CERN. The multiton magnets are each two meters long, miniature versions of the final magnets, which will be six meters in length. Peterson's contribution to the test facility was the dewar, the double walled container with a vacuum in between, like a giant thermos bottle. The dewar is the part of the test facility that keeps the magnet very cold during the one-month-long round of tests.

But Peterson's dewar is not just any dewar.

"It's a special dewar that allows us to test magnets in superfluid helium," Peterson explained.

The LHC will run at roughly atmospheric pressure at a temperature of only 1.9 degrees Kelvin, even lower than the Tevatron's 4.4 K. The colder temperature will allow more current in the magnets and, so, more energy in the accelerator. But below 2.17 K, liquid helium becomes a superfluid with properties all its own. It loses viscosity and becomes an extremely efficient conductor of heat, Peterson said.

Challenge enough was designing an absolutely leakproof dewar. But the dewar also had to include a cooling system. Consequently, Peterson's dewar is especially complex, with three valves, two heat exchangers, a load of piping, and an array of temperature and pressure sensors. In a series of cooling stages, liquid helium at 4.5 K from the liquefier in Industrial Building 1 is pumped down to a lower pressure and a lower temperature, and that low-pressure, low-temperature helium flows through two heat exchangers to cool the higher-pressure helium that surrounds the magnet in the test facility.

"The process of doing this cooling and maintaining the low 1.9 K temperature is a little tricky," Peterson said.

The whole project, from first discussions and designs to fabrication, took about two years. Assembling the rest of the test facility around the dewar, with attendant instrumentation, power supplies, and software, took another six months. Only then could the design be tested.

Remembering the December 1996 debut of the dewar, Peterson laughs, "I think the fact that it worked right off so relieved Peter Limon [head of the Technical Division] that he recommended me for this award."

Digging In To Ace The Test

by Mike Perricone

Digging a hole five feet across and 21 feet deep might sound like a straightforward civil construction task, but it became one of the biggest adventures in constructing the Vertical Magnet Test Facility housed in Fermilab's Industrial Center complex.

"It was a real mess, because this area is basically built on a swamp," said Mike Lamm of the Technical Division's Development and Test Department, who won a Fermilab Employee Recognition Award along with Tom Peterson (see the accompanying story) for bringing the VMTF from concept to completion.

The design work began in early 1994, with the first tests of magnet models run in late 1996. The VMTF was built to test superconducting electromagnets fabricated at Fermilab for the Large Hadron Collider project at CERN, the European particle physics laboratory in Switzerland, but its use will extend to future magnet development at Fermilab.

But first they had to dig the hole. The plan was to insert a steel sleeve to hold back the walls of earth as the digging progressed. When the digging was completed, concrete would be poured for the permanent support, with the steel sleeve extracted. The steel sleeve couldn't be left in place, because as a magnetic material, it would disrupt the intricate field measurements of the three-ton superconducting magnets to be tested in the giant Thermos bottle that would eventually fill the hole.

The trick involved precise timing: if the steel sleeve were removed too soon, the walls would collapse; if it were left too long, it would bond to the concrete, making the excavation useless. When the time came to remove the sleeve, it wouldn't budge, and only frantic efforts by the contractors saved the project.

"I was ready to get on the phone and call for every earth-moving vehicle on the site to converge on Industrial Building 1 and lift this thing out," Lamm said. "But fortunately, (the contractors) got it out."

The framework of the VMTF also extends as high as the 25-foot ceiling of the Industrial Building. A 10-ton crane resides on a track near the ceiling ("We had to shop around to find one that tucked up to the ceiling as close as possible," Lamm explained). The crane reaches down to lift an assembly that includes a three-ton magnet attached on end to a fiberglass-epoxy connecting plate and sealer called a "lambda plate," which is in turn connected to a stainless steel lid called the "top hat." An excellent thermal insulator, stainless steel is also non-magnetic.

The top hat serves as the lid of the sunken thermos bottle (actually a Dewar flask, named for inventor Sir James Dewar), a double-walled stainless steel vessel with vacuum insulation, which holds liquid helium. The lambda plate seals off the lower chamber of the vessel, where the liquid helium is further cooled to just above absolute zero (1.9 degrees Kelvin).

The crane lowers the assembly and dips the magnet into the dewar, the magnet is ramped up, and the magnetic field is measured for strength and accuracy under superconducting conditions. A spinning probe is inserted through the top hat, the lambda plate and the bore of the magnet to measure the field incrementally from end to end. The testing instrumentation is installed in electronic modules, and tests can be changed easily by substituting different modules.

"This was a fantastically well-done and well-organized job," said Peter Limon, head of the Technical Division. "It's a key element in the future of Fermilab, because it permits us to design and build many different kinds of magnets."

Photo by Reidar Hahn

Mike Lamm examines the cryogenic connections leading to the giant sunken Thermos bottle at the heart of the vertical magnet test facility.

Laura Mengel and her Fermilab colleagues use technology to support a new approach to teaching and learning.

GETTING ENGAGED

by Judy Jackson

Students learn best when they take an active role in the learning process; and, properly used, technology can help make that happen in the classroom. That's the premise behind the LInC program, begun at Fermilab in 1994 under the leadership of the Computing Division's Laura Mengel. LInC (it stands for Fermilab Leadership Institute Integrating Internet, Instruction and Curriculum) is a rigorous graduate course for K-12 teachers that aims to replace the standard "lecture-and-test" classroom model with what educators call "engaged learning," in which the students seek out—and hopefully absorb—new knowledge for themselves.

In the 14-week LInC course, each teacher creates an on-line classroom project designed to get students engaged in exploring a particular subject—water in the environment, say, or Revolutionary War heroes—using the World Wide Web and the Internet as resources. The teacher's role changes from lecturer and resident expert to coach, guiding the students in using the Web and other resources to connect with true experts on the subject and collaborate with students in other classrooms, far and near, who are at work on similar projects.

In the five years since LInC began, Mengel and a group of master teachers from neighboring districts have taken 200 teachers from 75 school districts in 18 states through the program. Initially, the teachers came to Fermilab to take the course face-to-face (f2f in the jargon). Now, Mengel has taken LInC completely on-line, a format that allows a "class" of extraordinary diversity. Teachers from rural Montana and definitely non-rural Paterson, New Jersey, for example, can compare notes during the weekly two-hour on-line chat.

Mengel divides her time between the LInC project and her responsibilities for providing support for 18 Computing Division Web servers, including the main Fermilab Web server and the shared Web server for experiments and projects. She says the main challenge for teachers who take the LinC course is less in mastering the electronic technology than in changing the way they think about teaching.

"We're asking them to explore and try out a different approach to teaching and that's a tall order," Mengel said. To keep the online course highly interactive, Mengel uses weekly on-line chats, e-mail coaching, an electronic bulletin board, a list-serve, and "we call on the phone, we go there to see them—whatever it takes, because this can be a hard change for them to make."

The effort seems to be paying off. In contrast to many on-line courses, LInC has a very small drop-out rate and a growing cadre of enthusiastic teachers, some of whom go on to become LInC instructors themselves. From the outset, one of LInC's goals has been to equip teachers to work with others in their home districts, to spread the gospel of the effective use of technology in engaged learning. And they do become believers.

"In all honesty," wrote one LInC graduate, "it's the best course I've ever taken. It's like night and day. Someone turned on the light when I took this course as to what teaching should be all about."

Photo by Jenny Mullins

Laura Mengel and the home page of LInC, the online program she and Fermilab colleagues developed to help teachers across the country use technology to change the way their students learn.

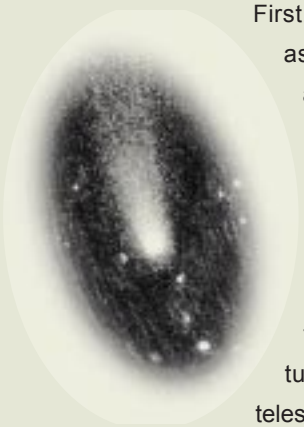
To see the home page for the LInC program:

http://www-ed.fnal.gov/lincon/

the talk of the lab

Star Light, Star Bright, Wonder What They'll See Tonight

Cast a wide enough net across the heavens, and who knows what you'll find. Astronomers for the Sloan Digital Sky Survey, the astrophysical collaboration that is Fermilab's most ambitious foray into the sky, have been turning up cosmological curiosities at a rate that verges on dizzying to those more accustomed to the measured pace of hard-won particle physics discoveries.



First, back in December, Sloan astronomers from Princeton announced that they had found the second most distant quasar ever spotted in the universe: WAY out there. But hold on—a few days later they had the MOST distant, along with the third, fourth and fifth. Not only that, but all those quasars, they pointed out, had turned up in just the data from the telescope's engineering run: they hadn't really cranked up the actual Sky Survey yet.

In April, on the track of more quasars, the Princeton astronomers found yet another astronomical anomaly in the Sky Survey's engineering data. It was an object too big to be a planet and too small to be a star, sitting all by itself in the constellation Ophiuchus right here in our own Milky Way galaxy, a mere 30 light years from home. No sooner had the Princeton discoverers given it the euphonious designation of "methane dwarf" than Sky Survey colleagues at The Johns Hopkins University found a second lonely brown methane dwarf in the constellation Virgo. Methane dwarfs, of which hitherto only one had ever been seen, were suddenly popping up all over.

The next week's discovery came as Sky Survey astronomer Julianne Dalcanton of the University of Washington was cruising the data, trawling for faint, fuzzy galaxies, her astronomical specialty. Suddenly her faint, fuzzy algorithm turned up something that wasn't a galaxy at all, but a true blue, honest-to-goodness comet, tail and all. (You can see what Julianne saw on the Web at http://sdsslnx.fnal.gov:8015/run-745/mosaic-491-500/745/4/h_0498.htm). The comet appeared in data from the night of March 20, and then disappeared from view. Dalcanton's comet has since been seen by other astronomers, and its orbit has now been computed: it's currently about the same distance from the sun as Jupiter, but is rapidly speeding away to the cold, outer reaches of the solar system. It'll be back in about 186,000 years.

All these discoveries raise procedural questions. What do you do when you find something new and different in the sky? You inform the Central Bureau for Astronomical Telegrams, the clearinghouse for new astronomical information, giving the particulars of your discovery. CBAT was established in the days of Western Union, but nowadays there's a form you fill out on the Web (http://cfa-www.harvard.edu/iau/DiscoveryForm.html). At this rate, the Sky Survey should probably bookmark the page.

—Judy Jackson

Professional slip

During the broadcast of a night game from hot and humid Miami, Chicago Cubs announcers Pat Hughes and Ron Santo (the Cubs' former all-star third baseman) were discussing the issue of whether a batted ball would travel farther in dry air or humid air.

"Who would you ask to get the answer to that?" Santo mused. "Would you ask a scientist? Or would you ask a physicist?"

Robert K. Adair, who generally answers to both descriptions, offers a solution in *The Physics of Baseball*:

"Humidity *per se* has little effect on the flight of the ball. Indeed, since water vapor is a little lighter than air, if all other factors are the same, a ball will travel farther if the air is exceptionally humid—but only by a few inches. The general belief that the ball does not travel as far if the humidity is high probably stems from experience on windless humid nights when the temperature has dropped from the daytime highs. Then, with the cooler evening air a little denser—or deader—and no breeze to carry the ball, the home run in the hot afternoon carries only to the warning path at night."

Adair is the Sterling Professor Emeritus of Physics at Yale University.

—Mike Perricone

A Fair Shake for Physics Science Projects

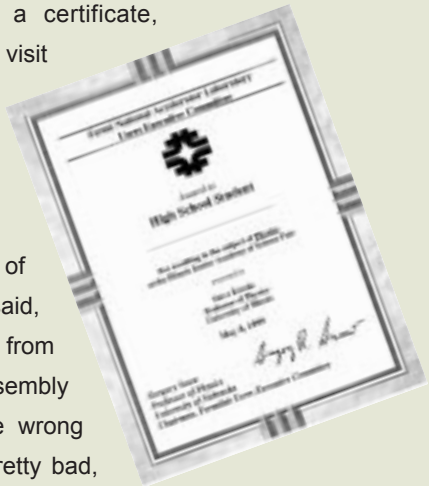
Every year, across Illinois, science students (and their parents) get ready for the school science fair. Conceptions and contraptions of amazing variety crowd the gymnasiums of countless junior highs and high schools, and Fermilab's phone rings off the hook with requests for physicists to serve as judges. The best of the best of these school science projects move through the competitive ranks to the top: to the Illinois Junior Academy of Science Fair, held each May in Champaign-Urbana.

When the children of Fermilab's Dee Hahn, known unofficially as the housemother of CDF, reached science-fair age and went to State with their science projects, Hahn noticed that the awards ceremony featured all kinds of special prizes. There was a prize for the best biology project, the best ecology project, the best chemistry project, all carrying cash awards and sponsored by various Illinois organizations. But, she was dismayed to find, there was no special prize for the best physics project.

Hahn shared her concern that physics science projects were receiving short shrift with the Fermilab Users' Executive Committee, and the UEC agreed that something must be done to give budding experimental physicists the same sort of encouragement as their peers in other fields. After exploring various means to finance a Science Fair Physics Prize, they decided simply to pass the hat at their monthly meeting. Thus was born "The Fermi National Accelerator Laboratory Users Executive Committee Award for excelling in the subject of Physics at the Illinois Junior Academy of Science Fair." Actually, the UEC created two prizes, one at the high school and one at the junior high level.

On May 8, in Champaign-Urbana, Fermilab user Steve Errede, a University of Illinois physicist, presented the awards to the winners. The high-school award went to Amul Tevar of Macomb Senior High for his project, "Investigations of Superconducting Levitation." In the junior-high category, Madeline Kissane of St. Scholastica in Woodridge won for "Does Corn Fiber Affect the Strength of Building Materials?"

Each winner received a certificate, an official invitation to visit Fermilab, and $50. Alas, we can only imagine the scope of the winning projects.



"I tried to take pictures of their displays," Errede said, "but the light coming in from the windows of the Assembly Hall was exactly in the wrong direction, so they are pretty bad, picture-wise."

—Judy Jackson

CALENDAR

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

JUNE 25

International Film Society Presents: *Sliding Doors.* Dir: Peter Howitt, (USA/UK, 1998, 99 mins). Film at 8 p.m., Ramsey Auditorium, Wilson Hall, $4. (630) 840-8000. http://www.fnal.gov/culture/film_society.html

JUNE 26

Art Series presents: *The Chenille Sisters with the James Dapogny Chicago Jazz Band*, $23. Performances begin at 8 pm in Ramsey Auditorium, Wilson Hall. For tickets call (630) 840-ARTS.

JULY 1

Tunnel Visions Symposium: *VLHC Low Field Option*, W. Foster, Fermilab, 1 West 3–5 p.m.

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.

MILESTONES

BORN

[redacted] Thomas Olszanowski (PPD-ESH/BMS) and Laura Smith [redacted].

[redacted] Leonard (PD/ESH-BMS) and Patty Nelson [redacted]

OBSERVED

First events at the Asymmetric B Factory, Stanford Linear Accelerator Center, in the early morning of May 26, at the BaBar detector.

HONORED

Ernie Malamud, (directorate), with the 1999 Chandler Award for Community Cooperation by the DuKane Valley Council, for his efforts creating the SciTech museum.

RETIRING

Larry Chiplis, ID.# 533 on September 10. His last work day will be June 30.

Mark Koening, I.D.# 925 from Beams Division/Electrical/Electronic Support, on June 10.

Marion Richardson, ID.# 2205 from Beams Division/Project Support, on June 30.

Chez Léon MENU

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

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

FOR RESERVATIONS, CALL X4512
CAKES FOR SPECIAL OCCASIONS
DIETARY RESTRICTIONS
CONTACT TITA, X3524
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

Lunch
Wednesday, June 23
Duck and Wild Rice Salad with Raspberry Vinaigrette
Banana Upside Down Cake

Dinner
Thursday, June 24
Marinated Red Pepper with Basil, Garlic and Fresh Mozzarella
Lamb with Balsamic Vinegar Sauce
Asparagus Risotto
Apricot Filled Crepes

Lunch
Wednesday, June 30
Guava Glazed Pork Loin
Asian Sweet Potato
Chicory, Jicama and Walnut Salad
Pecan Banana Tart

FERMINEWS

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A U.S. DEPARTMENT OF ENERGY LABORATORY

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The deadline for the Friday, July 2, 1999, issue is Tuesday, June 22, 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

■ ’99 Saturn SL2, dark green, 6K miles, 5 spd, a/c, am/fm CD, $12,500 obo. mail to:bertram@fnal.gov, or (847) 733-7951.

■ ’95 Mercury Tracer, 1.9L, auto, 36K miles, a/c, dual air bag, am/fm cassette, pb, ps, p mirrors, rear defroster, spoiler, intermittent wipers, runs great. $2,750 off “Edmunds” recommended market price! http://www.edmunds.com. Sasha, x4734, (630) 208-6214 eve, or mail to: amakarov@fnal.gov

■ ’94 Toyota Tercel, 92K miles, 4 spd, no rust, great gas mileage, $4,100 obo.mail to: jorgem@fnal.gov or call (630) 554-9481 eves.

■ ’93 Nissan Maxima SE, very good cond., 60K miles, $9,800, x4361.

■ ’91 Ford Ranger STX 4x4, 60K miles, ext cab, 4.0L V6, ac, cruise, trailer hitch, very good cond., $6,000. Doug x4847 or arends@fnal.gov.

■ ’91 Nissan Stanza XE,dark grey, auto, a/c, am/fm cassette, ps, pb, pw,pl, cruise, 113K miles, new battery, new tires, $3,500 obo. Boris, x8704.

■ ’90 Suzuki motorcycle, GS500E, 11K miles, mint cond., well maint., service records, Clymer service manual, headlight fairing, recent tires & brakes, extras, $1800 obo. Matt, (630) 208-1751.

■ ’89 Chevy Cavalier Z24 convertible, metallic maroon, graphite interior, power window/lock, am/fm cassette, 98K miles, exc. cond., $4,800 obo, Jim, x3777 or (630) 961-0052.

■ ’88 Honda Accord LX,4dr. 5 spd manual shift, dark grey, grey interior $1,500. Char (630) 377-5909.

■ ’82 Pontiac Grand Prix, 6 cyl, 105K miles runs good, body good, $750, call (630) 393-6744 leave message.

■ Leer fiberglass cap for ‘88-’98 Chevy/GMC C1500 short bed truck. Exc. cond., $450. Bill Pritchard, x3370, pritchard@fnal.gov, or (630) 859-8596.

■ La-Z-Boy chair: rocker, recliner, swivel, in very good condition. Brown tone. $40. Call (630) 851-2160.

■ 4 Box Seats, Kane County Cougars, July 17, 6pm, $8 ea. Jim, x4293, (630) 585-0907.

■ 2 Evenflo child car seats, infant - 40 lbs., very good cond., price negotiable, Gordie, x8630 or gordieg@fnal.gov.

■ Window air conditioner, $50. Rich, x3880 or (630) 690-1691.

■ Whirpool 2 spd washer, 2 yrs old, $300 obo. Simona, x2639 or rolli@fnal.gov

■ Townhome, Hanover Park, close to school, playground & pool, master bdrm w/private bath, 2 bdrms, living rm, dining rm, newer kitchen, additional 1 1/2 baths, 2 car garage, 2 AC/2 heating units, dishwasher, washer & dryer electric garage opener, ceramic tile throughout, newer carpeting, freshly painted. Asking $94,500. Call Glenn, x3725, Smitty@fnal.gov.

■ Home, St. Charles, nice large 4 bedroom Colonial, 2470 sq. ft. Eat-in kitchen w/pantry, beautiful sun room. Quiet low traffic neighborhood, near grade & middle schools. $249,900. Phone Ron, (630) 584-2897.

■ 3 acre farmette, south of Hinckley, includes 3 bdrm ranch w/many updates, 2 barns, stalls, pasture, fruit trees & perennial garden. Perfect for horse owner, easy access to I-88. $195,900 (815) 786-6672.

RENT

■ Studio, fully furnished, in private home, separate entrance. Unincorporated West Chicago, ~15 mins from lab. Electric water, cable TV, short or long term, to single individual, no pets, non-smoker. $675 mo or $195 week (630) 293-4651.

WANTED

■ A 3/4 size acoustic guitar. Contact thatcher@fnal.gov.

■ National-Louis University is seeking adjunct instructors to teach Astronomy & Survey of Physical Science (physics, astronomy, geology) in September. Teaching experience and Ph.D. preferred. Please send resumes to Dr. June Steinberg, jste@evan1.nl.edu. The Astronomy course is taught on the Chicago & Evanston campuses as an interactive video course, & the Survey of Physical Science is on the Chicago Campus. This is a 10-week quarter.

ITALIAN CULTURE

The Cultural Association of Italians at Fermilab invites the Fermilab community to a Festa Italiana on Wednesday, July 7. Highlights will include the 6:30 p.m. Second Floor Wilson Hall Gallery opening of an exhibition of works by Italian painter and engraver Giancarlo Tognoni, with a silent auction of the works displayed; a feast of Italian dolci, or desserts, at the Village Barn beginning at 7:30 p.m., and a raffle of selected paintings on silk by Gianpaola Pauletta, also at the Barn. Proceeds from the auction and raffle will benefit the Cultural Association? All are invited.

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