FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY

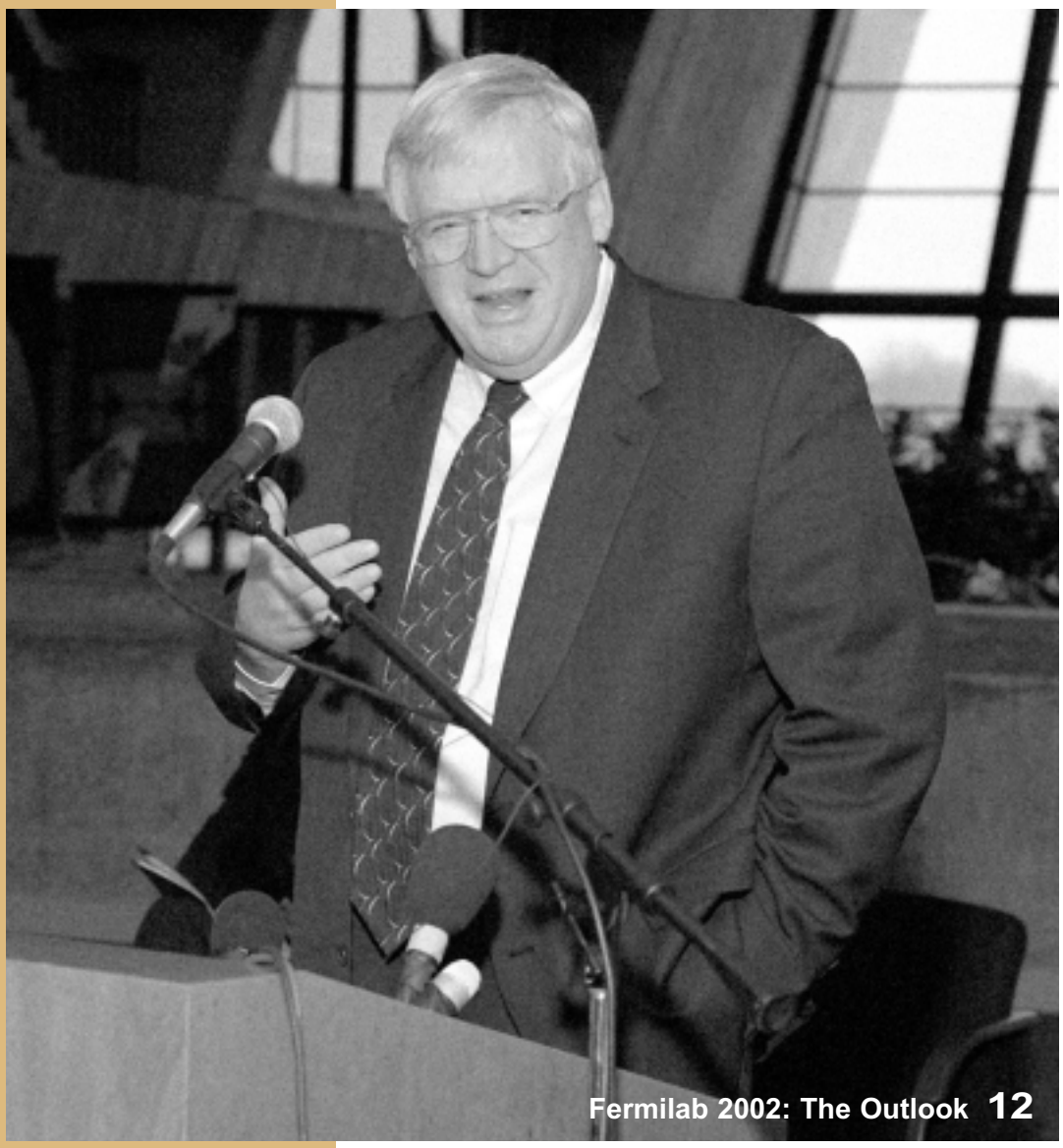

Photo by Reidar Hahn

Fermilab 2002: The Outlook 12

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INSIDE:

a clear view

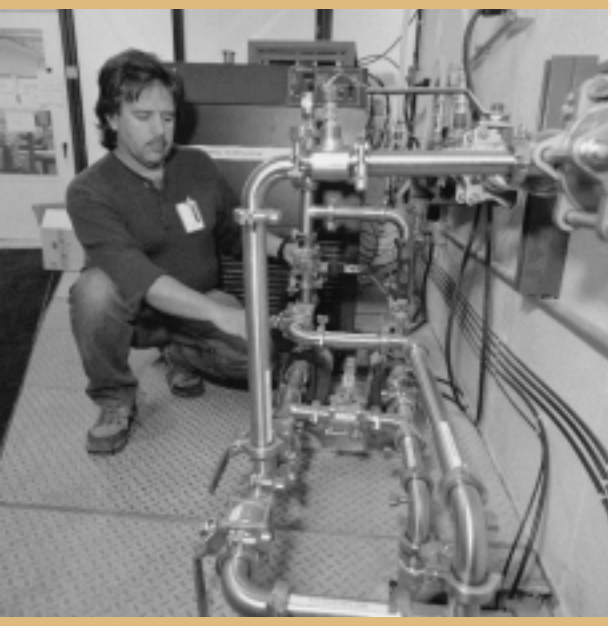


Photo by Reidar Hahn

Camilo Espinoza, mechanical technician from Los Alamos National Laboratory, checks the oil plumbing system that he designed for the MiniBooNE detector. By circulating oil through a heat exchanger, scientists can maintain the oil at a constant temperature of about 60 degrees.

by Kurt Riesselmann

It is as translucent as glass. It comes by train, two railcars every week. Fermilab will receive 250,000 gallons of it, enough to fill a 25-meter swimming pool.

What is it?

Some of the clearest mineral oil available in the country, intended for the MiniBooNE experiment.

“It is crystal clear,” said physics professor Randy Johnson, who has overseen the selection process of the oil. “It’s much clearer than water that comes out of your faucet.”

Johnson, who teaches at the University of Cincinnati, is one of 60 scientists working on MiniBooNE, an experiment designed to unravel the mysterious properties of tiny ghost-like particles called neutrinos. Until 1998, physicists believed that neutrinos are massless particles. Since then a few experiments have shattered this dogma by reporting results that indicate neutrinos do have a mass after all.

Understanding these surprising neutrino phenomena has become a top priority for particle physicists around the world. The MiniBooNE collaboration will study man-made neutrinos, created by Fermilab’s accelerators. A spherical steel tank, 12 meters (40 feet) in diameter and equipped with 1,500 light sensors, represents the heart of the MiniBooNE neutrino detector. When filled with oil, the detector will record the interaction of neutrinos with oil molecules, a process that leads to flashes of blue light. To observe the light pattern with maximum intensity and minimum distortion, experimenters rely on ultraclear oil.

“Oil companies have a very specific list of requirements for mineral oil used for baby or cooking oil, for example,” explained Johnson. “Our requirements for clear oil exceed theirs.”

For the MiniBooNE experiment to work well, scientists require the oil to have an attenuation length of greater than 20 meters, which means that at least 90 percent of the light sent into a two-meter-thick sample of oil emerges at the opposite end.

On the Web:

MiniBooNE homepage
www-boone.fnal.gov

Oil: History, Uses, Impacts
www.iclei.org/efacts/petro.htm

Energy: Past and Future
www.fe.doe.gov/education/

Photos by Reidar Hahn

Oil for the MiniBooNE detector arrives at Fermilab by railcars, each holding 23,000 gallons. Ultra-clean tank trucks take the oil to the detector.

To find the right vendor with the best oil for the experiment, Johnson initiated a nation-wide bidding process in which oil distributors submitted samples of their oil. Graduate student Jennifer Raaf and postdoc Eric Hawker, both members of Johnson's research group, determined the light transmission properties of each sample as a function of length, using various shades of blue light.

"Ten different bids came in, each submitted with a ten-gallon sample," said Raaf. "Many samples had an attenuation length of 15 meters. The worst was 2 meters. The oil that we chose has a 26-meter attenuation length."

Oil by the carload

In December the first two railcars with 46,000 gallons of oil arrived at Fermilab, paid for by a National Science Foundation grant to Columbia University. Fermilab's Jesse Guerra and his group of technicians were ready.

"We've been involved with the MiniBooNE experiment from the start," said Guerra. "We've cleaned the inside of the detector tank and helped with the installation of the photomultiplier tubes. For the oil pumping station at the railhead, we've done everything from engineering to producing blueprints to fabrication."

This is the first time that Fermilab has received oil by rail. Setting up the right infrastructure is only part of the challenge. Keeping the oil clean is as much of a concern.

"We have to use food-grade clean pipes, railroad cars and trucks," explained Guerra. "The railcars need to be cleaned to our specifications."

To minimize the amount of contaminants entering the oil inside the detector tank, Andrew Bazarko, scientist at Princeton University, carried out a series of tests by putting various detector materials, such as rubber, epoxy and paint, into samples of oil and heating them to 140 degrees Fahrenheit for eight hours. Finding the right material for the 30 miles of electrical cable, which connect the light sensors inside the oil-filled detector tank with the external data acquisition system, was critical. The MiniBooNE scientists decided to use Teflon-coated cables to keep the oil clear.

"We are concerned about two types of contaminants," said Hawker, who together with Raaf monitors the quality of the shipped oil. "We watch for chemical contaminants, such as water and plastic; and particulates: little specks of dirt, dust or paint, smaller than the thickness of a human hair. They all reduce the attenuation length. Even worse, they might scintillate, creating sparks of light on their own."

Fermilab technicians Craig Lerette (left) and Steve Sorenson pump oil from a tank truck into the MiniBooNE detector, located inside the building in the background. Lead technician Andy Lathrop (right) checks on the progress. It will take about 45 truckloads to fill the 250,000-gallon detector tank.

So far technicians have pumped more than 40,000 gallons of oil into the MiniBooNE detector.

"The highlight was before Christmas," said Guerra. "We started pumping oil into the detector. It was a great Christmas gift for us."

It will take about six weeks to fill the detector tank. Scientists will then begin to test their new detector using cosmic rays. In May the first accelerator-made neutrinos will cross the detector.

"We are scheduled to operate for two years," said Johnson. "It depends on what we find whether we will operate longer."

The MiniBooNE detector should soon make that perfectly clear.

THE STUFF THAT CAME IN FROM THE COLD

by Roger Dixon
Fermilab physicist,
CDMS Project Manager

Photo by Reidar Hahn

CDMS Project Manager Roger Dixon displays the experiment logo celebrating the constant presence of bats in the Soudan mine.

Despite the best efforts of particle physicists and astrophysicists, most of the Universe is still missing. We know where it is, but we don't know what it is. It is all around us, but we can only see it by looking far, far away. That is the challenge for the Cryogenic Dark Matter Search (CDMS).

In its quest to find some of the dominant but invisible component of matter in our universe, CDMS (E-891) will make the first serious incursion into the realm of parameter space where physicists believe they have a reasonable chance of detecting and studying dark matter in an earthbound laboratory. If we do find Weakly Interacting Massive Particles (WIMPs) thought to make up the dark matter, it will be largely due to state-of-the-art detectors, which give CDMS a substantial advantage over our competitors. The complex cryogenic system installed by a Fermilab team in the Soudan Laboratory is no small part of making those detectors work. This system pushes the edge of the envelope even by Fermilab standards.

Where most supercooled experiments at Fermilab run near 4.5 degrees Kelvin, the CDMS cryostat will chill our germanium and silicon detectors to 25 milli-Kelvin—25 thousandths of a degree above absolute zero. And it will reach this temperature frontier at the bottom of an old iron mine, nearly a half-mile underground in Soudan, Minnesota *(see "A Cryostat on the Edge," page 6).*

Rich Schmitt and his crew, including Bruce Lambin, Bryan Johnson, Rodney Choate, and Jeff Duncan, have done some of the most unusual work. They've put in long, hard hours in the north woods, for weeks at a time, in order to make this delicate system a dependable everyday reality. In late fall and winter, they sometimes don't see the sun, or even a cloudy sky, for more than a week at a time. Other essential Fermilab contributions include design and fabrication of the front end electronics, an effort led by Mike Crisler with the help of Merle Haldeman. The Laboratory has also been responsible for the CDMS infrastructure that is being built at Soudan, a difficult job headed up by Lou Kula and Stan Orr. Finally, Fermilab has also made substantial contributions to the data acquisition system. Don Holmgren of the Computing Division has taken the Fermilab lead on CDMS for this task.

Thanks to these efforts, and the efforts of all the CDMS collaborators at 10 other institutions, we have a chance to answer the question *Discovery* magazine recently placed at the top of its list of "The 11 Greatest Unanswered Questions of Physics:" What is dark matter?

Photos courtesy University of Minnesota

A clean room had to be built in the Soudan mine for assembling the cryostat. The completed facility (inset) houses an environment of only 10,000 particles per cubic meter. It is cleaned regularly with HEPA vacuum cleaners, and has a particle counter running continuously.

But first, a little history, 'way back to 1996.

We were beginning to run CDMS I at Stanford and planning a version of the experiment, CDMS II for the Soudan Laboratory. At the time, physicists were beginning to feel that they understood the makeup of the universe. Most cosmologists believed that the universe was balanced at the critical density between expanding forever and re-collapsing: sort of like standing a pin on a table, and then balancing the universe on the head of the pin. That scenario is actually more plausible than it sounds (or maybe I have been in this business too long).

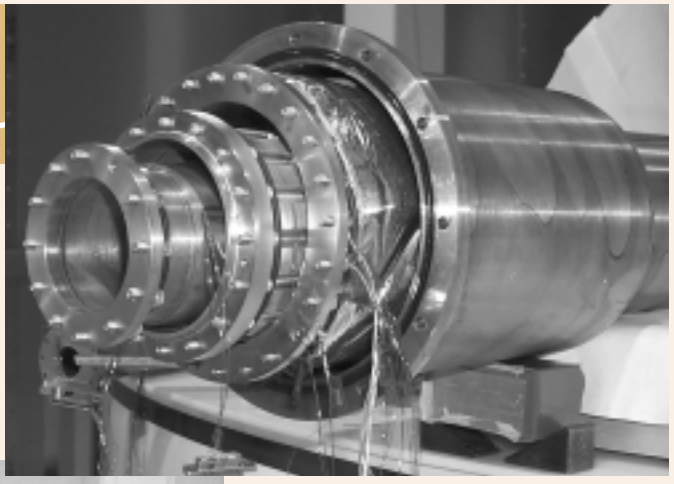
Dark matter had been an accepted concept for a long time because physicists wanted to believe that our notions of gravity were correct. We even had a good idea about how much of the universe was ordinary matter (baryons), and how much was something mysterious. In addition, observational evidence from astronomers, including the rotation curves of the galaxies, gave a good indication for how much dark matter there had to be to make the theories hold together. The inventory was something like one percent visible matter, five percent baryons, and 95 percent something else—dark matter. The picture seemed to be coming together—if we could just determine what the something else was.

But surprises are the motivators for experimentalists. In 1998, two experiments (the Supernova Cosmology Project, based at Berkeley Lab and headed by Saul Perlmutter; and the High-Z Supernova Search Team led by Brian Schmidt of Australia's Mount Stromlo and Siding Spring Observatories) set out to measure the density of the universe using Type IA supernovae as "distance candles." They compared the luminosities of near and far supernovae to establish their distances independent of red shift—then compared the red shifts to see how fast each was moving away from us due to the expansion of the universe.

They expected to see the gravitational effect of the mass of the universe slowing the expansion, and, therefore, the supernovae. Instead, their data indicate that supernovae are not slowing down: they are speeding up. Everyone was skeptical at first, but for the experimentalists, it was a golden period. We were overjoyed to see the theorists sufficiently frazzled to arrive at work unshaven, with untied shoes and mismatched socks.

A Cryostat on the Edge:

"IT SHOULD BE THE COLDEST SPOT IN MINNESOTA, AND THAT'S SAYING SOMETHING"



Photos by Reidar Hahn

CDMS photo

Rich Schmitt (photo at left) works on the cryostat assembly in the clean room at Soudan. Schmitt, Bruce Lambin, Bryan Johnson, Rodney Choate and Jeff Duncan (center photo) check over engineering drawings at Fermilab. The cryostat (above) is critical in allowing the detectors to achieve the extreme sensitivity necessary for any possible detection of Weakly Interacting Massive Particles—dark matter.

The ultra-sensitivity of the germanium and silicon crystal detectors for the Cryogenic Dark Matter Search depends on ultra-cold operating temperatures—25 milli-Kelvin (25 thousandths of a degree above absolute zero). Most cryogenic apparatus at Fermilab operates at approximately 4.5 Kelvin.

"Even for a place like Fermilab, this cryo system is way out at the edge," said CDMS Project Manager Roger Dixon. "Getting that much mass to that cold a temperature is quite a challenge. If you say you're running at 25 milli-Kelvin, even some cryogenics people will say, 'How do you do that?' Paul Brink (senior research associate from Stanford), and Rich Schmitt, Bruce Lambin and Bryan Johnson of Fermilab were excited by that challenge."

The experiment requires an extremely low radioactivity background, leading to a cryostat made entirely of high-purity copper using electron-beam welding. The extremely tight tolerances were checked on a coordinate measuring machine. The copper was acid-treated to remove any surface contamination, then cleaned again at the Soudan mine site with alcohol and lint-free wipes. The cryostat was assembled in a Class-10,000 clean room (10,000 particles per cubic foot) that was built in the experiment hall—a mine shaft a half-mile below ground, adjacent to the MINOS (Main Injector Neutrino Oscillation Search) detector chamber. The clean room is regularly policed with HEPA vacuum cleaners, and has a particle counter running continuously.

The cryostat consists of six nested layers ("cans"). The outermost layer is at room temperature, and each succeeding layer is colder, with the innermost and coldest can housing the detector. Refrigeration is produced by a dilution unit from Oxford Instruments in England, using liquid nitrogen and liquid helium for precooling. The refrigerant is a mixture of Helium-3 and Helium-4, designed to reach 10 milli-Kelvin. The refrigerator also has six layers, each connected to the cryostat.

"When we get this thing fired up," Lambin said, "it should be the coldest spot in Minnesota, and that's saying something."

"The trickiest part is keeping out contaminants," Schmitt explained. "We have copper parts that are so close, they are actually touching at room temperature. Then they separate due to thermal contraction. If there is still contact, that will bring in enough heat to spoil the operation. If anything is misaligned, we have to take it apart and reassemble it."

The cryo system could be ready for the detectors to arrive from Stanford as early as May. That would cap off more than a year of regular ten-hour, 550-mile drives from Fermilab; two- to three-week stays in an apartment in Minnesota; and shifts that begin when the elevator brings you down and end when the elevator returns to take you to the surface.

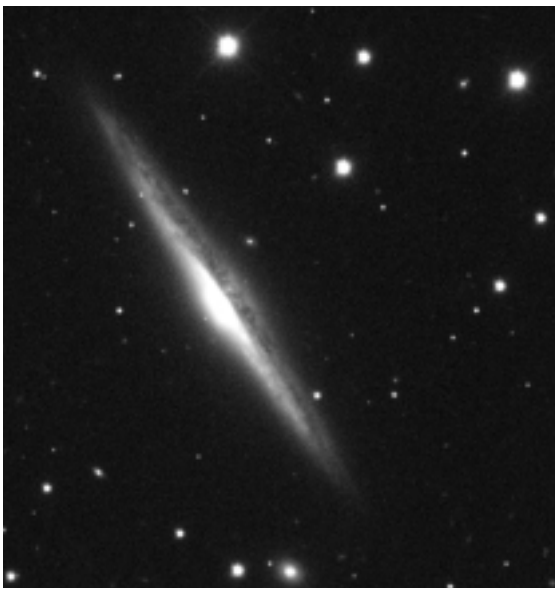
"We have to bring everything with us," Lambin said. "We can't run out to a hardware store. There's no McDonald's for lunch. On the other hand, there's something nice about seeing more deer than cars when you're driving to work."

—Mike Perricone

Looking back, it was actually fairly easy to incorporate the new information within existing theories, but it did mean a revision of the inventory of the universe. It was necessary to incorporate something that was causing this acceleration. To this day we don't really understand what the "something" is, but that does not prevent us from naming it. Dark energy must make up 60 to 70 percent of the energy density of the Universe. This revision reduces the amount of dark matter to around 20 or 30 percent of the universe, with the baryon content remaining at around five percent—plenty of mysterious stuff left around for everyone.

The longstanding rotation curves tell us what the density of matter, and hence dark matter, must be for our own galaxy to rotate the way it does. Since these curves were used in the initial planning for CDMS, the new information from the supernova experiments did nothing to change our plans. The curves tell us the density of dark matter comes out to about 0.3 GeV per cubic centimeter. Now we don't know precisely the mass of these dark matter particles, but accelerator experiments give good indications that the mass is likely to be more than 50 GeV if they are supersymmetric. At 50 GeV we would have roughly 10,000 particles passing through the passenger compartment of a good-sized Buick at any given time.

The germanium and silicon detectors, which are being fabricated at Stanford University, are designed to be sensitive enough to detect weakly interacting dark matter particles of such abundance. These detectors have already been used by the CDMS collaboration at a shallow site underneath the Stanford campus to set the best dark matter limits in the world. That bodes well for the sensitivity they will have at Soudan. The bottom line is that, if the dark matter interacts weakly, it is in our crosshairs. And if we do see something, then we can say: "Here it is, this is its cross-section, this is its mass, now let's go study it in the Tevatron."



The constellation Orion is home to the edge-on spiral galaxy UGC 03214, captured in this image by the Sloan Digital Sky Survey. The galaxy is receding from us at the rate of 4840 kilometers per second (about one-sixtieth the speed of light).

Furthermore, observational data from astronomers looking at the universe with infrared, visible light and x-rays continues to support the hypothesis that the dominant form of matter in the universe is dark matter. For example, the Sloan Digital Sky Survey has done some exquisite work with visible light and gravitational lensing to measure the distortion in faraway galaxies to show that there is lots of dark matter everywhere. In addition, many observations including recent results from the Chandra X-Ray Observatory confirm the abundance of dark matter.

So what is dark matter, and how do we detect it in the Laboratory, and how will we know we've found what we're looking for, when and if we find something?

The possibilities for detecting it are two-fold and complementary. The big collider experiments at Fermilab will be looking for a mysterious form of matter, called supersymmetric particles, to show up in the collisions they observe. There are good theoretical reasons for believing, not only that this form of matter could exist, but that it could also be the dark matter. If it is first observed in the Collider, it will be up to CDMS to show that it exists in nature and has the correct properties. If it is first observed in CDMS, it will be left to the collider experiments to measure its more subtle properties and determine whether it is the supersymmetric particles or not.

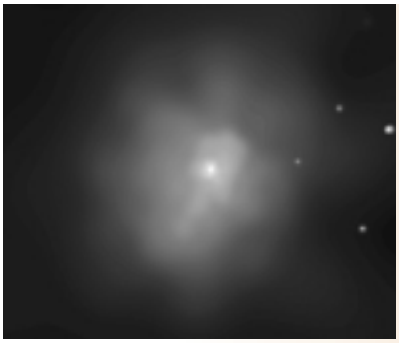
Either way, Fermilab has a great opportunity to take a giant step in our understanding of our universe, its evolution and its makeup.

On the Web

Cryogenic Dark Matter Search homepage
http://cdms.berkeley.edu/

Chandra X-Ray Observatory Center
http://chandra.harvard.edu/pub.html

Sloan Digital Sky Survey
www.sdss.org



NASA/MIT/J.Arabadjis et al.

Chandra Probes Nature of Dark Matter

The cluster of galaxies EMSS 1358+6245 about 4 billion light year away in the constellation Draco is shown in this Chandra image. When combined with Chandra's X-ray spectrum, this image allowed scientists to determine that the mass of dark matter in the cluster is about 4 times that of normal matter. The relative percentage of dark matter increases toward the center of the cluster. Measuring the exact amount of the increase enabled astronomers to set limits on the rate at which the dark matter particles collide with each other in the cluster. This information is extremely important to scientists in their quest to understand the nature of dark matter, which is thought to be the most common form of matter in the universe.

Scale
Image is 3.8 arcmin on a side.

Category
Galaxy Cluster

Coordinates (J2000)
RA 13h 59m 50.60s | Dec +62º 31' 04"

Constellation
Draco

Observation Date
Sept 3-4, 2000

Observation Time
55 ksec

Color Code
Intensity

Instrument
ACIS

(Courtesy Chandra X-Ray Observatory Center)

"I have always felt that science, technology, and art are importantly connected, indeed science and technology seem to many scholars to have grown out of art."

—Robert Rathbun Wilson

CONT

THE PHOTO

Fred Ullrich

All three descriptions of contrast are celebrated in this photographic exhibition. Look around at the variety, texture, and characteristics of these images to reinforce this theme. When comparing my work to the exhibition's title, I will argue my most successful efforts are the narrowly focused dissimilar images of similar or familiar objects, on which I have used the natural light. It is these dissimilar qualities that catch my eye, interest me and motivate me to work hard to create a picture.

RASTS
EXHIBITION

ART AND SCIENCE CONVERGE IN THE GALLERY ON THE SECOND FLOOR OF WILSON HALL. IT IS A SPACE FOR ART EXHIBITIONS, CHAMBER MUSIC CONCERTS, PHYSICS DEBATES AND QUIET CONTEMPLATION.

REIDAR HAHN

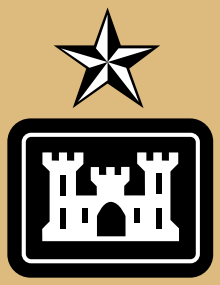
Light is my silent partner. Although it can stream in a window, break through the clouds, or flood a canyon without making a sound, to me it speaks volumes. However, there are no true silent partners in any relationship. After all why have a partner if the partner remains silent? This relationship is no different from any other. Sometimes we fail each other, sometimes we fail together, and in some, often serendipitous, moments we strike harmony.

On the Web:

Contrast: The Photo Exhibition
www.fnal.gov/pub/Art_Gallery/

Jed Brown Sees the Talent to Meet the Challenges

by Mike Perricone



Jed Brown, Fermilab's new associate director for operations support, was a Brigadier General in the U.S. Army Corps of Engineers.

As Fermilab's new associate director for operations support, Jed Brown has found the answer to a question that puzzled him for years.

Brown's interest in physics and physicists began in his youth and persisted through a military career of three decades, followed by an engineering career in the private sector. Among his favorite books, he lists a biography of Enrico Fermi; James Gleick's biography of Richard Feynman; and Richard Rhodes' Pulitzer Prize-winner, *"The Making of the Atomic Bomb."* As commander of the North Atlantic Division of the U.S. Army Corps of Engineers in the late 1980s, Brown stepped into the offices at 90 Church Street, in lower Manhattan, where the Corps' Manhattan District was established and where another Corps officer, Gen. Leslie Groves, became director of the Manhattan Project. There, the question absorbed him.

"I could never understand how Gen. Groves was able to do what he did in running that project," Brown said. "But coming to Fermilab, and seeing the enormous capabilities of the physicists here, I now see how he could have done it."

Brown was also immediately impressed by the Fermilab environment.

"Not only is the science fascinating, but the setting is an absolute delight," he said. "It's like a combination of a public park and a game preserve. It's unlike anything I've experienced in working with the government. Fermilab is a national treasure."

That's the judgment of a civil engineer (Brown earned his Master's from the University of Illinois) and a working environmentalist, in the most real-life terms. In his final military post at the Pentagon, General Brown was responsible for the Army's $2 billion program for environmental oversight and cleanup at installations around the world. He was on the oversight board for the environmental cleanup of the Rocky Mountain Arsenal, following the shutdown of the chemical weapons manufacturing facility. He believes he saved millions of dollars by contracting for the removal of a nuclear research reactor at the Watertown Arsenal in Massachusetts, before it was listed in the Superfund cleanup of the Environmental Protection Agency and subject to the special procedures of that program. Working with a German environmental minister, Joschka Fischer, he negotiated the environmental aspects of the return of U.S. military bases in Germany. He also witnessed another restoration.

Jed Brown, Fermilab's new Associate Director for Operations Support, retired from the U.S. Army Corps of Engineers with the rank of Brigadier General.

PROFILE IN

PHYSICS

Brown, who retired from the Army as a Brigadier General, succeeds the retiring George Robertson, who had been at Fermilab five years after serving as a Major General in the Corps of Engineers. Brown and his wife, Jean, have two daughters: Deborah is an industrial hygienist with Chevron-Texaco, working at recovery operations in Angola, Africa; Suzanne is completing her Ph.D. in international mining at the University of Western Australia in Perth. A native of Maine, Brown graduated from the U.S. Military Academy, taught at West Point, and his service record includes two tours with combat battalions in Vietnam.

"One night when we were going to dinner in Berlin, Herr Fischer [who is now the German Foreign Minister], had his driver take us to the Brandenburg Gate," Brown recalled. "The driver let us off, and Herr Fischer and I walked through the gate into East Berlin. This was just after the Berlin Wall had come down. It was one of the most emotional experiences I ever had, having seen the Wall go up, and remembering all the confrontations we had over it. I never thought I would live long enough to walk through the Brandenburg Gate."

At Fermilab, Brown knows he has a responsibility for the site infrastructure at a time when facilities are aging and budgets are tight. He said his goals are "managing the resources to the best of our ability to advance science as far as possible, and at the same time to continue this laboratory as the parklike place it is now—all done in safe manner."

Brown endorses the Fermilab policy of integrating safety and science.

"Managers and leaders have to make safety a high priority," he said. "Safety is also good business. Safety saves you money in the long run. I firmly believe if you're going to run a safe operation, you're going to plan it. And I've always found that well-planned operations are well-executed."

Among the first mementos Brown placed in his Wilson Hall office is a poignant reminder of how the world changed on September 11: a photograph of New York harbor, with the Statue of Liberty in the foreground and the World Trade Center in the background. Brown's Corps of Engineers office at 90 Church Street was adjacent to the Twin Towers, but one of his strongest New York memories was on the human scale.

"I hired a new human resources manager, who had worked in the New York office in the past and went on to several other Defense Department assignments," he recalled. "The first day she rejoined the staff, I was taking her to lunch at a little restaurant in the World Trade Center. At the corner of Church and Vesey Streets, there was an old hot dog vendor, and while this woman hadn't been in New York for 10 or 12 years, he recognized her. She recognized him, too. He gave her a free hot dog. New York City can be very different than what people imagine."

FERMILAB 2002

The Outlook

by Judy Jackson

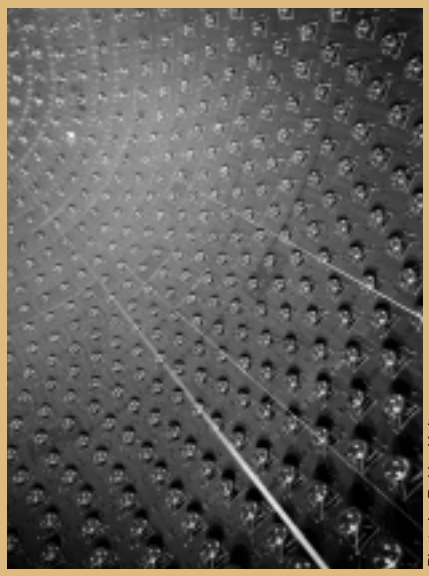


Photo by Reidar Hahn

MiniBooNE will come on the air in 2002.

If we learned anything from the year 2001, it is the impossibility of predicting what the next twelve months will bring. Nevertheless, at least one thing seems certain: 2002 at Fermilab will see unique scientific opportunities and extraordinary challenges for physics at the energy frontier.

Even before the old year ended, the new one got off to a promising start with the signing of a new five-year Fermilab operating contract, worth an estimated $1.5 billion. Fermilab's congressman, Speaker of the House Dennis Hastert, attended the December 27 ceremony where the Department of Energy's Marvin Gunn and Universities Research Association President Fred Bernthal signed their names to the document that will extend URA's 36-year operation of Fermilab.

Speaker of the House Dennis Hastert: "You know that great ideas come from here

Speaker Hastert used the occasion to describe his pride in the physics laboratory that makes its home in Illinois's 14th Congressional District.

"Fermilab is one of the premier physics laboratories not just in the United States but certainly the world," Hastert said. "To be able to have a five-year contract and say you know that your future is secure and the science we build on is going to happen here is a good thing."

Not everyone is on intimate terms with the quarks, Hastert said. "You don't have to know every little thing that happens here, but you know that great ideas come out of here."

Meanwhile, the great idea in the Main Control Room, Operations Central for Fermilab's accelerators, is to rev up the Tevatron to its best possible performance for Collider Run II.

"Our highest priority for 2002 is to get going on the physics operation for Collider Run IIa and to get the luminosity up," said Fermilab Director Michael Witherell. "We will be doing whatever it takes to deliver the maximum possible number of collisions to experiments."

Since restarting after a late-fall shutdown for key accelerator and detector improvements, the Tevatron has been slow to achieve desired levels of luminosity, or proton-antiproton collision rates. Associate Director Steve Holmes described the status of efforts to boost performance.

On the Web

Universities Research Association, Inc.
www.ura-hq.org/

Fermilab Experiments and Projects
www.fnal.gov/pub/about/experiments/

"All the accelerator hardware for Run IIa is installed," Holmes said. " The Beams Division has plans in place to raise luminosity to the levels we want by year's end. Our greatest current challenge is to sharply increase our efficiency in transferring antiprotons from the Antiproton Source to the collider. We are devoting five accelerator shifts per week to Tevatron studies to get the luminosity where we want it. Nothing at Fermilab is more important than this. We have to succeed."

Holmes gets no argument from the Tevatron's customers, the experiment collaborations at CDF and DZero.

"DZero is looking forward to 2002 because this will be the year that the Run II physics program begins," said DZero cospokesman John Womersley. "We still have some detector work to do, but we're hoping that the accelerator makes life hard for us by steadily increasing the luminosity delivered. In 2002, we will present our first physics results; and the first students who have worked on Run II will receive their Ph.D.s."

Across the accelerator ring at CDF, cospokesman Al Goshaw described 2002 as an exciting year for his collaboration.

"The CDF detector will be recording physics-quality data for the first time since we turned off Run I operation on February 20, 1996," Goshaw said.

"It has been a long dry spell," CDF cospokesman Franco Bedeschi agreed, "but the Tevatron program will soon resume a leadership role in experimental high energy physics using the first significant Run II data sample. This really is the beginning of a new era in experimental high energy physics."

The year ahead also looks like a good one for neutrinos at Fermilab. MiniBooNE will come on the air in late spring. As the experiment's detector slowly fills with oil and the clock runs toward the start of operations, anticipation builds in the collaboration.

"The year 2002 will be a big one for MiniBooNE," said spokesperson Janet Conrad. "This spring we will begin taking data. After four years of preparation, it's very exciting."

The Neutrinos at the Main Injector project will also reach hard-won milestones in 2002. On December 20, 2001, came the welcome news that the NuMI project has been "rebaselined," that is the Department of Energy has approved the project's new cost and schedule, as recommended by a DOE Lehman Review panel in September.

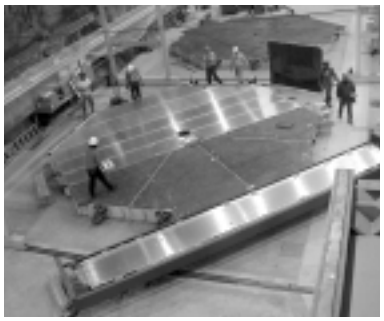
Photo by Fred Ullrich

In the Main Control Room, Operations Central for Fermilab's accelerators, the goal is to rev up the Tevatron to its best possible performance for Collider Run II.

"Rebaselining was a great Christmas present," said NuMI Project Manager Greg Bock. "This year will be another busy one for NuMI. As we speak, the tunnel boring machine is coming out of the ground. In 2002, we will finish tunneling on the Fermilab site and begin outfitting tunnels and constructing service buildings. Up north, in Soudan, the first supermodule of the MINOS detector will begin taking data from atmospheric neutrinos this summer. We're truly making progress."

Fermilab's long-term future will come one year closer in 2002; and long-range plans will be the subject of a January 28 meeting of the High Energy Physics Advisory Panel. That's the day HEPAP will make public the report of the Subpanel on Long Range Planning for U.S. High-Energy Physics, the so-called "Bagger-Barish" report, a road map for the field of high-energy physics over the next 20 years. Among its recommendations will be construction of a linear collider "somewhere in the world," hopefully in the United States, as the next large accelerator for high-energy physics.

"In line with the Subpanel's recommendations, linear collider work will be getting heightened attention at Fermilab," Witherell said. "In addition



MINOS is making progress at the Soudan mine site (clockwise, from top left): applying scintillator to the first detector plane; lifting the first steel plane from the assembly area; rigging the first steel plane to the detector support structure; the detector plane in place; the detector control room seen through the bore of the first detector plane. Eventually, 486 planes will fill the detector hall.

Photos courtesy MINOS collaboration

to working on accelerator R&D, we have also formed a linear collider detector working group."

Fermilab astrophysics projects will be looking up in 2002. The Cryogenic Dark Matter Search will chill down for action in late spring. In Argentina, as successive governments and the peso fell, so did cosmic ray air showers and in December the Auger Observatory observed them for the first time using both fluorescence and surface detectors, which worked precisely according to plan. Auger's objective in 2002 will be to proceed with full production and deployment of detectors.

The Sloan Digital Sky Survey will scan the sky and measure redshifts for galaxies and quasars at its design peak rate of up to 2500 square degrees and 200,000 spectra per year, providing new statistical leverage in the distribution of matter on cosmological scales, said SDSS spokesman Rich Kron.

"In the search for rare objects, such as spectacularly luminous quasars seen at the greatest look-back times," Kron said, "it is quite possible that SDSS will break its own redshift record yet again in 2002."

Security concerns following the September 11 terrorist attacks closed Fermilab's gates to most of the visiting public. Laboratory officials expressed hope that the easing of such concerns in 2002 will bring neighbors back to the laboratory.

"It's very important to Fermilab that we maintain the close and friendly relations that we've always enjoyed with our neighbors," Witherell said.

Also ahead in 2002: the home stretch, or at least the almost-home stretch, for Fermilab-led accelerator and detector projects for the Large Hadron Collider at CERN; R&D for the TESLA project; stepped up preparations for Collider Run IIb; extraordinary efforts in computing to deal with the data from Fermilab physics and astrophysics experiments, high-powered new theory applications and the international data grid; ongoing accelerator and magnet R&D; intense efforts on proposed new experiments for Fermilab's future... The to-do list for 2002 is a long and active one.

And those are just the things we know about.

ASK-A-SCIENTIST RESUMES

Beginning January 19, Fermilab's Ask-a-Scientist program resumes at a new time and location: Saturdays, 1 to 3 p.m. at the Lederman Science Center. The hands-on exhibits of the Center will be open from 9 a.m. to 3 p.m. For more information: www.fnal.gov/pub/presspass/press_releases/ask_scientist.html

VAN POOL

Tired of driving to work? PACE offers a Vanpool Incentive Program for Fermilab employees and users. Post a message on our WebBoard at www.fnal.gov/faw/vanpool/ for both car- and vanpool groups.

CALENDAR

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

FERMILAB ARTS SERIES PRESENTS: MARC SMITH'S UPTOWN POETRY SLAM

Featuring 4 Performance Poets, 4-Piece Jazz Band, and Marc Smith, "The Slampapi"

Saturday, January 26, 8 p.m.

Tickets - $18 ($9 ages 18 and under)

Since Marc Smith began the poetry slam at the famous Green Mill jazz club (former hangout of Al Capone) in Chicago's Uptown neighborhood, competitive performance poetry has spread throughout the world. The evening includes performance poetry as well as a poetry slam, in which audience members are invited to take that power and creativity into their own hands.

FERMILAB LECTURE SERIES PRESENTS:

Bioterrorism in the 21st Century

Dr. Philip Brachman, Emory University

Friday, February 1, 2002 at 8:00 p.m.- $5

Fermilab's Ramsey Auditorium

Dr. Philip Brachman is former Director of the Bureau of Epidemiology with the Centers for Disease Control in Atlanta and currently a Professor in the School of Public Health at Emory University. He will shed light on the recent events, as well as give insights on prevention and contingency plans on a variety of methods of bioterrorism.

To purchase tickets, or for further information or telephone reservations, for Fermilab Arts and Lecture Series events, please call 630-840-ARTS weekdays between 9 a.m. and 4 p.m.

Please Note: At this time Fermilab is accessible to the public only from the west entrance. From Kirk Road, turn east on Pine Street. Additional information is available on our web page 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.

MILESTONES

STORED

Antiprotons; by the Fermilab Antiproton Recycler Storage Ring, for 30 hours reaching a beam intensity of 1e11; on January 9, 2002.

APPOINTED

Persis S. Drell of Cornell University, as Professor and Associate Director of the Research Division at the Stanford Linear Accelerator Center. The appointment takes effect in the spring of 2002.

RETIRING

■ Glenn C. Johnson, ID 1039, BD-Accelerator Controls Dept. December 31, 2001.

CARRIED

■ The Olympic Torch: by Annie Jackson, daughter of Judy Jackson, head of Fermilab's Office of Public Affairs; on January 5 in Racine, Wisconsin as part of the procession bringing the torch to the Winter Olympics in Salt Lake City.

CORRECTION

Due to an editing error, "View From the Top" (*FERMINEWS*, vol. 24, no. 20, Dec. 14, 2001) omitted the information that Lederman Fellow Natalia Kuznetsova received her Ph.D. from the University of California at Santa Barbara. *FERMINEWS* regrets the error.

Chez Léon MENU

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

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

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

Lunch
Wednesday, January 23

Spiced Cornish Hens with Curried Onions and Potatoes
Sauteed Peas with Cumin
Almond Baklava with Rose Water

Dinner
Thursday, January 24

Vichyssoise
Fillet of Sole Stuffed with Crab
Green Beans and Carrots with Mustard and Chervil
Mixed Field Green Salad
Chocolate Fondue with Fruit

Lunch
Wednesday, January 30

Northern Italian Meat Lasagna
Caesar Salad
Mocha Creme Filled Profiteroles

Dinner
Thursday, January 31

Tortilla Chicken Soup
Lamb Adobado with Chipotle Sauce
Mexican Rice
Jicama, Red Pepper and Cilantro Salad
Lime Coconut Tart

FERMI NEWS

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The deadline for the Friday, February 1, 2002, issue is Wednesday, January 23, 2002. 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

■ '00 Ford Focus LX, 4-dr, 5-speed, radio with CD player. 18,300 miles. Has approximately 1-1/2 years left on the factory warranty. Silver color. $9,800 Call David Butler at x3370 or e-mail dbutler@fnal.gov

■ '99 Hyundai Accent L, 2-dr hatchback. 5 speed, two air bags,rear window defroster. Excellent condition, only 25K miles. Economical and reliable car. Great gas mileage. $4,950 o.b.o. Call Simon at x2329 or email: swalk@fnal.gov.

■ '98 Chevrolet C1500 Silverado pickup, reg. cab, short bed, 5.7L V-8 engine, 5 speed manual trans., 31K miles, ps, pdb, pw, pl, tilt, cruise. Dark blue with matching interior. Maintenance records since new. No dings, dents, accidents, or rust. $12,500. 630-859-8596, or pritchard@fnal.gov

■ '97 Jeep Grand Cherokee Ltd., 4 WD, V8, 32K miles; loaded, excellent condition, well maintained, $14,900. Call Phyllis, ext, 2522 or 630-585-0907.

■ '96 Jeep Grand Cherokee Limited 39k miles, metallic green, 5.2 Liter V8, QuadraTrac, towing package, leather, keyless entry, loaded! $13,000 must sell 630-840-8319 John.

■ '94 Mercury Villager "Nautica" minivan, white, auto., ABS, airbag, 3 doors, 7 leather seats, loaded, very good condition, 102K mi, $7500 See more http://tdserver1.fnal.gov/montanet/car/car.htm Email montanet@fnal.gov x6486 or x4234.

■ '93 Cadillac Deville, Colorado car, $5,000 o.b.o., fully loaded/leather interior, keyless entry, 69k miles. Call x3057.

■ '90 Honda Accord LX new tires, brakes, excellent upkeep 107,000 mi. 33 MPG. Must sell, asking $2,500 call 630-557-2397 day or night.

■ '89 Plymouth Horizon, 4-dr hatchback with fold-down rear seat. Always reliable and solid Southern car. Second owner. Good gas mileage. Automatic & cruise. 96K miles. $1,300 o.b.o.. Call 708-645-1168 or x6342.

■ '89 Ford Probe 2-dr hatchback, sport version LX. 4 cyl, automatic w/cruise, excellent condition. Priced to sell. $1,250. Call 630 851 9769 or X4987.

■ '93 Harley Davidson Softail, needs work, $10,000 o.b.o.Steve 1-815-895-8852 or e-mail Pam at pkisham@fnal.gov.

■ '96 Arctic Cat ZRT 600 snowmobile, 3936 miles V-Force Delta II reeds, 144 traction studs, silencer $3,000 newhart@anet.com 630-365-1601

■ 16 HP Lawn Tractor with 42″ mower deck. Ward's Industrial/commercial, Briggs 16hp twin cyl engine. Dependable, good running tractor, 11 years old. $300 call Ed Dijak X6300, home 630-665-6674, or dijak@fnal.gov.

■ Tires: Four 245/75 x 16 tires and custom rims with 8 lugs. 10,000 miles left on tires. $100 takes everything . Email lscott@fnal.gov or 840-4681.

■ Tires: (4) P215/60R14 raised-white-letter tires on 5-lug Ford factory aluminum mag wheels. Fits Ford Ranger. $125.00 for all 4. Call Mark Shoun at x2085, page x0511 or email shoun@fnal.gov.

■ 2002 Nitro Bass Boat. BRAND NEW!!! This fully equipt fiberglass boat has 50hp with power trim/tilt, foot controlled trolling motor, Hummingbird locator and custom trailer. Won in a contest. If purchased new this package would cost around $12,500. Asking $9,600 Call Mark x6510, E-mail msteinke@fnal.gov, home 630-553-5186.

■ Snowboard Package: Marker, Mfg. Germany, Bindings, Stepin Boots men's size 9″, Board 141 cm, Paid $350 asking $100. Call AJ x6896 or 630-690-1560.

■ Tama Swingstar drum set - gloss black color. Set includes 1 base drum, 1 snare & stand, 1 floor Tom, 2 rack Toms, 14″ Hi-Hat cymbals & stand, 16″ crash cymbal & stand, and 1 Sabian 20″ heavy ride cymbal & stand. Throne not included. $675. We'll throw in a set of used wooden sticks but you're on your own for ear plugs. Contact T.J. 630-840-3299 or sarlina@fnal.gov.

■ 19″ Magnavox color TV/VCR combo; cable ready. Eight years old, like new $125. sweber@fnal.gov.

■ Hypertech computer enhancement for fullsize truck or S10, Blazer, '96 or '97 only. Call for details. Chuck, x3556, 3557.

■ Brinks fireproof home safe. Dual locking system, combination and key. 1 cu. ft. capacity, model 5061/5060/1060. Brand new, still in the box. Asking $75. 630-859-8596 or pritchard@fnal.gov

■ Glass mirror with beveled edges, 30″x36″x1/4″, like new. $10. Contact Bob x4700.

■ HP Desk Writer 550C color printer for Mac. Works well. $25 x4699 or pseifrid@fnal.gov.

■ Dining room set by Lane, solid walnut. Table (6 ft x 4 ft, with two 18″ leafs), six chairs, hutch and lighted china cabinet. $425. Bob x2702, evenings 879-2698.

■ Collectable items for sale-Star Wars, Star Trek, Madonna. Books, posters, cards and other collectible merchandise. All in great condition. Call Steve at 815-756-1287 if interested.

FOR RENT

■ Room in 3-bdrm West Chicago house near train. Large kitchen, washer/dryer, $420 plus utils. x2724 or kirby@fnal.gov.

ROOMMATE WANTED

■ Male or female, to share a 1 yr. new, 7 rm., 2.5 bath tri-level townhouse, second floor laundry, living room fireplace, dinning room pool table, rear deck, clean quiet neighborhood adjacent to golf course, just 9 miles from the lab. Only $500/mo., utilities included. Short term leases considered. Eve x6498 aponte@fnal.gov.

LOOKING TO RIDE SHARE

I am in need of a ride to and from work. My work hours are 8:30-5 (can be a little flexible). I reside near the corner of Eola Rd. and Hafenrichter Rd. in the new Homestead subdivision in Aurora. This is 3 mi. S of Rt. 34 and 5 mi. W of Rt. 59. I work at the corner of Hubbard Ave. and Kirk Rd., 1/2 mile north of Fermilab. I can be reached at work, 630-406-5900 or at home after 6 p.m. at 630-978-4119. Ask for Bryon Guyer.

EARLY RISERS?

Looking for fellow early risers to walk the Fox River bike path Sunday mornings. Call Michelle x8062.

LAB NOTES

URA SCHOLARSHIPS REQUIRE SAT TEST SCORES

Universities Research Association (URA) awards a number of scholarships to children of regular, full-time Fermilab employees. URA scholarships are awarded on the basis of SAT (Scholastic Aptitude Test) scores. Scholarship candidates must be high school seniors who will begin a four year college degree program next fall. The maximum amount of the scholarship is $3,000 for tuition and fees, and is renewable for four years for students in good academic standing. Applications are available January 1 through March 1. Scholarships will be awarded in early April. Questions about the program may be directed to Jeannelle Smith of Human Resources, Mail Station 124, extension 4367.

FALL AND WINTER RECREATION PROGRAMS

Adult Outing-Spirit of Chicago Island Fever Cruise, March 16. Muscle Toning, Tai Chi, & Pilates Classes. Climb a Mountain Exercise Program. Discount Movie Ticket Sales. Entertainment Book Sales. Information at the Recreation web page http://fnalpubs.fnal.gov/benedept/recreation/recreation.html

PLAYERS WANTED

Coed Volleyball league is looking for additional female players. Games are Monday evenings at 6:30 and 7:30 p.m. Fermilab gym membership is required. Please contact Elizabeth Gallas, eggs@fnal.gov.

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