FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY

A Deep Sense of Place 8

Photo by Fred Ullrich

Volume 25
Friday, June 14, 2002
Number 10

INSIDE:

Extended FAMILY?

Physicists report signs of new relatives of the proton

by Kurt Riesselmann

On Friday, May 31, a group of physicists presented the results of a yearlong analysis of an experiment carried out at the Department of Energy's Fermi National Accelerator Laboratory. Sifting through the data of particle collisions in which they produced particles made of three quarks, the experimenters found signals that indicate the creation of new particles with quark combinations never observed before. However, experimenters emphasized that significant questions remain in the interpretation of these results.

Jim Russ

Jim Russ, co-spokesperson of the SELEX collaboration, announced the new results to a group of 90 scientists during a seminar at Fermilab.

"Our analysis has reached a point of maturity," said Russ, physics professor at Carnegie Mellon University. "We believe that we have found three candidates for doubly charmed baryons. But there are many puzzling aspects that remain."

"Baryon" is expert's lingo for a class of particles composed of three quarks. Protons and neutrons are the most frequent baryons occurring in nature, accounting for almost all matter on earth. Since quarks, the fundamental building blocks of matter, come in six different types, scientists have predicted many other three-quark combinations to exist, including baryons with two charm quarks, which SELEX scientists may finally have seen.

"People have observed charmed baryons in the past, but not with two charm quarks," said Mark Mattson, who based his Ph.D. thesis on this particle search. "Since there were rough predictions of their properties, we had an idea about how to look for them and what sort of particles they would decay into."

In the last 30 years, scientists have conducted increasingly sophisticated experiments to produce the various types of three-quark systems expected to exist. Similar to the periodic table of atoms, particle physicists have identified a classification scheme for baryons. The endeavor of creating the heaviest of these quark-composite particles, however, is challenging, comparable to the quest for the heaviest, still-undiscovered elements of the periodic table.

The SELEX collaboration includes 130 scientists from 10 countries: Brazil—9, China—7, Germany—9, Israel—5, Italy—8, Mexico—2, Russia—49, Turkey—1, United Kingdom—2, United States—38 (Illinois—8, Indiana—1, Iowa—12, Michigan—1, New York—5, Pennsylvania—11)

On the Web:

The SELEX Seminar, 5/31/02 (streaming video)
http://vmsstreamer1.fnal.gov/VMS_Site_02/Lectures/WC/Russ/index.htm

The SELEX Homepage
http://fn781a.fnal.gov/

The Classification of Particles
http://www.nobel.se/physics/educational/matter/7.html

The Quark Dance
http://quarkdance.org/

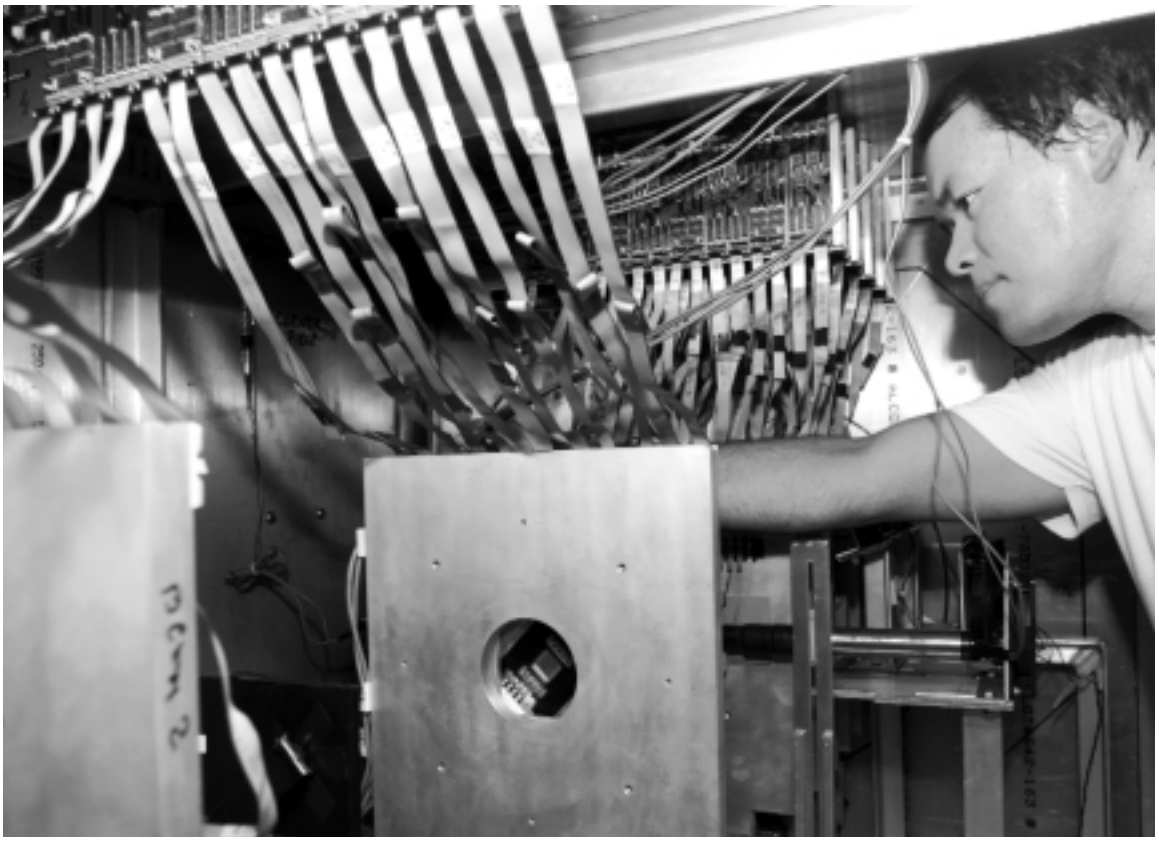
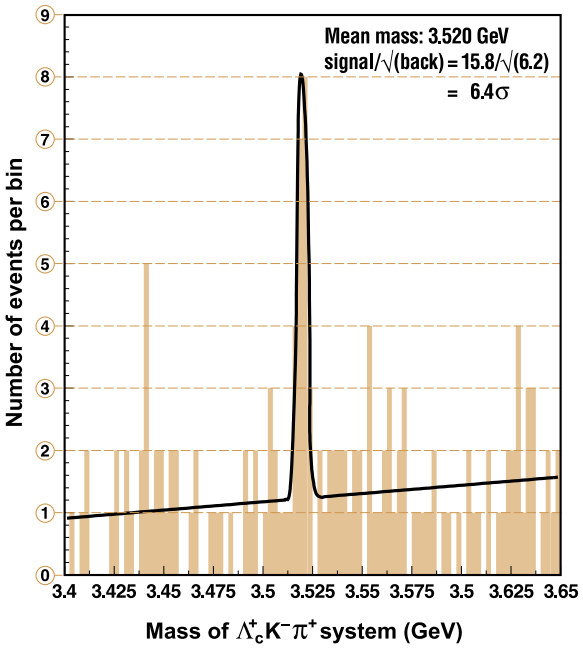


Photo by Reidar Hahn

Mark Mattson checking the silicon vertex detectors of the SELEX experiment. The detectors, which allow for precision measurements of particle tracks, are essential to identify short-lived charm particles. Mattson, a former graduate student at Carnegie Mellon University, wrote his thesis about the search for doubly charmed baryons.

SELEX candidate for a *ccd* baryon



The SELEX collaboration has observed three new massive particles. This plot unveils 16 examples of a particle with mass of 3.520 GeV decaying into three particles: $\Lambda_c^+K^-\pi^+$. The particle is a candidate for the Ξ_{cc}^+, which has never been observed before.

"We're trying to understand the structure of matter," said Fermilab physicist Peter Cooper, the second spokesperson of the SELEX collaboration, which comprises 130 scientists from 10 countries. "More than ninety-nine percent of what all of us are made of are protons and neutrons. They are composite objects, sort of like atoms. The question is: How are they put together? What is their structure? What is the nature of the forces that hold them together? By studying various baryons, we learn something about the family traits."

Using detector components built at physics laboratories in Russia, Germany, Brazil, Italy and the United States, the SELEX experimenters recorded in 1996 one billion collisions of high-energy particles with a diamond target. Physicists searched the resulting data for easily identifiable particles, and then linked the tracks of different particles to reconstruct decays of heavy, very short-lived baryons. Over five years, the collaboration steadily developed the tools to look for more and more complicated decay patterns. Last year, physicists finally applied their latest tools to a sample of singly charmed baryons, which are the key to identifying doubly charmed baryons.

Photo by Reidar Hahn

Some of the 130 members of the SELEX collaboration in front of Fermilab's Wilson Hall. Standing from left: Nikolai Terentyev, Nikolai Kuropatkin (both St. Petersburg, Russia), Jürgen Engelfried (San Luis Potosi, Mexico), Jim Russ (Pittsburgh, Pennsylvania), Loretta Dauwe (Flint, Michigan) and Peter Cooper (Batavia, Illinois). Front row from left: Nikolai Bondar (St. Petersburg), Joe Lach (Batavia), Mark Mattson (Detroit, Michigan)

Finding ingredients of the Big Bang

Peter Cooper

The SELEX experimenters think they now can fill a few blanks in the baryon classification tables. Their analysis indicates the existence of doubly charmed Ξ (pronounced sigh) particles, a type of baryon that may not have been produced in nature since the very first minutes after the creation of the universe, the Big Bang. Based on Mattson's Ph.D. research, a thorough analysis of the SELEX signals has revealed candidates for two different types of doubly charmed baryons. One type has an up quark in conjunction with two charm quarks (*u*-*c*-*c* combination), and the other one contains a down quark as third constituent (*d*-*c*-*c*). The *s*-*c*-*c* baryon, which includes a strange quark, and the all-charm combination (*c*-*c*-*c*) are still eluding detection.

"If any of these states didn't exist it would be miraculous," Cooper said. "This is the quark model, the extension of the theory that Murray Gell-Mann won the Nobel Prize for.

"There are four different quark flavors that can contribute at the energies used in our experiment, and we ask: how many ways can we combine them to make up all the possible baryons. If one of these combinations didn't exist in nature, there would have to be some very fundamental reason why."

The four flavors—up, down, strange, charm—allow for twenty different ways of putting quarks together to form baryons (see graphic). Protons, for example, consist of two up quarks and one down quark (*u*-*u*-*d*), and neutrons have a *u*-*d*-*d* quark content. Some combinations exist in two different spin configurations, and the SELEX collaboration believes it has identified both spin levels of the *u*-*c*-*c* baryon.

Because charm quarks are much heavier than up, down and strange quarks, the doubly charmed baryons are more difficult to produce. The SELEX data, for example, indicates the *u*-*c*-*c* baryon mass to be about four times larger than the proton's, making the particle as heavy as an entire helium atom.

The two heaviest quark flavors, called top and bottom, weigh too much to contribute to the SELEX data. Scientists, however, already predict that a new generation of Fermilab experiments, currently recording data, will reveal baryons containing bottom quarks in combinations never seen before.

Questions remain

Although the SELEX analysis has convincingly shown the existence of three high-mass particles, the collaboration is still grappling with surprising findings. The mass difference among the new baryons, for example, doesn't match theoretical mass predictions for doubly charmed baryons.

"Based on particles already found, you can extrapolate to what these particles should behave like," Mattson said. "Our findings don't quite satisfy all predicted properties."

Physicists expect the mass difference between *u*-*c*-*c* and d-c-c baryons to be comparable to the difference in proton (*u*-*u*-*d*) and neutron (*u*-*d*-*d*) mass, since this particle pair is also related by the replacement of an up by a down quark. The proton-neutron mass splitting, however, is sixty times smaller than the mass difference between the Ξ_{cc} candidates observed by the SELEX collaboration.

"That's huge," Russ pointed out. "On the other hand, this may reflect on the dynamics of particles with two charm quarks. Nobody else has ever measured baryons with two heavy quarks."

Fermilab theorist Estia Eichten, who attended the seminar, was one of many scientists viewing the large mass difference with skepticism. During the question-and-answer session at the end of the seminar, he promised to provide the collaboration with some theoretical input.

"[The mass splitting] is probably calculable," he said. "I'll do the calculation."

Other questions, however, remain as well. The SELEX collaboration is puzzled by the high rate of doubly charmed baryons seen in their experiment.

As a matter of fact, most scientists believed that the SELEX collaboration wouldn't see any of these particles.

"Many years ago, there was one paper in which—based on certain theoretical assumptions—the authors came right out and said it is impossible for SELEX to find this," Mattson recalled. "Fortunately, there are complementary experiments, like FOCUS (at Fermilab) and CLEO (at Cornell University), that can perhaps look for these signals. And future experiments should have enough data to verify our findings, too."

It wouldn't be the first time that charmed baryons have provided the physics community with a big surprise. In 1985, nobody expected Experiment WA62, carried out at the European accelerator laboratory CERN, to discover singly charmed baryons. But the production rate turned out to be much larger than predicted.

Is the story repeating itself at SELEX?

Peer review essential

"At this point, we have to get some feedback to understand where we are," Cooper said, explaining why the collaboration decided to go public. "If this is real, then there is lots of work for us to do, and there is lots of work for other people to do. We should exploit this, trying to learn everything we can from the data we have. We already have evidence for three states that nobody has seen before, which is an awful lot in one go. Right now, it is sort of time for a reality check."

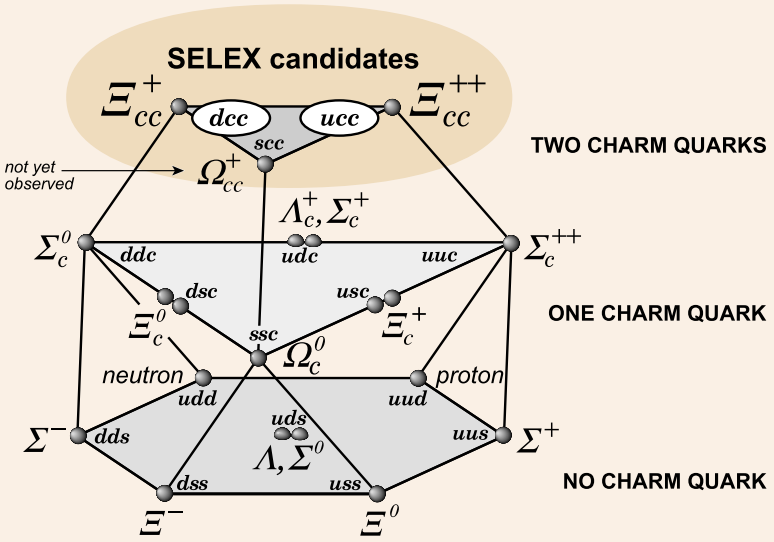
In addition to the talk at Fermilab, which is available on the Internet as streaming video, the SELEX collaboration will present its results at a physics conference in Vancouver, Canada, at the end of June. And Cooper expects that he'll be talking to physicists of the BABAR and Belle collaborations, which currently record particle collisions at accelerators in California and Japan. Although their experiments focus on the production of particles involving bottom quarks, those scientists may find a large number of doubly charmed baryons hidden in their data if the surprisingly large production rate of these particles is confirmed.

If the new results withstand the critical first peer review, the SELEX collaboration will submit an article for publication in a scientific journal.

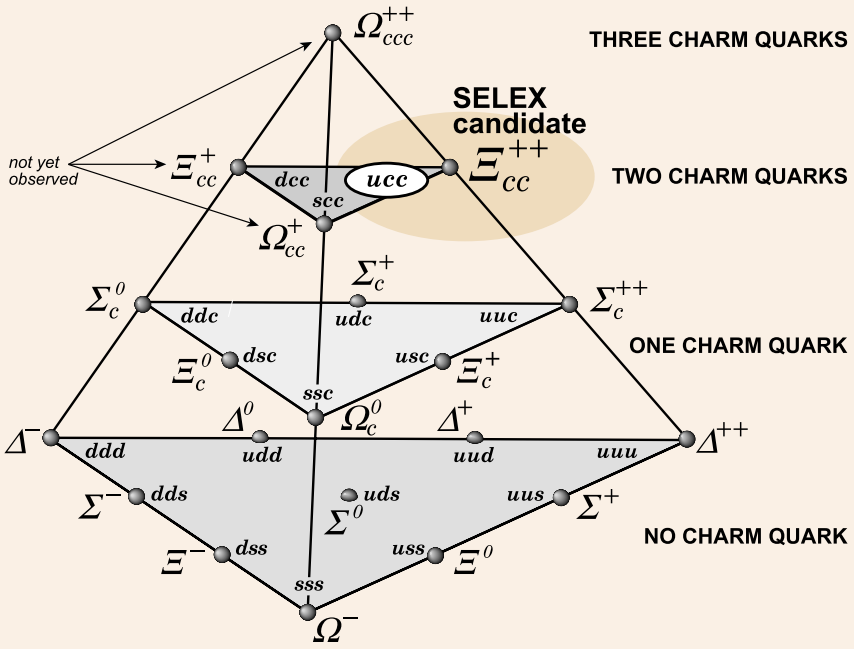
"We are just beginning to draft this thing," Cooper said. And he added with a smile: "To get a paper out of a collaboration—it's sometimes easier to have a child!"

After analyzing one billion particle collisions, writing a paper should actually seem like a piece of cake.

BARYONS WITH LOWEST SPIN (J = 1/2)



BARYONS WITH HIGHEST SPIN (J = 3/2)



The four lightest quarks—up (u), down (d), strange (s) and charm (c)—can be arranged in 20 different ways to create baryons, composite particles containing three quarks. Some of the combinations come in two different spin states: an excited state (J=3/2) and a ground state (J=1/2). The SELEX experiment has found candidates for three previously unobserved baryons, all containing two charm quarks.

Graphics based on the 2000 Review of Particle Physics, Particle Data Group

¡Hécho en México!

Kaon experiment commissions detector components from Mexican university

by Gary Ruderman

Photo by Jenny Mullins

Herman White with a sample of the press coverage of the agreement signed at San Luis Potosi.

In his 28 years at Fermilab, physicist Herman White has both witnessed and helped encourage the globalization of science.

"The focus today is on international cooperation," White said, "especially in high-energy physics. We are a world society."

With this extended focus, every part of the world takes on increasing importance—and offers increasing opportunities.

White recently worked as both kaon researcher and diplomat in helping complete an agreement with *Universidad Autonoma de San Luis Potosi* (UASLP), in Central Mexico north of Mexico City, to build part of the detector for Fermilab's Charged Kaons at the Main Injector (CKM) experiment. While Mexican researchers have a longstanding presence at Fermilab, the agreement marks the first time that a Mexican institution has been responsible for building part of a new experiment.

"This is an embryonic collaboration between the U.S., Mexico and Russia," White explained. "It's an opportunity to bring people together from all around the world."

The choice of UASLP grew from already-established collegial associations. This international outreach centers around two Fermilab high-energy alumni: Jürgen Engelfried and Antonio Morelos Pineda. Engelfried was a postdoctoral candidate from the University of Heidelberg studying charmed particles at Fermilab. Engelfried went on to CERN and then to the university in San Luis Potosi. Morelos Pineda was a graduate student at Fermilab from San Luis Potosi who studied under the Mexican theorist Augusto Garcia.

Engelfried and Morelos Pineda are also collaborators on the SELEX experiment, which has announced indications of baryons containing two charm quarks, a combination never seen before experimentally (see the story on Page 2).

"The commitment of the scientists really drives many choices for specific contributions to the project," White explained. "This is mostly the case for San Luis Potosi in that our collaborators there have the expertise for significantly contributing to the design of the detector, including producing the mirrors. It's the usual practice to go to those with a history of expertise, someone you know."

Fermilab has a history of outreach toward Mexico and other countries in Latin America, sparked by director emeritus and Nobel laureate Leon Lederman. While serving as Fermilab director in the late 1970s Lederman called for more cooperation with Latin America.

On the Web:

E 921—Charged Kaons at the Main Injector
www.fnal.gov/projects/ckm/Welcome.html

Universidad Autonoma de San Luis Potosi
www.uaslp.mx

Antonio Morelos Pineda of UASLP displays a mirror prototype.

"With a GDP of hundreds of billions of dollars there is no logical reason why Latin America could not develop to the equal of Europe," Lederman said recently. "So why not give them a hand?"

U.S. Rep. Rush Holt (D-NJ), former assistant director of Princeton Plasma Physics Laboratory, is a proponent of scientific collaboration beyond the usual connections with Japan and Europe. He applauded the Fermilab accord with San Luis Potosi.

"When you consider that much of scientific research is for the sake of knowledge, in other words for cultural reasons," said Holt, "it's almost incumbent on the American researchers to include …some international breadth to the research."

Holt added that while the United Nations leads a great deal of the international scientific collaboration, much more of the cooperation happens "through some collegial or individual contacts."

At Fermilab, connections with developing nations are growing.

"Now we're focusing on countries like Bangladesh and Vietnam, where physicists are in short supply," explained physicist Peter Cooper, who signed the accord with San Luis Potosi as CKM spokesperson. "We are the United Nations of physics."

Under the memorandum of understanding, San Luis Potosi will design and build the mirror array for the Ring Imaging Cerenkov counter of CKM.

Cerenkov light is produced by particles traveling faster than the speed of light in water. The light is focused by a mirror array into the Ring Imaging Cerenkov counter. Measuring the angle of the light's emissions in a cone around its trajectory allows researchers to measure the particle's velocity, trajectory and energy.

The CKM experiment—which hopes to begin taking data in about 2006—looks at rare kaon decays that, at their foundation, provide another view of the properties of symmetry or asymmetry between particles and antiparticles. The CKM experiment is designed to maximize the efficiency of observing and measuring very rare kaon decays.

In the case of kaon decays, rare means quite rare, indeed. The first measurement of this particular rare kaon decay required a 15-year search at Brookhaven National Laboratory. The second was made in 2001. The CKM experiment at Fermilab anticipates measuring 100 events in a two-year period, which White explained would provide a precise measurement of the decays and another test of the Standard Model of fundamental particles and forces.

The agreement between Fermilab and UASLP might also extend its reach beyond the production of the mirror array.

"Possibly, from a university perspective," White said, "participating in a large international research project will attract students to a unique technical area, and supporting that participation is just a good idea."

Which could, in turn, spur further funding from the Mexican university. Adding perspective to the San Luis Potosi collaboration, White said the scientists who come through Fermilab from other countries are the "seed corn" for future experiments—and for future connections.

"Since our motivation is academic," White said, "we've reached out ever since this facility was built. As a society, reaching out is what we must do."

Photos by Herman White

At the signing ceremony (from left): Hugo Navarro Contreras, Universidad Autónoma de San Luis Potosí; Peter Cooper, Fermilab CKM Spokesman; Jaime Valle Méndez, Rector, UASLP; Mario García Valdez, UASLP; Pedro Villaseñor González, Director, Instituto de Física, UASLP.

A DEEP Sense of Place

by Mike Perricone

On the Web:

Soudan Underground Mine
www.dnr.state.mn.us/state_parks/soudan_underground_mine/index.html

NuMI-MINOS
www-numi.fnal.gov

MINOS Mural Project
http://members.macconnect.com/users/g/giannetti/pages/mural.html

Soudan iron mine offers

SOUDAN, Minn.—If Gertrude Stein had ever visited this far northeastern corner of Minnesota, she probably would have written about the Soudan region in the same way she did about Oakland, California: “There is no there, there”

But that’s all right, because the people up here like it that way. And they’d know that Gertrude Stein never worked in a mine. Most people up here have, one time or another, often through more than one generation, and often through lean times.

The number of miners is seriously declining in this region, called the Iron Range since rich ore deposits were discovered in 1865. The underground mines have largely given way to surface mining, which requires less labor, is amenable to mechanization, and produces far more ore from less-concentrated deposits by processing more rock, faster and cheaper, crushing the rock and separating the ore magnetically. Quantity outstrips quality.

But the underground mines remain. The Soudan Underground Mine is one of them, a national historic landmark since 1966—and a physics laboratory since 1979. With commendable foresight, the state of Minnesota has sought alternatives for more than 60 years to an over-dependence on mining for the economy of the region. The Iron Range Resources and Rehabilitation Agency was created by the 1941 Minnesota Legislature to help ease northeastern Minnesota’s dependence on the natural ore and timber industries.

The Soudan Underground Mine was closed in 1963 and placed on the National Register of Historic Places in 1966. It is operated as a state park by the

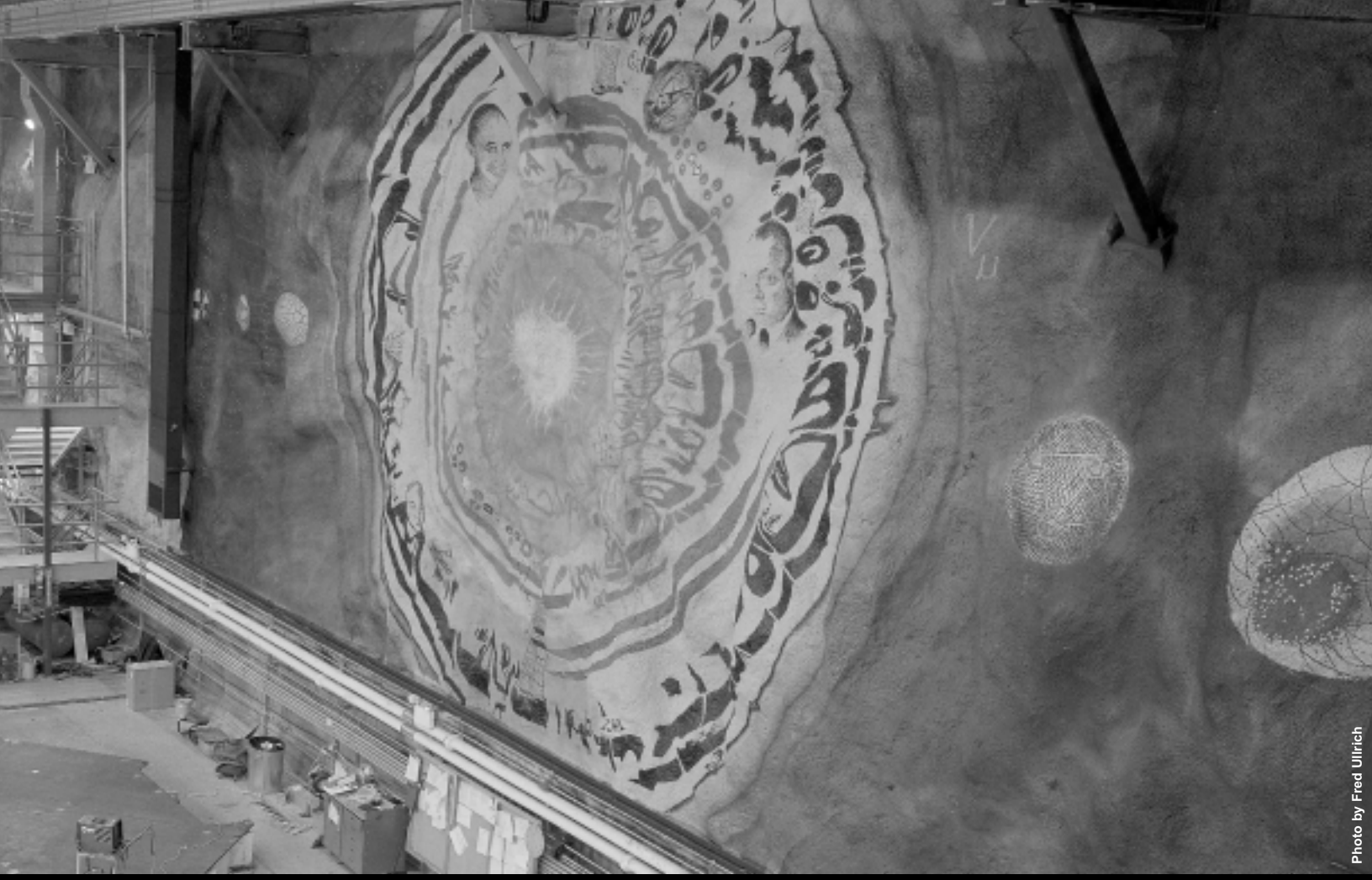


Photo by Fred Ulrich

neutrino science some bedrock support

Minnesota Department of Natural Resources, with 14 tours a day taking the fast and clamorous elevator ride nearly a half-mile below the surface. After descending, hard hat-wearing tourists can view old mine caverns with some of the equipment still standing in place.

Since Memorial Day, tourists have also been able to view the cavern housing the detector array for the Main Injector Neutrino Oscillation Search—nearly 500 assemblies of steel, scintillating plastic and electronic readouts, shaped like 28-foot stop signs, hung like file folders, each weighing 12 tons. The completed array will weigh 6,000 tons, about equivalent to a naval battleship, aimed at halting a small portion of the neutrino beam sent through the earth from Fermilab.

The tourists can also catch a glimpse of real miners—although these miners are now working for the University of Minnesota, assembling and mounting the detector planes that will halt a handful of neutrinos a day when the experiment is up and running, around 2005. The working crews were drawn largely from some 1,400 people laid off when the LTV Steel Mining Company shut down its facility in nearby Hoyt Lakes in May, 2000. It was just about that time that MINOS detector construction began.

"You never like to have good fortune based on someone else's bad fortune," said Assistant Lab Manager Jerry Meier. "But with the LTV layoffs, we were able to bring in people with excellent skills and experience. We really have quality crews working here."

The crews work 10-hour shifts, four days a week. They work quickly, quietly, efficiently and fastidiously—the cavern floor glints under the stark white lighting. They work so well, in fact, that the production schedule had to be changed—because the crews were running ahead of the predicted rate for assembling and mounting the detector components shipped from Fermilab.

The assembly work in the cavern is quietly impressive, but the process of getting the components down the narrow elevator shaft is stunning.

The cavern housing the detector for the Main Injector Neutrino Oscillation Search, where nearly half of the projected 486 detector planes have been assembled and installed. The mural is 59 feet wide and 25 feet high.

Cover photo: The view from the other end of the hall.

Photos by Jerry Meier

From left: Crate of scintillating plastic being unloaded from a truck and placed on the elevator in the mineshaft; detector sections being unloaded from

The materials are delivered three times a week at 5:30 p.m., after the day shift and public tours have ended. The work is highly dependent on the weather, especially the wind conditions. When it's windy, the crews can't unload the boxes of scintillating plastic, which are about 30 feet long.

"We won't let them unload the scintillator if the winds are above 25 mph," Meier said. "The detector plate sections are heavy enough to withstand the wind, but the boxes of scintillator are too light and too hard to handle in the wind."

Watching the preparations, the unloading, and the elevator descent is like witnessing a combination of ritual dance and close order drill. The crew begins by essentially dismantling the elevator car, or cage, removing the sides and top. A pulley from the mine headframe begins slowly drawing the component—either the long wooden crate or the six-ton package of half a detector section—off the delivery truck. It takes so much space to shift the material from the horizontal to the vertical that part of the headframe support had to be removed and reconfigured. While the load is hanging there, and changing its orientation, the crew guides it to rest in the cage. Then it is sent 2,341 feet down the shaft to level 27, and unloaded by a similar process onto a track that carries it to a staging area in the cavern. Not a word or motion is wasted.

The operation can extend well into the night, as late as 3 a.m. For some of the crew members, this is not their only job. But they're accustomed to working two jobs if necessary, shifting jobs because of layoffs or mine closings, or just because times aren't what they used to be. Physicist Earl Peterson of the University of Minnesota has been part of the underground laboratory operation since 1979, when the proton decay experiment (Soudan II) began. He's watched this sort of work performed for more than 20 years.

"These people have always lived here, and this is where they want to be," Peterson said. "They'll do what it takes to stay here."

Mines aren't the only feature of the area, or the only resource. Minnesota calls itself "Land of 10,000 Lakes," which is probably an underestimate given the innumerable inland basins in this heavily-forested region alone. The forest is a three-dimensional curtain of towering but stick-thin evergreens. Any peek through the curtain is likely to reveal a lake with miles of densely wooded shoreline interrupted by just a handful of clearings for prized and longstanding lakefront hideaways. The prevailing sentiment seems to be the fewer of those, the better—though many of them are having DSL lines installed.

"The city populations are declining, and we are seeing more people move into the rural areas," said Lab Manager Bill Miller, who built his own home and has been living on a quiet lakefront property for more than 25 years. "With the growth of the Internet, people are realizing they can live and work and be connected just about anywhere."

A phone call brought Miller the news that another neighbor was, indeed, interested in signing up for DSL. Miller explained that it would take five

the elevator at Level 27; surface buildings of the Soudan Underground Mine look out over the heavily-forested Iron Range of northeastern Minnesota.

subscribers to get a line run out to the lake. "Now we just need two more," he said.

Direct communication is still a priority on the project, and Miller frequently drives to Fermilab and back for meetings—a trip that can take as much as 10 hours each way (the neutrinos, meanwhile, will cover the straight-line distance of 450 miles in 0.0025 seconds). But distance driving seems to be the norm in this region. Miller has been known to drive with his wife on a Saturday to attend a Fermilab Arts Series presentation that night.

"Oh, it's not that bad a drive," he said with a shrug and a smile.

The arts have also reached down to Level 27 and made quite an impact. The University of Minnesota Foundation commissioned a mural for the MINOS cavern—a mural painted onto the rock wall, 59 feet wide by 25 feet high. The artist, Joe Giannetti of Minneapolis (whose accent betrays his origins in Brooklyn, New York), did his painting while dangling from a sling suspended from a support beam near the roof of the cavern. His distinctive technique was featured in a recent National Geographic television documentary about the MINOS project.

Giannetti was challenged, not only to find the right paint to adhere to the rock, but also to overrule his instincts in placing the image on the undulating surface. He had to steel himself to be guided by the image projected onto the wall from a slide projector across the cavern. Distortion in the close view translated to a normal image viewed from the second-level visitors' gallery across the cavern. The mural's fiery central focus area contains images of scientists such as Enrico Fermi and Wolfgang Pauli, Wilson Hall at Fermilab, George Shultz, a key figure in the history of Minnesota mining, and a number of surprises.

"The easy way out would have been to fill the horizontal space with a horizontal time line," Giannetti said. "But I wanted a focus that would be the same from any angle, and not be lost from one end to the other. I've included the word 'change' in as many languages as people could give me translations for it. Neutrinos are changing all the time—just as we are, just as the universe is. I'm fascinated by neutrino science, and I admire the imaginations of the scientists. A scientist had to imagine this experiment, this series of detectors. This place is a temple of the human imagination."

Scientists, miners and an artist have combined to create a special sense of place on Level 27. All that's required is looking beneath the surface.

Artist Joe Giannetti: "I'm fascinated by neutrino science, and I admire the imaginations of the scientists."

Changing of the Guard

Montgomery succeeds Shaevitz as Associate Director for Research

Photo by Dan Shaevitz

Mike Shaevitz is ready to roll on a Harley-Davidson custom VRSC, during commencement ceremonies at Columbia University. Looking on a bit warily is Jeff Bleustein, the C.E.O. of Harley-Davidson, who gave the commencement address at the school of engineering.

by Mike Perricone

After three years as Fermilab's first associate director for research, Mike Shaevitz is ready to saddle up and head back to Columbia University and Nevis Laboratories. Shaevitz, a Fermilab researcher since 1975, will move back to Westchester, New York in August, but he'll make frequent return visits as a collaborator on the MiniBooNE neutrino experiment.

The silver Harley, however, is only symbolic of his expected time on the road.

"Jeff Bleustein, the C.E.O. of Harley-Davidson, gave the commencement address when my son, Dan, graduated from the Columbia school of engineering last month," Shaevitz said. "Bleustein arrived on campus riding this new custom model. I got a photo op."

The charges of the last three years during Shaevitz's watch have gone well beyond the ceremonial. Collider Run II of the Tevatron had its official start in March, 2001; MiniBooNE is anticipating its first neutrino events; the Main Injector Neutrino Oscillation Search (MINOS) is progressing both at Fermilab and at the remote detector site in Soudan, Minnesota; the lab is moving ahead on a new fixed-target program originating at the Main Injector, as well as following the recommendations of the High-Energy Physics Advisory Panel in investigating the possibility of a linear collider. The list goes on from there.

"I feel I owe the lab a lot for my career in physics, and I'm glad I've been able to help in this way for these last three years," Shaevitz said. "It's been good to give something back in the way of service to the lab. I feel that we've accomplished a lot, though of course you always hope to accomplish more."

The position of Associate Director for Research was created in 1999 by new Fermilab Director Michael Witherell, with Shaevitz the first appointee. Fermilab physicist Hugh Montgomery has been named to succeed Shaevitz. Montgomery moves to the second floor of Wilson Hall bringing two decades of lab experience, including roles in fixed target experiments, in the "old" Research Division, the upgrades to DZero, terms as both co-spokesperson and department head at DZero, and as head of the lab's response to the severe recommendations of the 1992 review by the Department of Energy "tiger team."

On the Web:

Columbia University
www.columbia.edu/

Nevis Laboratories
www.nevis.columbia.edu/index.html

University of Manchester
www.man.ac.uk/

Manchester United
www.manutd.com

Harley-Davidson
www.harley-davidson.com

Photo by Reidar Hahn

Shaevitz in 1998, atop the now-dismantled NuTev detector. In October 2001, NuTev announced a significant and surprising discrepancy between predictions for the behavior of neutrinos in contrast to the way other subatomic particles actually behave. "Neutrinos seem to be different, and this is also showing up in neutrino oscillation experiments," Shaevitz said. "I think that's why people are so excited about neutrino physics."

Responding to the tiger team report was a milestone of teamwork under pressure.

"The tiger team examined the entire operation of the lab," Montgomery recalled. "They presented an ocean of findings. The lab had to provide a plan to respond to those findings. Our response team had to formulate what the lab needed to do for each finding, and estimate the cost of doing it. I was working with very good people—Gerry Bellendir, Kevin Cahill, Tom Nichol, Rich Stanek, Dan Wolf. By now these are some of the most senior engineers in the lab. We completed the report on time, though everyone had been skeptical about the target date at first. The consultants who were working with us called these guys 'the dream team.'"

Yet another team-building exercise lay ahead, on a somewhat different scale. Montgomery was co-spokesperson of the DZero collaboration, with Paul Grannis, when the top quark announcements were made for evidence of a finding in 1994, and for the observation in 1995. The significance of the discovery was complicated by the sheer numbers of collaborating scientists, and by the communication and review effort needed to bring nearly 500 voices into accord.

"It was quite challenging and rewarding," Montgomery said. "The time scales for a reaction were not long, given nearly 500 people were all required to say 'yes' before we could make a move. It was quite a trick, the last few weeks."

Grannis and Montgomery assembled a review board of scientists who were not working on top quark analysis, chaired by Michigan State's Harry Weerts, who went on to succeed Grannis as DZero co-spokesperson.

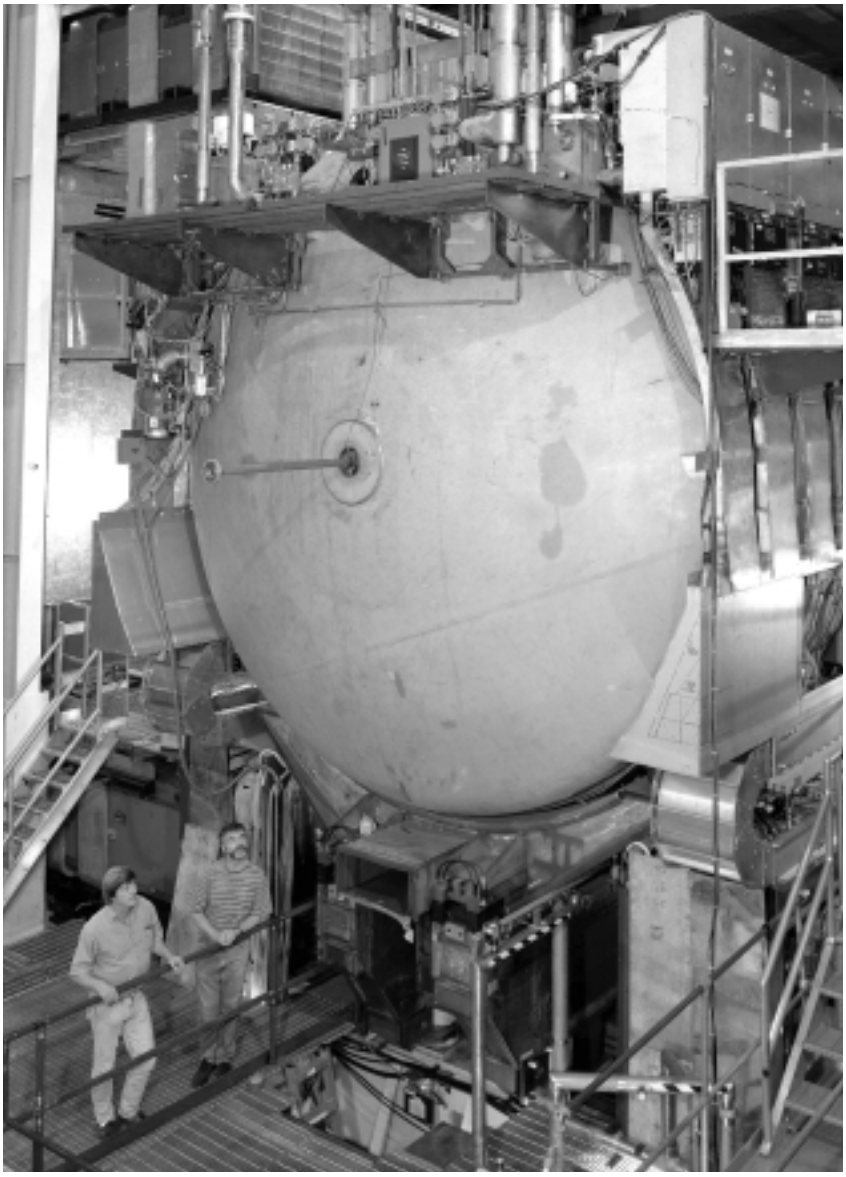
"Email had matured by then," Montgomery said, "so we made strong use of email communications to tell people what we were doing, what stage we had reached, and inviting them to contribute and comment. The collaboration stretched from Europe to Hawaii."

For the 1995 discovery announcement, Grannis gave the talk at Fermilab and Montgomery gave the presentation at CERN, where he had worked before moving to Fermilab.

"It was gratifying," he admitted, "to go back to the lab you had left ten years earlier, and say, 'Hey, we found the top.'"

Montgomery retains British citizenship, along with much of his North Country accent. His origins are in Middleham, a village in the cheese-producing region of northern England. The village grew from a castle built around the 12th century, which is still standing. Montgomery described the environs as "six hundred people, six hundred horses, one castle, two chapels, one church, and four pubs." His interest in physics grew from helping his instructor assemble lab equipment in secondary school (his starting class numbered 11 girls and five boys). He studied at the University of

Changing of the Guard



Co-spokespersons Hugh Montgomery (left) and Harry Weerts at the DZero detector in 1997.

Manchester ("…and I support Manchester United," he added quickly, staunchly establishing his soccer loyalties). At CERN, he was spokesman for the European Muon Collaboration before moving to Fermilab in 1983.

Montgomery (universally called "Mont") also organized the 2001 series of "Line Drive" lectures, highlighting issues involved with a linear collider as the possible next "big machine" for high-energy physics after the inauguration of the Large Hadron Collider at CERN later this decade. He said he is encouraged by the increased interest and enthusiasm for a linear collider evident in the last year, with university groups willing to participate in research and development for the machine, as well as in its experiments.

Fermilab is a major participant in LHC, building components for the accelerator and major structures of the Compact Muon Solenoid, and Montgomery saw a challenge ahead in a new experience for Fermilab physicists.

"We don't have a great deal of experience with large numbers of Fermilab scientists working outside Fermilab," he said. "But we'll have our scientists working remotely at CERN, while we also serve as a host hub for analysis, for computing, maybe even for physics here in the U.S."

But Collider Run II of the Tevatron is the research priority.

"Fermilab has a very big physics program, and with its collider and neutrino experiments, one can argue that it's the strongest in the world," Montgomery said. "We have the highest-energy machine in the world until the LHC. It's our duty to exploit that capability. It's also tremendously exciting. The physics potential is very high. We must execute well and exploit what we have, with very much a feet-on-the-ground approach. It will not require a 20-year vision, but it will require careful nurturing to maximize the results, given the limited resources felt by all the labs. Maintaining the right balance, looking for the right opportunity, and enjoying the ride—that's no mean feat. Looking to make the maximum of the opportunity—that will be my goal."

Shaevitz will be an active and enthusiastic participant, teaching at Columbia and continuing his neutrino research.

Photos by Reidar Hahn

Hugh Montgomery

"I'm happy Mont decided to take up the reins," Shaevitz said. "He's a good choice with a lot of experience at the lab. And it looks like Fermilab will be the center of the universe for the next ten years. It looks like most of the important physics in our field will come out of here. The Tevatron collider has such enormous potential in both discovery and measurement. The lab will also be the center of neutrino physics. It seems like a particularly good situation, and it was nice to be able to work on making it happen."

CALENDAR

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

SUMMER RECREATION

Employees, Users, On-Site Contractors and Retirees, for information regarding access to the Fermilab site for participation in the Recreation Office summer activities go to http://fnalpubs.fnal.gov/benedept/recreation/leagues.html

MEET SCIENTISTS AT SCIENCE CENTER

The popular Ask-a-Scientist program takes place every Saturday from 1 to 3 p.m. at Fermilab's Lederman Science Education Center. The Center with its hands-on science displays is open Monday through Friday from 9 a.m. to 4 p.m. and every Saturday from 9 a.m. to 3 p.m. Visitors must use the Pine Street entrance.

HOUSING ASSIGNMENTS – FALL 2002/SPRING 2003

The Fermilab Housing Office is now taking requests from Users for houses, apartments and dormitory rooms for the Fall of 2002 and Spring of 2003. Since there will be a large influx of experiments during the fall/spring, and requests are anticipated to be in excess of our available facilities, you are urged to submit your request for reservations to the Housing Office by Monday, July 8, 2002. Requests can be made for any period and need not commence on any particular date. For further information, please contact the Housing Office at 630-840-3777; fax 630-840-2823; email housing@fnal.gov.

BARN DANCES

Barn dances are held in the Warrenville Community Building and feature traditional square and contra dances. Admission is $5 for adults, $2 for age 12-18, and free for under 12 years old. Come with a partner or without; bring the family or not. For information on scheduling contact Dave Harding (x2971, harding@fnal.gov) or Lynn Garren (x2061, garren@fnal.gov) or check the webpage at http://www.fnal.gov/orgs/folkclub/.

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.

ARTS SERIES

JUNE 15—CHERISH THE LADIES

8 p.m. Tickets - $21 ($11 for ages 18 and under)

"Cherish the Ladies from the USA made their connection from the first note, skillfully managing the cheers and tears for every second of a torrential two-hour set. The band brilliantly strutted the very Irish-American sound which simultaneously exudes a tremendous joie de vivre and deep nostalgia."
—The Irish Times (Dublin)

JULY 13—LOS FOLKLORISTAS

8 p.m. Tickets - $19 ($10 for ages 18 and under)

"The only predictable thing about one of their performances is that something peculiarly true and beautiful will surface during the evening."
—Christian Science Monitor

AUGUST 10—GEORGE WINSTON

8 p.m. Tickets - $23 ($12 for ages 18 and under)

"Winston is the undisputed master of contemporary solo piano, and his lyrical style is often imitated but never duplicated." —Dirty Linen

LECTURE SERIES—JUNE 26

Myths are the Earliest Form of Science: My Life in the Theatre with Ovid, Galileo and Leonardo

Mary Zimmerman, Director of Galileo Galilei at the Goodman Theatre

8 p.m. WEDNESDAY Tickets $5.
(please note change from usual lecture day)

For further information or telephone reservations, call 630/840-ARTS weekdays between 9 a.m. and 4 p.m. For a map or further information, please go to the web page at www.fnal.gov/culture.

MILESTONES

AWARDED

- Ph.D. to Mark Mattson, Carnegie Mellon University. For his research on baryons with two charm quarks as part of the SELEX experiment.
- Ph.D. to Jason Kasper, Northwestern University; for his research on bound states with charm quarks (experiment E835).
- Ph.D. to Jeremy Ed Sweezy, Georgia Institute of Technology; for the development of an enhanced neutron therapy beam.

RETIRING

- James Shallenberger, ID 282, effective July 11, last day May 31.
- John Slowiak, ID 1406, ES&H Fire Group, effective May 31, last day May 8.

LUNCH SERVED FROM
11:30 A.M. TO 1 P.M.
$10/PERSON

DINNER SERVED AT 7 P.M.
$23/PERSON

Chez Léon MENU

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

LUNCH
WEDNESDAY, JUNE 19

Pita Stuffed with Dominican Chicken
Coconut Cake with Rum Caramel Sauce

DINNER
THURSDAY, JUNE 20

Fresh Mozzarella Cheese and Tomato Salad with Basil
Grilled Rib Lamb Chops
Mushroom Risotto
Vegetable Medley
Fresh Fruit Tart

LUNCH
WEDNESDAY, JUNE 26

Grilled Flank Steak with Pea Pods and Mushrooms
Melon with Summer Berries

DINNER
THURSDAY, JUNE 27

Caesar Salad
Shrimp Scampi
Lemongrass Rice
Sauteed Spinach with Lemon and Garlic
Strawberry Shortcake

FERMI NEWS

FERMILAB
A U.S. DEPARTMENT OF ENERGY LABORATORY

Ferminews is published by Fermilab's Office of Public Affairs.
Phone: 630-840-3351
Design and Illustration:
Performance Graphics
Photography:
Fermilab's Visual Media Services
Ferminews Archive at:
http://www.fnal.gov/pub/ferminews/

The deadline for the Friday, June 28, 2002, issue is Tuesday, June 18, 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.

Fermilab is operated by Universities Research Association, Inc., under contract with the U.S. Department of Energy.

CLASSIFIEDS

FOR SALE

■ '99 Hyundai Accent L, 2-dr hatchback. 5 speed, two air bags, rear window defroster. Excellent condition, only 28K miles. 10yr/100K mile warranty from the manufacturer. Economical and reliable car. Great gas mileage. $4,500 o.b.o. Call x2329 or email: swalk@fnal.gov.

■ '97 Dodge Intrepid sport sedan $7,500; 33,100 mi.; one owner; new tires; bright platinum metallic; "Sport" trim pkg.; 3.5L V6; 5-speed auto; AC; AM/FM/cass.; cruise; pwr. wdws., locks, mirrors; remote keyless entry; Carfax report available from owner! Contact Clay at 630-406-1213; Heidi at 630-482-2832 or Merle at 630-964-0185.

■ '96 Honda Accord LX, 2dr. coupe, 65K, 5spd, silver, new tires and muffler, excellent condition, $7,690 o.b.o. Call 630-637-8082.

■ '95 Honda del Sol, low mileage, good economy, take the top off 'cuz it's summer! $5,300 bellanto@fnal.gov. pager 266-3803.

■ '95 Ford Aerostar van for information contact alcorn@fnal.gov or x8056.

■ '93 Ford Mustang LX, 5 speed, 2 door, Hatch back, Sunroof, New clutch, New Battery, PL, PW, 111K, Good condition. $1,800 o.b.o; 2. '89 Chevy Cavilier, Auto, 2 door, 105K. Runs well, $500. meiqin@fnal.gov, x6765 or 630-719-9097.

■ '89 Ford Ranger XLT Pickup, 4-cyl. 2.3L 5-speed manual, long (7ft) bed, light blue, radio/cassette, 121K miles, $1,950 o.b.o., Call Joe x2693.

■ '88 Lincoln Town Car, V8, automatic, power steering/locks/mirrors/seat, AM/FM cassette, Available July 1 with approx. 132K miles, white, leather interior, runs good. $1,600 o.b.o. Must sell. warsinsk@fnal.gov or x5440.

■ '73 Crestliner 14′ boat with Sea Bird trailer. 5-1/2 HP Johnson Seahorse motor, 2-electric trolling motors, Garmin Fish Finder, dual anchors with cranks, misc fishing poles, tackle, vest, etc. $1,300 o.b.o. Call 630-505-0276.

■ Metal shelving different sizes $10 each. Paradon speakers(2) $100. Greg x4606 or 630-557-2523.

■ 20 "Star Trek: Next Generation Videos," 2 episodes on each. Purchased from Columbia House in original boxes, some unopened. New $575, call Mary at 630-312-7668 with best offer.

■ Piano: Yamaha Studio Upright. Model U3AR. Walnut finish, bench w/leather seat. Purchased January, 1988. All wood internals, no plastic parts. Please reply by email to cejcnm@aol.com.

■ Toro riding mower, 11 hp., 32in. cut, runs well, rear bagger. $200. Call 708-301-4256, ask for John.

■ DR walk-behind trimmer $200 or best offer. Call 630-505-0276.

■ Master Grip Golf Clubs and Bag Graphite shafts $225. Call Craig at 630-505-0276.

■ "IMAGE 4.0" free weight station, 1,000 lbs. of steel weights, bars, and bench. $325 o.b.o, call Ed Dijak x6300, 630-665-6674, or e.dijak@att.net

■ Nordic Track Walkfit unmotorized treadmill with computer stats. Good condition $100. kingc@fnal.gov or x6746.

■ Elliptical fitness crosstrainer - heavy duty $100 Greg 630-557-2523 or x4606.

■ Epson Stylus 440 color printer $25, HP 380 Color printer/scanner/copier $50, Fiberglass Tonneau Cover by ARE for Dodge Ram 1500, 6-1/2′ bed, includes upgraded package with carpeted inside of cover, fits any Ram with 6-1/2′ bed up to 2001 model year, 1 year old cover, currently painted white with clearcoat, locking. $500 o.b.o. Contact: stephens@fnal.gov or 879-6291 after 5:00pm.

■ 1 Vitamaster Northern Trails plus ski machine w/electronic readout for speed and ear clip to measure pulse rate. Height adjustment to increase level of difficulty. $50. Alpine Climber stair step machine, 4 level difficulty adjustments, electronic readout. (Needs battery) $25 o.b.o. Need to clear out to make room for basement stained glass shop. e-mail rsward@fnal.gov or call 847-658-1939 after 6:00pm.

■ Refrigerator, 21 cu/ft, upright, white, excellent condition, 5 years old, $325, call Ed Dijak x6300 work, 630-665-6674 home, e.dijak@att.net.

■ 13.4 cu/ft upright freezer $125, 5′x3′ refrigerator $25, entertainment center NEW $75, beige/brown couch with recliners both ends $125, call Don 630-896-3211.

■ Resin patio set (blue). Large round table and four chairs with matching umbrella stand. $150; Girls bike (appropriate for ages 8-10). Dark purple. Great condition $25; crogers@fnal.gov x3824.

■ Contemporary, full-size, four post canopy bed with like new mattress and box springs $300; two night stands (match bed) $50 each; flowered full-size quilt, pillow shams, neck roll pillow, eyelet bed skirt, mattress pad, and two sets of sheets, $75; corner computer table w/adjustable keyboard shelf, $100; framed contemporary prints, 39″Wx31″H, $50 each; Brother portable electric typewriter, $25; Kenmore zig-zag sewing machine with carrying case, $50; contact Cynthia at 312-317-2383 or by e-mail at sazama@fnal.gov.

■ Metal desk $35, metal shelves $10 each, beer tap handles $10 each, 20 cinder blocks $5 for all, x4606 or 630-557-2523 Greg.

■ Lane 4 pc. contemporary dining room set, caramel colored burled wood. China hutch: Twin, lighted cabinets with two glass doors Each cabinet measures: 37w x 72h x 14d. Table: 42″ round with 2-18″ leaves and pads w/glass top. Server: Measures 40w x 34h x 18d. Has pull/out extension and 2 doors w/shelving and drawer inside. Glass top also. $950 o.b.o. Three section entertainment unit; cream colored high gloss finish. Unit arranged as shown measures 10 ft. wide by 7 ft. high. $950 o.b.o. Contact John Fomusa at x3842 or fomusa@fnal.gov (can email pictures).

■ Furniture refinishing and restoration. Please contact x3762 or 815-695-5460 with questions.

HOUSE FOR SALE

■ Beautiful 3 bedroom tri-level in Lake Holiday, 2 bath, professionally landscaped, Sandwich Schools, large lot, 3 beaches, boating, fishing, water-skiing, low taxes. Available after April 1, 2002. $139,900. Call x3499.

FOR RENT

■ One big bed room and bath on independent floor in family house. Quiet residential Naperville. Car garage, laundry, living room available. $495/month. Ready April 30. Call: 840-2574 office hours.

TUTOR WANTED

■ Looking for tutor (female, high school or college student) to teach two girls (8 and 12 years old) how to speak and understand English as a second language. Girls know some basics (alphabet, etc.). Three times a week from 10 a.m. till noon in our Batavia home. Non-smoking. Call Irina at x3651 (7:00 a.m.- 3:00 p.m.) or 761-1268 (5:00 p.m.-9:00 p.m.).

HELP WANTED

Fermilab Public Information Specialist

Gather, write, update, illustrate and archive daily news on the Fermilab Web site. Work with external Web consultant to improve, expand and develop the Fermilab Web site as a key communication tool for the laboratory.

Coordinate Web aspects of Fermilab press releases and Office of Public Affairs activities. For detailed responsibilities and requirements, see the Web site at http:// fnalpubs.fnal.gov/employ/jobsfull.html#admin/. Candidates for position #020106 should submit a résumé with salary history to: jcthomas@fnal.gov/. Date of opening 06/05/2002.

FERMILAB
A U.S. DEPARTMENT OF ENERGY LABORATORY

Office of Public Affairs
P.O. Box 500, Batavia, IL 60510

First-Class Mail
U.S. Postage
PAID
Bartlett, IL
Permit No. 125