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Wilson Hall Given Seal of Approval by Corps of Engineers

High Rise found safe for the next five years while repair effort is under way.

By Mike Perricone, Office of Public Affairs

Gravity's role might not be clear in the possible restructuring of the Standard Model, but gravity clearly set the stage for the remodeling of Wilson Hall.

Gravity summoned a chunk of concrete from the 15th floor down through the sloping glass on the south side of the cafeteria in 1993, prompting a full-scale structural examination by a consulting firm, leading to a collaboration by Fermilab's Facilities Engineering Services Section (FESS) with a structural engineering firm on plans for interim and permanent repairs.

Now the Army Corps of Engineers has endorsed the $18.5 million renovation plan for the high rise—and, most important, has certified the building's safety for five years while repairs take place.

"We took (Fermilab's) very good data on temperature changes and environmental changes over a five-year period," said structural engineer Jim McCoy, who directed the study by the Louisville, Kentucky, district of the Corps of Engineers, with computer modeling provided by Anatech of San Diego.

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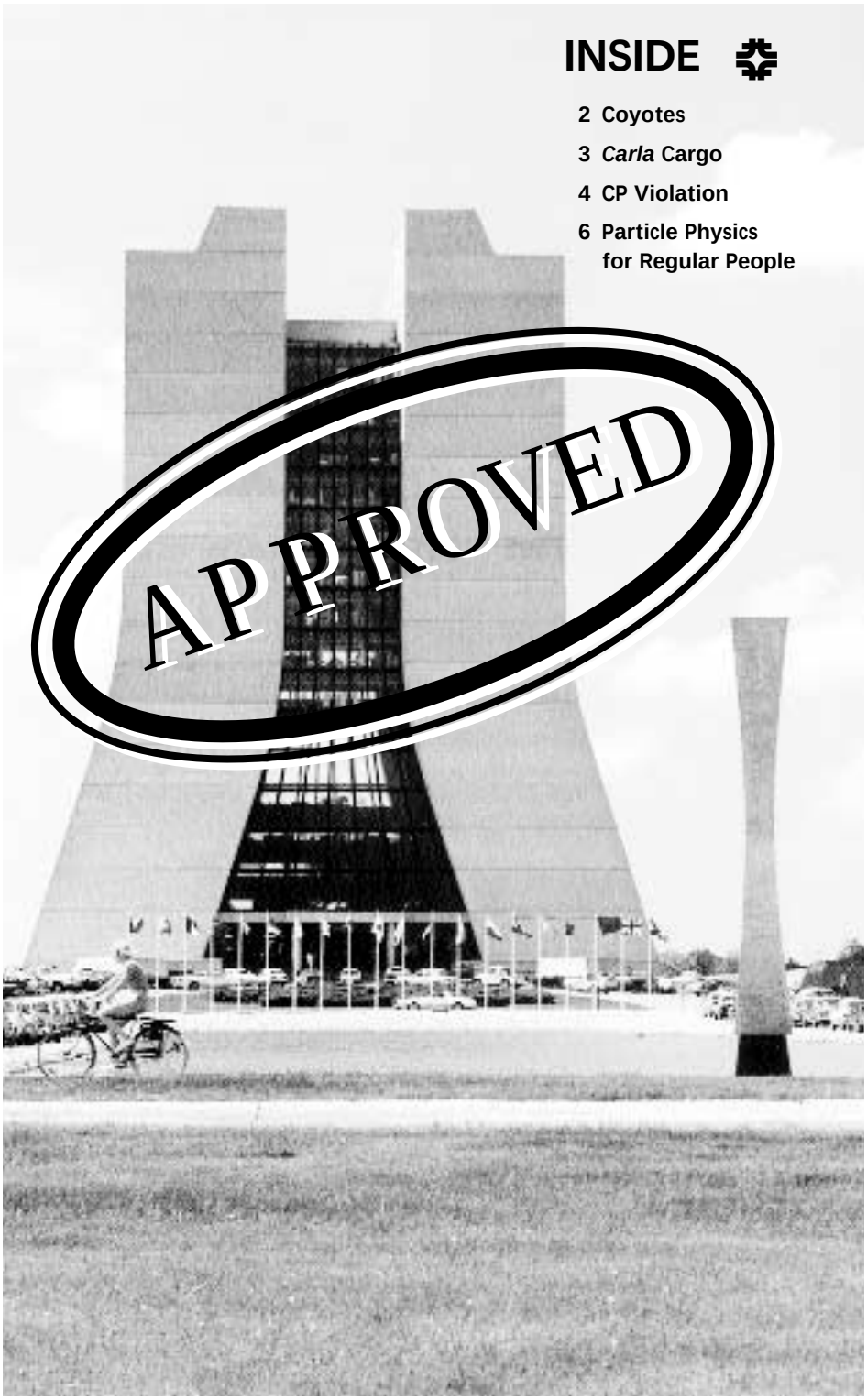

Fermilab Photo

INSIDE

Coyotes Settle In at Fermilab

Photo by Robert McKemie

by Rod Walton, Environmental, Safety and Health Section

He is sly, cunning, swift, smart, but more often than not undone through his own devices. She is called sun dog, laughing dog, barking dog or little wolf. The ambiguity surrounding coyotes extends to the pronunciation of their name: you say kai-ó-te, I say kaí-oat. The word comes from the Aztec word coyotl, which suggests that a three-syllable name might be more authentic.

Few animals have elicited more interest and emotion than the coyote, whose reputation in Native American lore as a sly and treacherous survivor holds up well against the animal's natural history since European settlement. Campaigns to eradicate the coyote have met with little success. If anything, the coyote has extended its range—ironically with the help of settlers, who were remarkably successful at driving out the coyote's cousin and erstwhile competitor, the wolf.

Employees and visitors at Fermilab often see coyotes in the early morning, gracefully loping across the fields. Jim Kalina, of Roads and Grounds, estimates that as many as 15 animals currently reside at the Lab, including triplet pups born here in 1996. The young animals typically disperse after a year or two, seeking out their own home ranges. Although the animals at Fermilab are generally in good health, some individuals have contracted mange, a common canine disease.

Coyotes are remarkably adaptable. They tolerate our presence, and even capitalize on some of the fruits of civilization. They gladly raid garbage pails or take advantage of cast-off tidbits, and they demonstrate an uncanny ability to avoid humans in our more predatory moods. On the other hand, they present no real threat. A recent survey of literature from the last 30 years produced reports of only 16 attacks on humans in North America, none of which were fatal.

Reading the signs

The indirect impact of coyotes on human endeavors is more controversial. Depradation by coyotes on livestock, especially sheep, is often due to rogues killing weak and vulnerable animals. For the most part, coyotes are opportunists who prefer smaller, more tractable game. Lynda Randa, an ecologist from Northern Illinois University, conducted a study from 1993 to 1995 at Fermilab and found that over 90 percent of coyote droppings contained small mammal remains. About 80 percent of those were field mice and rabbits. The remainder were squirrels, pheasant, deer (probably scavenged), invertebrates and plant material.

Coyotes tend to be nocturnal, although if not harassed by humans, they will hunt during the daylight. They prefer a mixture of wooded and open land, a preference nicely fulfilled by human-created landscapes. Before 1900, there were probably few coyotes east of the Mississippi River, but they quickly settled the new farmland after the eradication of wolves.

The Illinois Department of Natural Resources reports that the state's coyote population has remained stable for the last seven years. Local naturalists and biologists agree that the state-wide population is steady, but the urban and suburban population seems to be increasing. Animal control agents destroy one to three coyotes each year at O'Hare and Midway airports to protect aircraft from collisions, and the number of complaints from suburban neighborhoods has increased.

In Native American cosmogony, coyotes are portrayed as creators, "singing humans into being" or placing the North Star in the heavens. They are said to bring rain (or not), and have the ability to change the appearance of things. Whatever the coyotes' role in determining the fabric of the world, we will likely continue to share it with them in a grudging, sometimes admiring coexistence. ■

It Was Sad... but Not Titanically Bad for Lost *Carla* Cargo

"The iron boats go, as the mariners all know,
But the gales of November remember..."

— Gordon Lightfoot, "The Wreck of the Edmund Fitzgerald"

By Mike Perricone, Office of Public Affairs

This cable dispatch emanated from Medite Shipping Company (UK) Ltd., 25 Nov 97:

"MSC are sorry to inform you that the MV MSC Carla while en route from Europe to the United States on her regular voyage during gale force 11 / 12 was hit by an abnormal wave which caused the rupture of the fore part of the vessel, parting the vessel completely in two pieces."

Helicopters rescued all 34 crewmen. The part of the ship still afloat was towed from north of the Azores, where waves had reached 90 feet during the gale, to the calmer Canary Islands. The world press (including *The Wall Street Journal*) noted the loss of a huge wine shipment destined for U.S. distributors during the holidays, including a thousand cases of French wine selling for $200 a bottle and several cases of vintage Armagnac retailing for as much as $700 a bottle.

Not mentioned: 3500 pounds of R2799 Strip, 1.27 mm x 50.42 mm, Cold Rolled in Coil, Special Hardness, Minimum Diameter 30-40 cm, Valued at 30,624.58 USA Dollars.

But Gregg Kobliska, Material Control Dept. head, had received a fax from Telcon Speciality Alloys and Components in Crawley, West Sussex, England. The specially-treated nickel-iron alloy for the permanent magnet temperature compensators at Fermilab's Recycler Ring had been on the *Carla*, which left LeHavre, France, bound for Boston.

"We didn't know right away which half of the ship it was on," Kobliska said. "We didn't know if it was sunk or if it was still floating. Then we found out it was sunk, but that there would be a salvage attempt. Then we found out what the salvagers were really after was the wine and the champagne and the $700 bottles of brandy."

Telcon placed its insurance claim and notified Fermilab that a replacement for the alloy would be shipped on January 30.

"Usually, it takes about six months for something like this," Kobliska said. "Six weeks—that's really an extra-ordinary effort by Telcon."

There was more good news from Dave Harding, a manager for the Recycler magnet project. The delay would have no impact on the costs or schedule of Main Injector construction.

A larger shipment of the alloy was purchased from Telcon about a year ago and has already been used in constructing permanent magnets for the Recycler Ring. The iron-nickel alloy is treated so that its magnetic permeability changes with temperature, allowing its use as a continuous feedback mechanism to maintain a constant flux in the permanent magnets, made of strontium ferrite bricks.

Permanent magnets are simpler than the more-commonly-used electromagnets, but their field is highly temperature-dependent. The compensator material will keep the field strength constant to 0.01 percent over temperature swings as much at 10-15 degrees C, the typical requirement for an accelerator.

"The shipment that was lost," Harding said, "was an add-on destined for use in some of the specialty magnets, the Lambertson magnets, used for getting the beam into and out of the recycler. The rest of the components for the Lambertson magnets are not due until late February. We have enough compensator already to build one Lambertson magnet. So with our usual pattern of first building one magnet out of a series, and studying it before going into production, it won't be until well into March that we would need this lost compensator material."

All hands hope there are no gale warnings in February near the Azores. ■

Photo by Reidar Hahn

Gregg Kobliska, Material Control Department Head, shows where the compensator material will go, when it arrives.

Searching for CP Violation

Or, how KTeV physicists like Vivian O'Dell hope to elucidate why matter survived and antimatter disappeared.

by Sharon Butler, Office of Public Affairs

When physicist Vivian O'Dell first came to Fermilab's Computing Division five years ago, she had scarcely crossed paths with a kaon.

And no wonder.

The evanescent particle survives only 12 billionths of a second. It's not like an electron or even a bottom quark; it doesn't exist in the world most people know.

But when the Tevatron is running beam for fixed-target experiments, O'Dell and 80-odd physicists from 12 research institutions manufacture billions of kaons every day—neutral kaons, to be exact.

By becoming intimately familiar with these fleeting particles and how they self-destruct, the scientists who work on the experiment called KTeV (for kaons at the Tevatron) hope one day to explain how matter came to be, and antimatter disappeared.

Photo by Reidar Hahn

Star Trek's Data, guarding his namesake, and physicist Vivian O'Dell, examining the data acquisition system she helped design for the KTeV experiment's next generation.

CP violation

Antimatter is the reflection of matter: one particle is positive, the other negative, one is right-handed, the other left-handed. Despite their differences, in charge (C) or parity (P), the two should behave exactly alike. Both were created in equal parts when the universe began in the Big Bang.

Of course O'Dell can't figure out why the universe came to be at all—"it blows my mind," she says—but she does know, from the Standard Model and years of physics experiments, that no pockets of primordial antimatter survive anywhere in the universe today. The only evidence that antimatter ever existed lies in the background microwave radiation left over from the Big Bang.

As intricate mathematical calculations show, matter prevailed because of a slight difference in behavior between matter and antimatter, called CP violation, an asymmetry in what should be a symmetric relationship. The phenomenon, first discovered in 1965, occurs in only one in 500 events. To date, O'Dell says, it has been seen only in neutral kaons, not in any other particles.

Direct CP violation

One KTeV experiment involves trying to find evidence of *direct* CP violation, which no one has yet observed.

Scientists so far have seen only one kind of CP violation: indirect. In indirect CP violation, a neutral kaon called a *K*-long self-destructs, creating first another kind of neutral kaon, called a *K*-short, and then two pions. Direct CP violation would occur if the *K*-long dissolved into two pions directly, with no intermediary step.

But whether direct CP violation occurs at all is not clear. The Standard Model says only that it might.

An earlier experiment at Fermilab found no sign of direct CP violation, even with sensitive measurements. And an experiment at CERN, the European Laboratory for Particle Physics, might have found something, but the data are uncertain.

Now, says O'Dell, KTeV scientists are hopeful they'll be the first to find direct CP violation in neutral kaons. In the fixed-target

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Photo by Reidar Hahn

Canada geese appear unflappable in their newly-frosted habitat.

A case of goose pimples?

Snow Place Like Home for Frosty Fermilab Fowl

By Mike Perricone, Office of Public Affairs

Turning off the Tevatron will leave Fermilab's geese with cold feet this winter, but they won't be flying the coop.

"There's not going to be any wholesale migration," said Fermilab ecologist Rod Walton. "Geese don't live in the water, and most of their feeding is done by foraging in the grass and plant material on shore."

With the Tevatron idle during construction of the Main Injector, the cooling water is carrying only a fraction of the usual heat through Fermilab's four pond systems.

For example, the Booster pond system, which includes the large lake in front of Wilson Hall, usually absorbs between 14 million and 19 million BTUH while the accelerator is running in winter. When the accelerator is shut down and no testing is being conducted, the heat level is approximately 2.7 million BTUH.

"A residential home of 2,000 square feet will take about 100,000 BTUH to heat it," said Lee Hammond of Facilities Engineering Services Section. "So now the Booster pond system is taking in enough BTUH to heat 27 homes. When the accelerator is running, that would be 140 to 190 homes."

The geese might be chilly while the ponds freeze and thaw at a more natural pace, but Walton stated that they're in no danger. Neither are the fish, as long as even a small patch of pond is open to allow oxygenation. Walton also said it's extremely unlikely that any geese would be trapped in the ice.

"Not unless the bird is ill, or hurt, or tangled in something and can't move," Walton said. "You'll actually see the geese sitting on their feet on the ice, because the ice is still warmer than the surrounding land on most winter days." ■

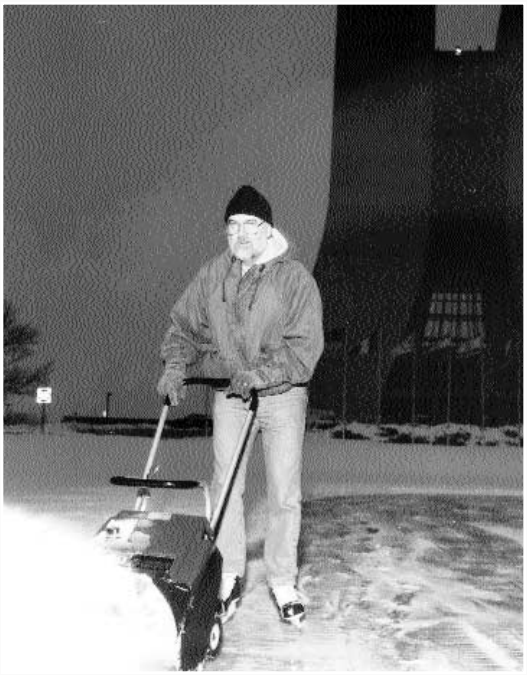


Photo by Fred Ullrich

With the Tevatron idle, Fermilab physicist Dave Anderson does some moonlighting in snow removal and gets in some power skating on the pond in front of Wilson Hall.

Brush up your bosons

Particle Physics for Regular People

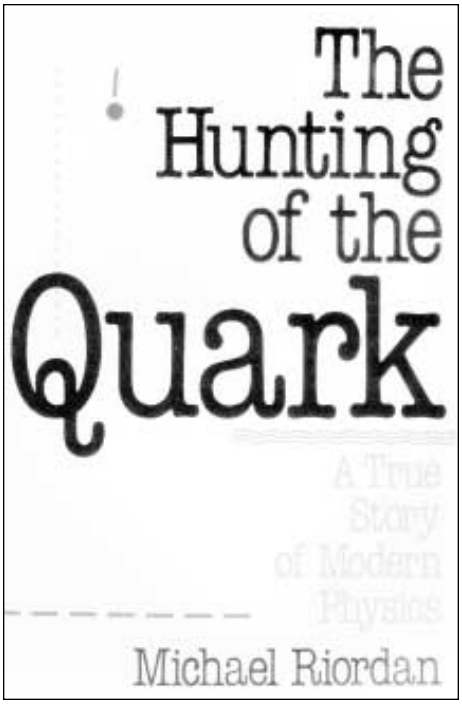
By Mike Perricone, Office of Public Affairs

Psychologist Oliver Sacks has Robin Williams portraying him on screen. Cosmologist Carl Sagan's fictional heroine explores the universe in the glamorous guise of Jodie Foster. Biologist Stephen Jay Gould muses about the Red Sox in the PBS megadocumentary "Baseball."

Where are all the particle physicists?

They're on a high-energy bookshelf near you.

The authors of the best plain-language literature in particle physics might not yet have reached stardom, but their books offer a literate, accessible and engaging introduction to a field of science that has been known to intimidate the uninitiated. The stories of the discoveries of the particles at the heart of matter offer all the thrills of a good chase—one of the biggest chases of 20th-century science. From the wide field available, readers can start with a half dozen of the "best of the best" books for gaining an understanding of the reason for all the excitement.



Take your cue from Leon Lederman, 1988 Nobel laureate and former director of Fermilab. And take a clue to his approach from his witty title—"THE GOD PARTICLE: If the Universe Is the Answer, What Is the Question?"

Prompted by an imaginary dialogue with the classical Greek mathematician-philosopher Democritus, whom he calls "the first particle physicist," Lederman leads us on a trail that begins with the smell of baking bread in ancient Greece and culminates in the quest for the Higgs boson, the "God particle" of the title—so-named, Lederman says, because it is "so central to the state of physics today, so crucial to our final understanding of the structure of matter, yet so elusive."

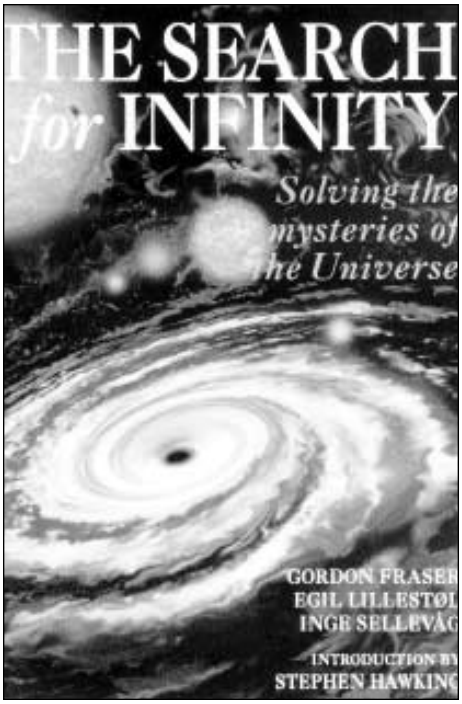
It's easy enough to focus on Lederman's humor and zero in on his groaning board of puns. Example: When the Greek philosopher uses a knife to halve a piece of cheese innumerable times, the result is a "feta-compli." Groan.

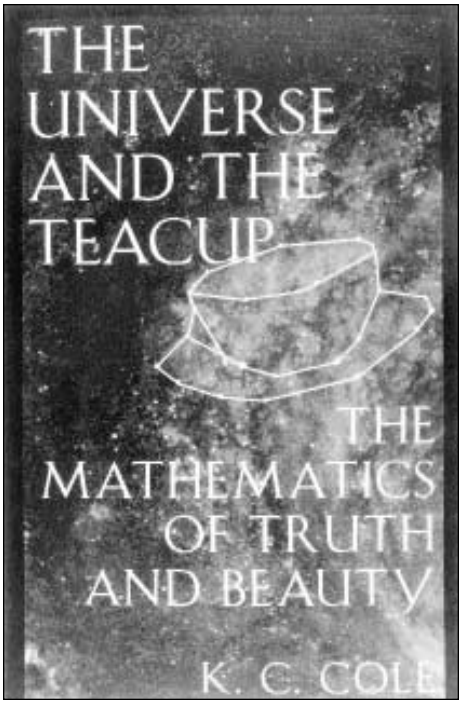
But the prime significance of "The God Particle," and the power of its appeal as an introductory work, lies in the clarity of Lederman's explanations, the sense of his comparisons, the tangible and unbreakable thread of the story through time and his own experience.

Another veteran of the chase is Michael Riordan, who is also one of its best chroniclers in "THE HUNTING OF THE QUARK: A True Story of Modern Physics."

If you're a mystery fan, this is the "police procedural" of the particle physics era—the background, the evidence, the investigators, the relentless and systematic pursuit, the false trails and surprises, the accidental discoveries, and the sense of groping that seems to be absent in many treatments of science. Riordan covers the 20-year search for the quark, from the first intimations in the 1960s to the series of discoveries in the 1970s that made the quark "real." Riordan's goal is to show "how our mental image of the subatomic world was transformed between 1964 and 1980."

You must form a mental image before you can transform it, and you'll find spectacular introductory images in "THE SEARCH FOR INFINITY: Solving the Mysteries of the Universe," by the European team of Gordon Fraser, Egil Lillestol and Inge Sellevag. Illustrated as impressively as any coffee-table book, "The Search for Infinity" begins by "Looking In" (The Exploration of Matter), and concludes by "Looking Out" (Understanding the Universe). The excellent overviews of particle physics and astrophysics are enlivened with vignettes of the scientists associated with them. Wolfgang Pauli, who first predicted the existence of the neutrino, supposedly once offered encouragement to a colleague who was distraught after finding an error in his own work. "Everybody makes mistakes," Pauli said sympathetically. "Except me."





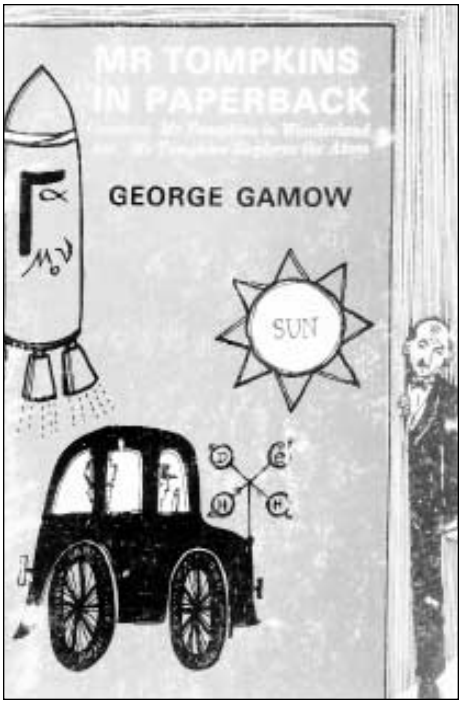
Not as colorful as "The Search for Infinity," but at least as valuable, is "THE PARTICLE EXPLOSION," by Frank Close, Michael Marten and Christine Sutton. Focusing exclusively on the subatomic realm, "The Particle Explosion" is a primer on atomic structure and each of the known particles. It also includes a powerful secret weapon: an exhaustive Table of Particles, charting each particle's physical properties, its history of discovery (and discoverers) and its role in matter, all keyed to the appropriate sections of the text. The Table is the kind of reference you'll want to keep in an honored (and secure) place and hand down to the next generation, especially if there's an exam coming up.

There's no physics without funding, and ultimately there's no physics without mathematics. Award-winning science writer K.C. Cole has a new gem, "THE UNIVERSE AND THE TEACUP: The Mathematics of Truth and Beauty," with the title offering a subtle resonance with the top ("truth") and bottom ("beauty") quarks.

In counterpoint to the near-unanimous "maleness" of physics and its literature, Ms. Cole has a refreshing chapter on Einstein, relativity, and the little-known but critical contributions of Emmy Noether. A brilliant mathematician, Noether was refused a university position in Göttingen, Germany, because she was a woman—though she had recommendations from eminent mathematician David Hilbert and from Einstein himself. But it was Noether who later gave credibility to relativity by proving mathematically that energy was conserved in four-dimensional space-time. So in a real sense, relativity, particle physics and Fermilab all owe their ongoing well-being to the work of Emmy Noether.

They also owe a debt to George Gamow, one of the originators of the big bang theory of the birth of the universe.

Gamow was one of the first popularizers of relativistic physics and quantum theory. He wrote two whimsical little books in the 1940s about a traveler, bank clerk C.G.H. Tompkins (c, for the speed of light; G, the gravitational constant; h, the quantum constant), in a realm of highly exaggerated relativity. "MR. TOMPKINS IN WONDERLAND" and "MR. TOMPKINS EXPLORES THE ATOM" were later combined in a single slim volume, "MR. TOMPKINS IN PAPERBACK," that was still being used as a supplementary college text in the 1960s and 1970s—and it's still going strong. Some of the language is amusingly antiquated, and Gamow would certainly be surprised at today's take on his chapter entitled "The Gay Tribe of Electrons." But "Quantum Billiards" has a collision between two billiard balls resulting in "innumerable balls, all of them very vague and gruelly...rushing about within an angle



of 180 degrees round the point of impact." And "Cosmic Opera" matches expansion vs. steady-state theories in contesting arias. Dated, yes; but musty old Mr. Tompkins is worth any allowances.

Lederman, Riordan, Gamow and company flavor their science with myth, mirth, poetry and history. They offer a high quality of armchair companionship when you unwind from the hunt at the end of day and consider the words of Democritus, that first particle physicist, who said 2,400 years ago: "Nothing exists except atoms and empty space; everything else is opinion." ■

For Further Reading...

Like atoms and space, physics books are everywhere. Whether you buy or borrow, your book is likely to be checked out by a device that scans a bar code with a laser beam—a direct outgrowth of physics research. A list of the best (and many of the rest) is on page 8.

For Further Reading...

The Physicists: The History of a Scientific Community in Modern America	Daniel J. Kevles	Vivid saga of atomic weapons scientists and their postwar role. New preface details politics behind death of SSC.
The Second Creation: Makers of the Revolution in 20th Century Physics	Robert P. Crease and Charles C. Mannand	Particle physics told through two generations of physicists. Good history and good science, well-written and compelling.
The Physics of Baseball	Robert K. Adair	The great white particle. Lots of equations. Good field, no hit.
Blind Watchers of the Sky	Rocky Kolb	Fermilab astrophysicist tells highly engaging story of astronomy and astronomers.
Men Who Made a New Physics	Barbara Lovett Cline	Basic bio sketches of early particle physicists. Slim. Light on science.
Great Men of Physics: The Humanistic Element in Scientific Work	Emilio Segre, Joseph Kaplan, Leonard Schiff, Edward Teller	Renowned physicists offer insights into, respectively, Galileo; Faraday; Newton and Einstein; and Neils Bohr. Slim book, quick reading.
Taking the Quantum Leap: The New Physics for Non-Scientists	Fred Alan Wolf	Writing is bland, also on the stuffy side.
In Search of Schrodinger's Cat: Quantum Physics and Reality	John Gribbin	Solid beginning to the second tier of reading. Starts with basics but quickly moves beyond.
From Atoms to Quarks: An Introduction to the Strange World of Particle Physics	James S. Trefil	Lots of diagrams, lots of math laid out plain and simple. Another solid primer for the second tier.
In Search of the Big Bang: Quantum Physics and Cosmology	John Gribbin	Still a classic by the British astrophysicist.
A Brief History of Time	Stephen W. Hawking	A "must" for the second tier, when you're ready.
The Quark and the Jaguar: Adventures in the Simple and the Complex	Murray Gell-Mann	A step beyond, into abstraction and philosophy. Nobel winner Gell-Mann named the quark.
Achilles in the Quantum Universe	Richard Morris	Delightful musing on infinity as a driving force in physics and mathematics. Great examples.
The First Three Minutes: A Modern View of the Origin of the Universe	Steven Weinberg	THE classic popular work on the origin of the universe and the relationship between cosmology and particle physics.
Dreams of a Final Theory	Steven Weinberg	Literate consideration of the whys and hows of a single "theory of everything."
A Theory For Everything	Jeremy Bernstein	Essays by a noted physicist, from *The New Yorker, The Atlantic, Scientific American*, etc.
The Physics of Star Trek	Lawrence M. Krauss	What the series got right and wrong.
The Curve of Binding Energy	John McPhee	Noted journalist collaborates with bomb designer Ted Taylor to explore dangers of nuclear weapons proliferation.
"Surely You're Joking, Mr. Feynman!"	Richard P. Feynman	Farcical physicist commits gaffes, cracks safes, plays bongos, reveals headaches of Nobel Prize.
Genius: The Life and Science of Richard Feynman	James Gleick	Chronicle of contributions, from quantum electrodynamics to compelling testimony on the Challenger shuttle disaster.
Einstein: The Life and Times	Ronald W. Clark	The absent-minded violinist whom we may not know as well as we think we do.
Scientific American Library From Quarks to the Cosmos: Tools of Discovery	Leon M. Lederman and David N. Schramm	Clear illustrations highlight engaging, accessible explanation of methods used to explore the infinite and the infinitesimal.
Scientific American Library The Discovery of Subatomic Particles	Steven Weinberg	History of discoveries with appropriate physics introduced along the way. Well-illustrated with valuable appendix of physical principles.
Scientific American Library The Elusive Neutrino: A Subatomic Detective Story	Nickolas Solomey	University of Chicago physicist brings the particle search up to date. Well-written, with lots of photos and drawings.
Scientific American Library Powers of Ten: About the Relative Size of Things in the Universe	Philip and Phyllis Morrison, and the Office of Charles and Ray Eames	Excellent companion to any reading in physics: graphic illustrations of sizes in scientific notation.
Particles and Forces: At the Heart of the Matter	Richard A. Carrigan, Jr., and W. Peter Trower, Editors	Collection of *Scientific American* articles. For serious amateurs with firm grounding.

Wilson Hall

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"We programmed (the data) into the computer to show the accumulated damage in concrete at the end of five years," McCoy continued, "and we showed that the safety factor was definitely adequate at that period of time. Of course, they should continue with ongoing retrofit plans to fix the structure."

The main effort (some $14.5 million) involves reengineering the crossover supports, with interim repairs as needed. That's where FESS engineer Elaine McCluskey comes in—with brackets and diapers.

"Diapers" are the nickname for the protective cloth underneath the joints along the west tower, under the seventh floor and above the main entrance. The cloth guards against concrete spalling, catching any dislodged chips that are likely to fall.

The steel brackets provide extra support where joints are showing deterioration.

"That was the case last summer, after our spring inspection," said McCluskey, who will be overseeing repairs with Ed Crumpley of FESS. "We installed brackets under some of the joints upstairs under floors 14, 15 and 16—16 being the roof."

McCluskey expects contracts to be awarded in October 1998 for the permanent repairs, with work to begin in FY1999.

The plan for 1998 (estimated cost: $270,000) involves extensive monitoring of changes in the building with changes in temperature, comparing previous inspections of expansion and contraction (and cracking). Details of the structural model and over-all project will be refined, and a pilot beam repair will be mounted under the 15th floor. There are also twice-yearly inspections of the internal joints, in the fall and spring, and the building will have a full exterior inspection, as it does every five years.

The complicated plan fits a complicated building.

"It's unique," said McCoy, whose experience in concrete structures ranges from barracks buildings to nuclear power plants. "Even beyond the temperature variations, this is a building that is not symmetrical on any axis or any floor. It's just a very interesting structure."

Photo by Jenny Mullins

Elaine McCluskey of FESS testifies to the safety of the crossover repairs.

It's also a moving structure, the source of all the complications. Wilson Hall is actually two tower buildings joined together across the atrium. Normal movements due to weather and temperature changes become enlarged. While the crossovers are tethered on the east side, the building was constructed with a series of joints between the west tower and west side of the crossovers. The joints were intended to "give" with expansion and contraction, allowing the crossover beams to slide in the joints.

But the joints are constructed of concrete sitting on concrete, which produces breaking, not sliding. The replacement joints, central to the permanent repair plan, will feature teflon-coated steel plates, one imbedded in the support for the crossover floor and one in the crossover floor itself. The technique is common in bridge construction; at Fermilab, it is used in supports at one end of liquid nitrogen tanks to allow for thermal expansion.

Overall, the high-rise renovations will include a plumbing upgrade and an ongoing replacement of the existing glass with safety glass, which is layered around a sheet of polyvinyl adhesive and shatters into pellets instead of stiletto-like shards.

The Wilson Hall Project had a Lehman budget validation in September and faces a full review, which Ron Lutha of Department of Energy said hasn't been scheduled yet. The Corps of Engineers review came about at the request of Fermilab Director John Peoples and URA President Fred Bernthal, to provide an independent validation of proposed repair techniques. More important, the Director wanted additional assurance that the building would be safe throughout the renovation period.

The Corps of Engineers also conducted a review of the CZero project because of changes being considered by the House Subcommittee on Energy and Water Development, which funds the Department of Energy, in its 1998 funding bill.

"We definitely wanted an independent review," said Associate Director George Robertson, himself a former Major General and assistant commander of the Corps of Engineers. "But the House subcommittee was considering some language requiring a Corps of Engineers review for projects starting in 1998. So to play it safe, we went through DOE to get an interagency agreement for the Corps to conduct the review."

The subcommittee settled on review by "an impartial and independent source," though a separate Corps review had already validated the CZero project getting underway this year. "We didn't want to take any chances on that project," Robertson added.

No one wants to take chances with Wilson Hall, either.

"It was a fun building to work on," said McCoy. "I hope it's around for a long time to come." ■

Run II Upgrade UpDate 2000

In this issue, *FermiNews* begins a regular feature reporting on progress toward Collider Run II at the Tevatron in the year 2000.

by Sharon Butler, Office of Public Affairs

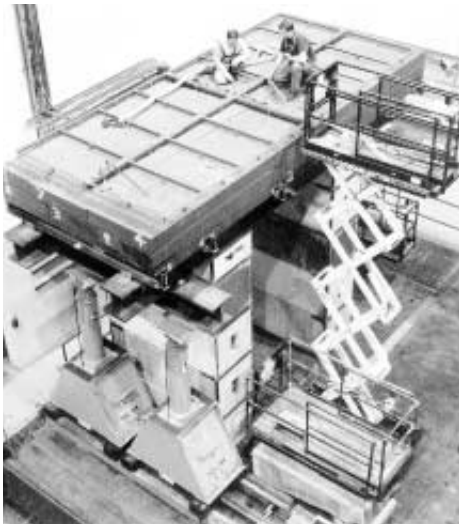
DZero's superconducting solenoid magnet wheels in.

Physicist Jim Christenson, in purple T-shirt and white denims, was in the hot seat in the Fermilab's Comitium conference room this month. The occasion: a Danny Lehman mince-no-words review to make sure the $81-million project to upgrade the DZero detector was doing what it said it would do when it was officially "baselined" last March. Christenson is the project's comanager, and the guy who tries to share both the prolonged pain and the momentary pleasures. He groans when the project encounters the inevitable setbacks. But he recently rejoiced, along with others in the collaboration, when the detector's spanking new superconducting solenoid arrived all the way from Japan with barely a scratch.

The review team from the Department of Energy was full of praise, especially for progress in what Christenson called DZero's "R&D stunt": the new fiber tracker. As usual in big construction projects, the expert consultants who served as reviewers with Lehman also repeatedly referred to the "very aggressive," "extremely aggressive," and "very tight" schedule for the DZero upgrade.

But what Christenson heard was "aggressive but do-able." It's something he believes, too. "Nobody wants to see the schedule slip," Christenson avers, least of all him, and he is working closely with management to line up the resources he needs to make sure there are no delays. In that, DOE offers a helping hand. Like Fermilab, it has a strong interest in seeing this high-profile project come in on time and on budget.

Speaking of budget: Christenson is particularly proud that the DZero collaboration has substantially reduced the $2.9-million deficit it started out with. According to Christenson, the majority of the savings came from "keeping a tight lid on spending." ■



Photos by Reidar Hahn

Steel slabs, ready for transport into CDF's collision hall.

Meanwhile, CDF passed its second Lehman review back in December. Now in the CDF hangar, pieces of the 5,000-ton detector lie helter skelter down in the pit. In one corner are the curvatures of the 60,000-pound muon detector; in another, a wall of steel shielding; in front, an end plug wrapped in a sheet of plastic.

The detector may be in pieces, but progress is evident. Fermilab physicist Pat Lukens theorizes that there are two kinds of progress, visible and invisible, and he's aiming for both: he is choreographing the installation of detector parts old and new. He's already worked out the schedule for the next two years, down to the day for some components. Ironically, before coming to Fermilab seven years ago, Lukens had built a reputation in electronics. Now he's making sure the detector gets put back together again—and overseeing welders and machinists.

Today, giant I-beam cranes mounted near the top of the building whir, hiss and creak as the crane operator in faded jeans pushes buttons on a radio control box slung on his hip. The cranes throw long dark shadows across the floor as they pass overhead. They are lugging "hoisters" one by one halfway across the building and gently setting the equipment down in the pit below. A row of hoisters now sits beside a stack of steel slabs, soon to be welded into a two-foot-thick unit weighing 100 tons.

Like industrial-strength car jacks, the hoisters will lift the steel slabs, move them into the collision hall and help hang them from the ceiling to sit on top of the detector. The loading, carting, unloading and positioning of all this weight will take two full weeks.

The steel slabs have none of the technological wizardry of, say, the fiber trackers. Yet the slabs are vital components. Without them, neither the CDF nor any other detector, for that matter, could sort electrons and protons from muons. The steel works by brute force, stopping the electrons and protons in their paths. Muons pass right through, and on to the muon chambers for data collection on the other side. ■

CP violation

continued from page 4

run in 1996–97, they improved their chances of seeing direct CP violation by increasing the sensitivity of their measurements from seven to only one in 10,000 decays.

Whether they will observe direct CP violation in all the data they've collected, or will just put a more precise limit on how often direct CP violation occurs, experimenters hope to know soon. Analyses are already under way.

O'Dell's rare decay

Meanwhile, O'Dell is poring over her own statistical data from the latest fixed-target run, looking for one of the rare ways a *K*-long particle can reinvent itself: by self-destructing into four particles—two pions and two electrons. This particular way happens so rarely (once in every 10 million decays) that it has never been seen before.

O'Dell is gloating over the fact that KTeV experimenters have already found 40 incidents of what she gleefully calls *her* decay mode. That's 40 out of some five billion decays she's examined so far. Collecting rare decays in the pile of interactions that occur in a particle detector is hard work. But by the time the experimenters have finished analyzing the data, O'Dell believes they will have compiled information on as many as 2,000 incidents of this decay—a goodly sample.

Science is often in the details, and KTeV physicists believe that in such rare events as O'Dell's, they can investigate aspects of CP violation and test the limits of the Standard Model.

"The distributions will tell us the level of CP violation in this decay and whether that level agrees with overall theories of CP violation and with predictions derived from the Standard Model," says O'Dell.

There's another reason to study this rare decay mode: Serendipitous discovery is the stuff of basic research—in fact, it's already shaped the study of neutral-kaon decays. When James Cronin and Val Fitch first witnessed CP violation in 1965, they weren't aiming to see the elusive decay. They were looking only for an answer to the question: If a kaon can spontaneously yield a pair of pions, how often might such a decay occur? It was a standard experiment, O'Dell says, the stuff of volumes of *Physical Review* papers. But their unexpected discovery won the Nobel prize.

And so, O'Dell sifts through the complexities of the KTeV data, thinking, jokingly, that one day her decay mode will make her "rich and famous," and that if it doesn't, well, at least it will give her a clue as to how she came to stand on this Earth at all. ■

Two FONSIs Signed

by Sharon Butler, Office of Public Affairs

The U.S. Department of Energy was hard at work the last two weeks in January. It signed two FONSIs, as they are called, one approving a deer management program at Fermilab, the other allowing construction for the NuMI (Neutrinos at the Main Injector) experiment.

What's a FONSI? It's a Finding Of No Significant Impact on the environment, and follows a detailed review, called an environmental assessment, of a project's potential effects, including any risks to human health or any possible harm to sensitive resources such as wetlands or archeological sites. An environmental assessment is required under the National Environmental Policy Act of 1969. By issuing a FONSI, DOE signals agreement that a project presents no danger to humans or the environment, and effectively allows the project to go forward. In this case, two projects were approved:

- The deer management program proposed by the U.S. Department of Agriculture. In an effort to reduce the size of the deer population and reverse the extensive damage done to the ecosystem at Fermilab, USDA will begin culling the herd using agency sharpshooters. All meat will be donated to two charitable food organizations, the Greater Chicago Food Depository and the Bethlehem Center Food Bank. USDA estimates that there are 860 deer on the Fermilab site, far more than the site can sustain. Both USDA and Fermilab considered numerous alternatives to sharpshooting, including immunocontraception and relocation, but none proved feasible or showed promise of being effective.

- Construction of facilities for the NuMI experiment. The NuMI experiment will seek to determine whether neutrinos have mass by measuring whether one kind of neutrino "oscillates," or changes, into another. The experiment to be conducted at Fermilab will direct beams of neutrinos to a detector on the Fermilab site (a short-baseline experiment) and to a detector in northern Minnesota (a long-baseline experiment). Neutrinos are particles that some physicists speculate make up at least a portion of dark matter, the bulk of matter in the universe that astronomers are unable to see but know exists. ■

Lunch served from
11:30 a.m. to 1 p.m.
$8/person
Dinner served at 7 p.m.
$20/person

For reservations, call x4512
Cakes for Special Occasions
Dietary Restrictions
Contact Tita, x3524

Lunch
Wednesday
February 11

Grilled Flank Steak
with Rice Noodles
and Vegetables
Apple Ginger
Upside Down Cake

Dinner
Thursday
February 12

Red Pepper Soup
Medallions of Lobster
with Tomato Cream Sauce
Beet Risotto
Lover's Salad
Mousse-Filled Chocolate Cups
with Chocolate Hearts

Lunch
Wednesday
February 18

Grilled Chicken with Mango,
Ginger and Cilantro
Roasted Potato Wedges
with Garlic and Herbs
Zucchini and Carrot Parmesan
Polenta Cake

Dinner
Carnival Thursday
February 19

Plantain Soup
w/Chicken Empañadas
Roast Suckling Pig
Rice and Pigeon Peas
Braised Chayote
Native Salad
Pineapple Flan
Tropical Fruit

CLASSIFIEDS

FOR SALE

■ '94 Dodge Caravan Grand LE. Showroom condition; 42k miles, mega-loaded, V6 engine, antilock brakes, options galore. Asking $14,900 obo. Will finance. Call Vic, (630) 513-1000.

■ '88 Plymouth Voyager SE, black cherry, 7 passengers, V6, new tires, looks great and is very reliable. Asking $3000. Contact Jerry, x4571, (630) 801-9408. or Jerryz@fnal.gov.

■ Skis, Atomic Arc 195, Salomon 547 sport bindings, size 12 US or 13 EU Trappeur 2000 boots, also have poles, ski & boot bag, $200 obo; Head skis older-style bindings, $25; Kenwood multi-component stereo system w/cabinet. System includes linear-tracking turn table, amplifier ka-94, synthesizer am/fm tuner kt-54 (memory holds 14 ea am & fm stations), graphic equalizer ge-34, dual-deck cassette recorder kw-64w, cd player dp-840, 2 4-way 150-watt speakers jl-840, $1,500 obo. Contact Terry, x4572 or skweres@fnal.gov.

■ Bridgeport Vertical Mill, J-series w/42-inch bed. Ultra-reliable multi-speed belt drive. Perfect condition with Sony digital readout system. Paid $6,500; asking $3,500 obo. Call Vic, (630) 513-1000.

■ American Racing equipment aluminum wheels (4), 15" X 8", with P275/60E15 BF Goodrich T/A radial tires. Fits full-size Chevy truck (5 lugs). Never used in winter. $400. Contact x4396, (630) 859-8596 or pritchard@fnal.gov.

■ TICKETS! For the Naperville Men's Glee Club 10th anniversary concert. Concert date is February 21, 1998 at 8:00 p.m. at Waubonsie Valley High School auditorium, Ogden Avenue and Eola Rd. General admission, $8/students and seniors, $6. Guest performers are the Waubonsie Valley Unity Choir. Call (630) 653-5154 or Bill Wickenberg, x4381.

■ Beautiful 2-bedroom Emerald Green condo in Warrenville; completely updated, remodeled kitchen & bath, fireplace, garage; $97,900. Contact Barb Honeyman, (630) 393-7960 or 75052.3713@compuserve.com.

FOR RENT

■ 3-bedroom, 2-bath ranch with basement and attached garage in Warrenville. Available March 1. Gardening and lawn care provided. Near schools and shopping. No smoking, no pets, references required. Lease $1,100/month, plus security deposit. Contact Earl Barnes, (630) 393-1228.

MILESTONES

RETIRED

■ George Termansen, I.D. # 4771, from the Beams Division/Mechanical Support Department on January 23, 1998.

CALENDAR

FEBRUARY 8

Barn dance at the Village Barn from 7–10 p.m. The dances are contras, squares & circle dances. All dances are taught, and people of all ages and experience levels are welcome. You don't need to come with a partner. Admission is $5. Children under 12 are free. The barn dance is sponsored by the Fermilab Folk Club. For more info, contact Lynn Garren, x2061, or Dave Harding, x2971.

FEBRUARY 12

Brown Bag Seminar: "Depression Across the Life Cycle: Differences in Experience & Treatment," Noon—1 p.m., 1 West conference room

FEBRUARY 13

NALWO potluck dinner at Kuhn Barn, 6:00 p.m., with drinks and appetizers. Dinner begins at 6:30 sharp! Everybody is asked to bring either a main dish serving 6-8 persons or a dessert serving 12. We will have soft drinks for everybody, pizza for the kids and wine for adults. Babysitting is provided. If you can't bring anything, please contribute $3. For further information, call Angela Jostlein, (630) 355-8279.

Fermilab International Film Society presents: *Careful*, Dir: Jeff Solylo, Canada (1992). Admission $4, in Ramsey Auditorium, Wilson Hall at 8 p.m.

FEBRUARY 15

Barn dance at the Village Barn from 2–5 p.m with live music by the Fiddling Zealots of Oak Park and calling by Bill Sudkamp. The dances are contras, squares and circle dances. All dances are taught, and people of all ages and experience levels are welcome. You don't need to come with a partner. Admission is $5. Children under 12 are free. The barn dance is sponsored by the Fermilab Folk Club. For more information, contact Lynn Garren, x2061, or Dave Harding, x2971.

FEBRUARY 17

Wellness Works presents: Blood Pressure Screening, from 11:30-1 in the atrium of Wilson Hall, by the credit union.

FEBRUARY 28

Fermilab Art Series presents: Caribbean Jazz Project, $20. Performance begins as 8 p.m. in Ramsey Auditorium, Wilson Hall. For reservations or more information, call 840-ARTS.

ONGOING

NALWO coffee mornings, Thursdays, 10 a.m. in the Users' Center, call Selitha Raja, (630) 305–7769. In the Village Barn, international folk dancing, Thursdays, 7:30–10 p.m., call Mady, (630) 584–0825; Scottish country dancing Tuesdays, 7–9:30 p.m., call Doug, x8194.

Conversational English classes, 9—11:30 a.m., Thursdays, in the Users' Center.

FermiNews

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Please send your article submissions, classified advertisements and ideas to the Public Affairs Office, MS 206 or e-mail ferminews@fnal.gov.

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