FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY

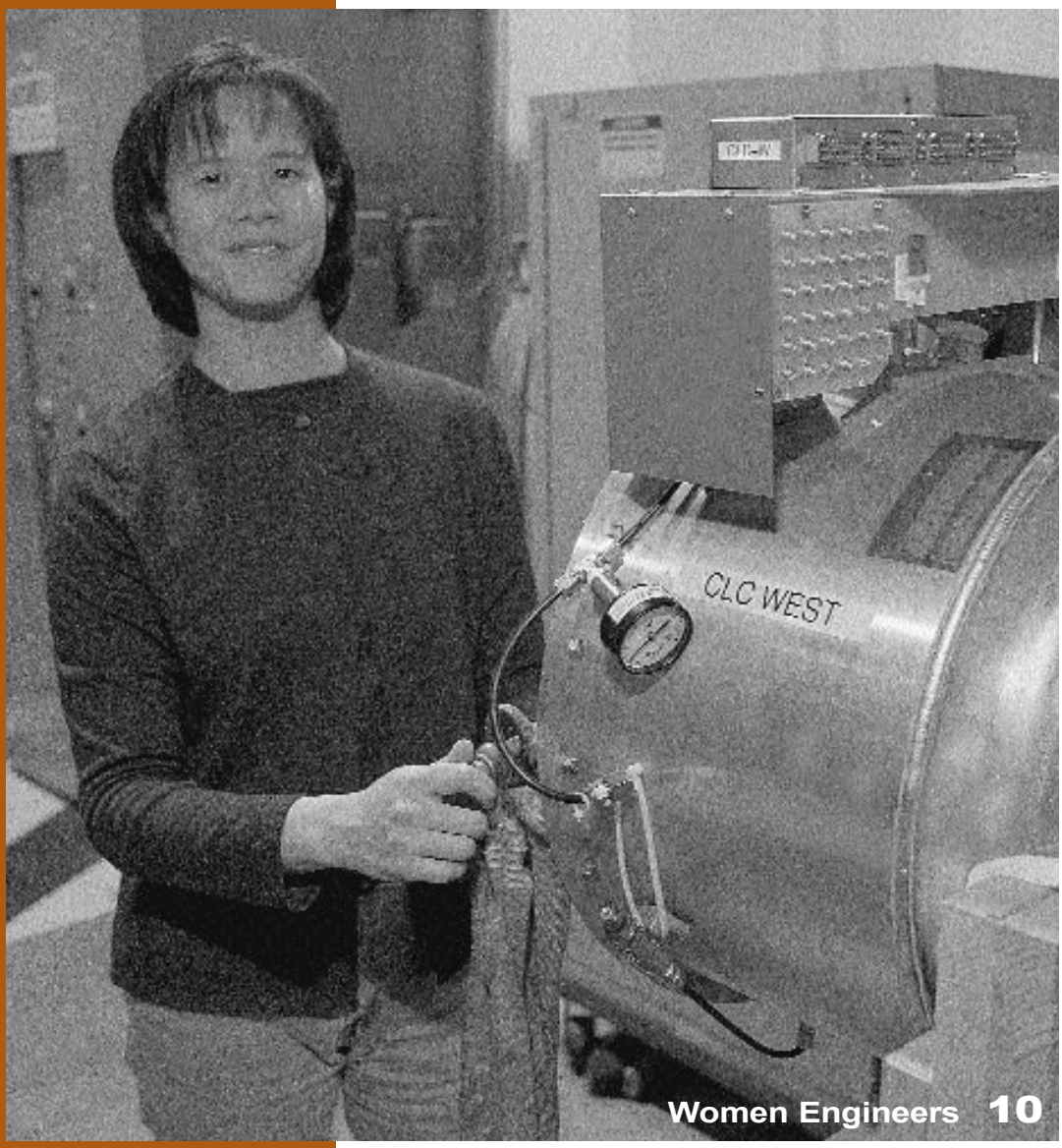

Photo by Jim Shultz

Women Engineers 10

Volume 23
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Number 8

INSIDE:

The Search for Extra Dimensions

Photo by Jenny Mullins

DZero's Greg Landsberg, curled up if not compactified, in Robert Wilson's sculpture, "Möbius Strip."

BRANES are big right now.

They're the vibrating membranes that superstring theorists, including Fermilab's Joe Lykken, have invented over the last five years to describe how our familiar three-dimensional universe might fit into a multidimensional "megaverse," one with as many as 11—count 'em!—dimensions, most of them so curled and compactified that we haven't detected them here on our own little dimensionally challenged 3-D brane.

Superstring theory, with its branes, strings and extra dimensions, represents one consistent way to achieve physicists' long-cherished goal of unifying the theory of gravity—Einstein's theory of general relativity—and the Standard Model—the well-thumbed playbook of particle physics that gives us the electromagnetic, weak and strong forces.

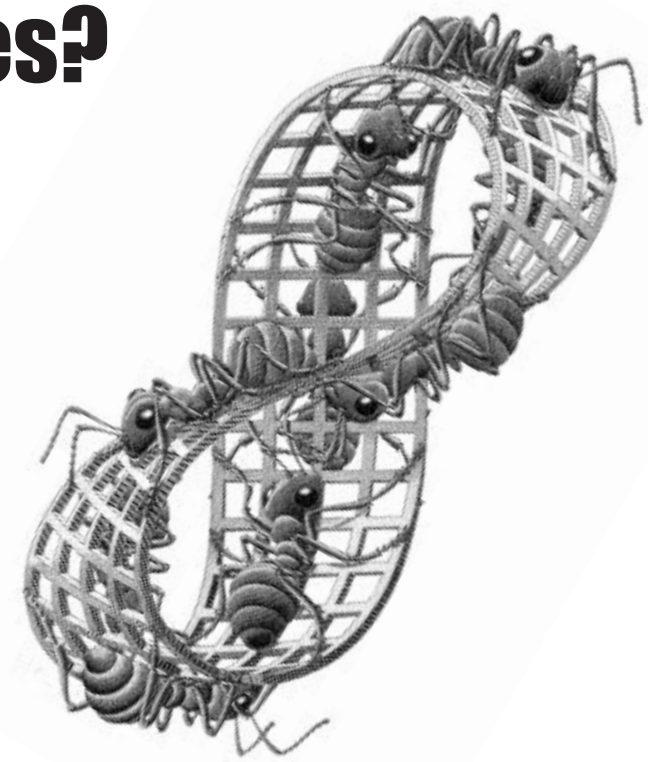
Best of all—almost too good to be true from a particle physics lab's point of view—superstring theory is testable by experiment. DZero's Greg Landsberg, a Fermilab user from Brown University, explains the hunt for evidence of extra dimensions at his experiment at Fermilab's Tevatron.

by Greg Landsberg

Extra dimensions? What extra dimensions? East is east, and west is west, the Bronx is up and the Battery's down. North by Northwest. South. Extra dimensions? Don't we have enough already?

In fact, we do not really know how many dimensions our world has. From our current observations, all we know is that the world around us is at least 3+1-dimensional. (The fourth dimension is time. While time is different from the familiar spatial dimensions, Lorentz and Einstein showed at the beginning of the 20th century that space and time are intrinsically related.) The idea of additional spatial dimensions comes from string theory, the only self-consistent quantum theory of gravity so far. This theory tells us that a consistent description of gravity requires more than 3+1 dimensions, and that indeed the world around us could have up to 11 spatial dimensions.

Does DZero Have Branes?

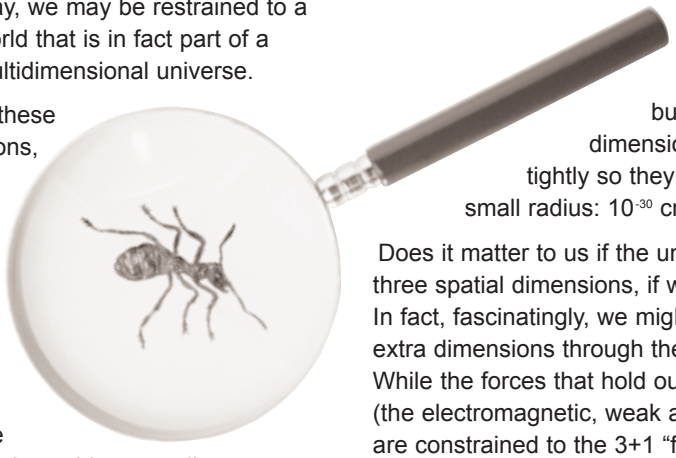


M.C. Escher's "Möbius Strip II"

Eleven? How is this possible?

If extra dimensions exist, we do not feel them in our everyday life because they are very different from the three dimensions we know. According to superstring theory, it is possible that our world is 'pinned' to a 3-dimensional sheet (a so-called "brane") that is itself located in a higher-dimensional space.

Imagine an ant crawling on a sheet of paper. For the ant, the "universe" is for all intents and purposes two-dimensional, since it cannot leave the surface of the paper. The ant knows north from south and east from west, but up and down have no meaning as long as it has to stay on the paper. In much the same way, we may be restrained to a three-dimensional world that is in fact part of a more complicated multidimensional universe.



Theorists tell us that these extra spatial dimensions, if they exist, are curled up, or "compactified." In the example with the ant, we could imagine rolling the sheet of paper to form a cylinder. If the ant crawled in the direction of curvature, it would eventually come back to the point where it started—an example of a compactified dimension. If the ant crawled in a direction parallel to the length of the cylinder, it would never come back to the same point (assuming a cylinder so long so that the ant never reaches the edge)—an example of a "flat" dimension. According to superstring theory, we live in a universe where our three familiar dimensions of space are "flat," but there are additional dimensions, curled up so tightly so they have an extremely small radius: 10^{-30} cm or less.

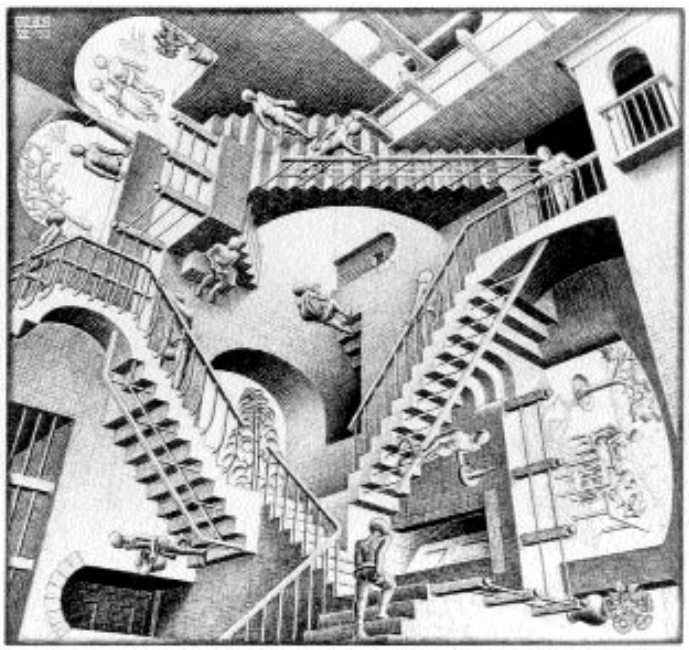
Does it matter to us if the universe has more than three spatial dimensions, if we cannot feel them? In fact, fascinatingly, we might actually "feel" these extra dimensions through their effect on gravity. While the forces that hold our world together (the electromagnetic, weak and strong interactions) are constrained to the 3+1 "flat" dimensions, the gravitational interaction occupies the entire "megaverse," allowing it to feel the effects of extra dimensions. However, since gravity is a very weak force and the radius of extra dimensions is tiny, it would be extremely hard to see any effects—*unless* there is some kind of mechanism that amplifies the gravitational interaction. Just such a mechanism was recently proposed by theorists Nima Arkani-Hamed of SLAC, Savas Dimopoulos

The Search for Extra Dimensions OR Does DZero Have Branes?

at Stanford and Georgi Dvali of New York University. They realized that the extra dimensions might be as large as one millimeter and still have been overlooked in experimentalists' quest for the understanding of how the universe works.

If the extra dimensions were indeed as large as a millimeter, the laws of gravity would be modified at distances comparable to the size of the extra dimensions. Why, then, don't we see such an effect in experiments?

We know very well how gravity works for large distances (Newton's famous law says that the gravitational force between two bodies decreases as the square of distance between them). However, no one has tested how well this works for distances less than about 1 mm. It is complicated to study gravitational interactions at small distances. Objects positioned so close to each other must be very small and very light, making their gravitational interactions also small and hard to detect. Although a new generation of gravitational experiments to probe Newton's law at short distances (up to a few microns) is under way, our current knowledge of gravity stops at distances of about 1 mm. We do not know whether there are, or are not, possible extra dimensions smaller than 1 mm.



M.C. Escher's "Relativity"

Here's where DZero comes in

So far so good, but what does this have to do with particle physics and Fermilab's DZero experiment? In fact, there is a direct connection. The particles that we accelerate at Fermilab are very energetic, and we can easily probe distances as small as 10^{-19} cm by studying the products of their collisions. The bad news is that, because the particles in these collisions are so light, the gravitational interaction between them is extremely weak. The good news is that, in the theory proposed by Arkani-Hamed, Dimopoulos and Dvali, the gravitational interaction is greatly enhanced if the colliding particles have a high enough energy. This enhancement is due to the so-called "Kalusa-Klein" modes of the graviton—the gravitational force carrier—in which the graviton winds around the compactified extra dimensions. If the graviton were energetic enough, it could travel—"wind" its way—around the compactified dimensions many times. Each time it wound around, it would give rise to a small gravitational force between the colliding particles. If the graviton made enough revolutions around the curled extra dimensions, the gravitational interaction would be tremendously enhanced.

As the highest energy particle accelerator in the world, the Tevatron is the perfect place to look for extra dimensions: the higher the colliding particle energy, the stronger the expected enhancement of the gravitational interaction. Physicists working at DZero have looked for the effects of gravitational interactions between pairs of electrons or photons produced in high-energy collisions. If the gravitational interaction between the two electrons or two photons were large enough, the properties of such a final-state system would be modified. There would be more pairs produced at high two-body masses, and the angular distribution of these particles would be more uniform than expected if gravity were weak enough to be ignored.

When DZero experimenters carefully analyzed the data they collected in 1992-1996, they found no such enhancements. The data agree very well with the predictions from known physics processes, and the gravitational interaction does not seem to play any significant role at the energies that we are able to reach. No evidence for branes has been found at DZero so far.

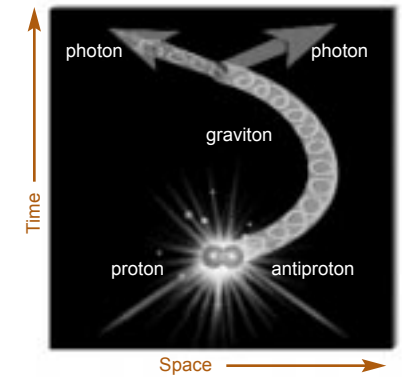
We've only just begun

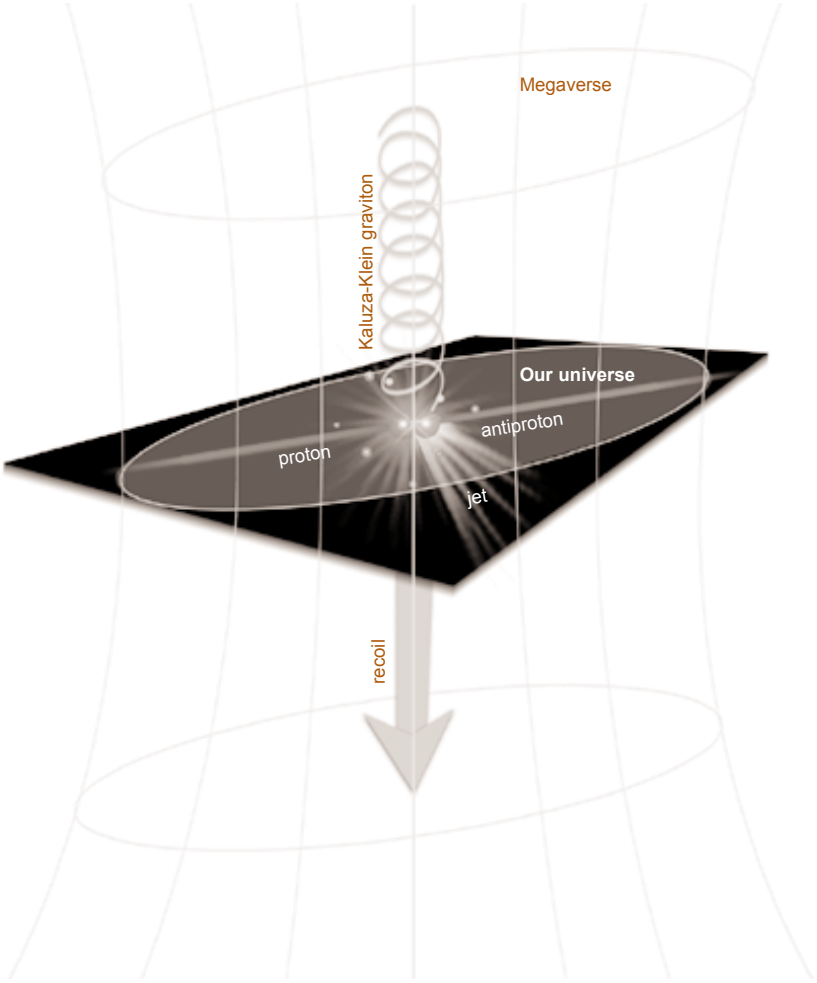
Although DZero experimenters have not seen extra dimensions, they were able to set stricter limits on their size than those set so far by gravitational experiments or accelerator experiments at lower energy machines. These new limits also place significant constraints on Arkani-Hamed, Dimopoulos and Dvali's theory.

The search for extra dimensions is not over. In fact, it has only just begun. Our colleagues across the ring at DZero's sister experiment, CDF, are searching their data for evidence of extra dimensions, and we look forward to their results. The collaborations are looking for the effects of extra dimensions in collisions that produce different types of particles, such as quarks. They are also seeking events where gravitons are produced in the collisions and then leave our three-dimensional world, traveling off into one of the other dimensions. Such a departure would cause an apparent nonconservation of energy from the point of view of our three-dimensional world.

With the next Tevatron run scheduled to start in 2001 and likely to deliver 200 times the data presently accumulated, Fermilab's collider experiments will have a significantly extended sensitivity to large extra dimensions. They might very well see them!

If they are not so lucky, the next generation Large Hadron Collider now being built at CERN in Europe will allow physicists to probe the theory of large extra dimensions and either find them or show that the idea is wrong. But we will have to wait six more years or so, before we learn that. □





According to superstring theory, our world may be pinned to a three-dimensional "brane" within a multidimensional universe. In high-energy particle collisions, gravitons winding around the extra dimensions might create a detectable link between our brane and the megaverse.

SUSY: We KNOW It's There ...

"Supersymmetry: Unveiling the Ultimate Laws of Nature"

by Gordon Kane,
with Foreword by Edward Witten
(Perseus Publishing,hardcover, 224pp., $26.00, ISBN: 0738202037)

Also by Gordon Kane:

Perspectives on Supersymmetry (1998)

The Particle Garden: Our Universe as Understood by Particle Physicists (1996)

Perspectives in Higgs Physics: Reviews and Speculations (1993)

Modern Elementary Particle Physics: The Fundamental Particles and Forces (1993)

Verification of Testing Limitations on New Strategic Systems (1985)

Reviewed by Steve Martin

Steve Martin is assistant professor of physics at Northern Illinois University

The triumph of discovering the top quark at Fermilab was inversely proportional to its surprise value.

Theory told us it was there, and how it would behave. We knew we would find it—knew we HAD to find it—and many of us delighted in having an explanation ready when curious, non-physicist friends asked the question they thought would stump us before the discovery.

"So, let's see if I've got this straight," their challenge might begin. "People at Fermilab are smashing protons and antiprotons together to try to make top quarks. Nobody has ever seen one of these top quarks, and yet you say you are absolutely sure they exist. Why?"

The best answer lies in the symmetries of the equations of the Standard Model of elementary particles and forces, the foundation of modern particle physics. One particular symmetry, called "weak isospin," requires that some equations don't change if the symbol used to represent each particle is exchanged with one belonging to a partner particle. The up and down quarks are partners of each other; so are the strange and charm quarks. Every quark must have its own partner, or the mathematics of the Standard Model would fall apart. The Standard Model was so well-tested in many other ways that this was inconceivable. Thus, the undiscovered partner of the bottom quark, the top quark, simply HAD to exist.

This was hardly the first time that a symmetry had insisted on predicting a new particle. In one of the earliest examples, Dirac used the relativistic symmetries of space and time to make the stunning prediction that the electron must have a partner. The positron was soon discovered.

In his new book *"Supersymmetry,"* University of Michigan physics professor Gordon Kane uses these examples and other arguments to show how we might anticipate the next great discoveries. In clear language aimed at a wide audience, he explains what supersymmetry is, why many particle physicists believe in it, how to look for it, and what a successful hunt might bring home.

Supersymmetry is a particularly ambitious cousin of the known symmetries. Like weak isospin, it predicts that every fundamental particle has a new partner, called a superpartner. The revolutionary, or "super," part is that the superpartners must carry different amounts of spin. No other symmetry dares to do such a thing, because particles with different spins don't seem to behave much like each other.

Or Do We?

Circumstantial evidence yields the only clues to superpartners, and not all particle physicists are convinced they exist, as they were about the top quark. Still, as Kane explains, “Supersymmetry is now a sufficiently mature area, and sufficiently close to confirmation... that a wider understanding of its content and implications is both possible and worthwhile.” And he illustrates why many particle theorists have fallen in love with supersymmetry as the preferred pathway beyond the Standard Model.

Kane reviews the Standard Model with special attention to puzzles that point towards supersymmetry—including the Higgs boson, postulated as the source of mass, the next great quest for particle physicists. He explains that the tiny length scales at which a Higgs boson would be important are actually huge compared to the length scales where gravity produces strong quantum effects. Without supersymmetry, this appears to be very odd; these two important length scales are hard to separate in the equations. With supersymmetry, pairs of superpartners can easily conspire to allow the two length scales to be as different as they indeed are.

All the superpartner particles (“sparticles”) are introduced next, with such whimsical-sounding names as squark, slepton, photino, and Wino (“Wee-no”). Using easy-to-understand diagrams, Kane offers a guide to some of their habits and personalities. There is a specific, but not technical, discussion of how we expect supersymmetric particles to be produced in colliders, and how the results of their decays are detected. Kane clearly explains how to tell the resulting events apart from those produced by known particles. Not surprisingly, Fermilab plays a central role here, and Kane strongly makes the point that this is a great place to discover superpartners, if they exist. Kane even extends an invitation to visit Fermilab, complete with photographs. Kane also argues eloquently for the value of future projects and the necessity of funding them.

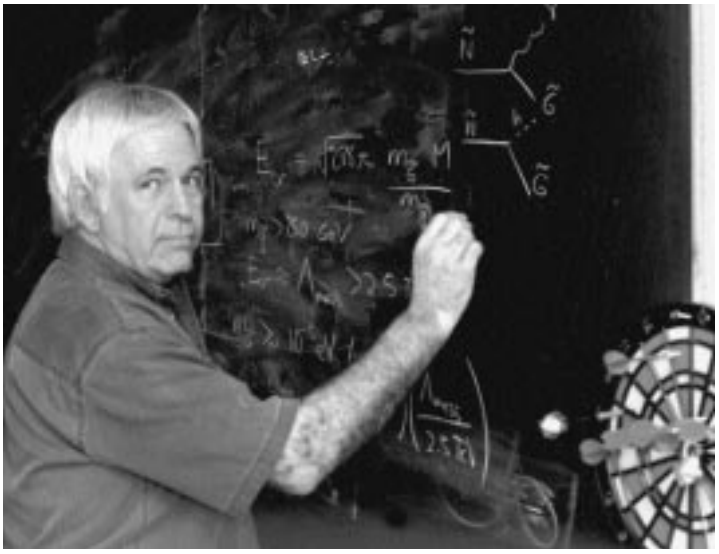


Photo by J. Zorn

Gordon Kane couples blackboard work with a classic random number generator, the dart board. “But occasionally, we paste various people’s faces on it,” he admits.

What will we learn if supersymmetry is found? Among other possibilities, Kane proposes supersymmetry as a solution to the dark matter problem. He is not afraid to point out that supersymmetry provokes some challenges of its own. He argues, however, that discovering sparticles may help us to get at what he calls the “primary theory.” This is an insightful (and sensible) term for what others have called the “theory of everything” (slightly grandiose, considering it doesn’t address the behavior of complex systems) or the “final theory” (unnecessarily bleak). While tests of a primary theory will be possible, it isn’t so clear that anything like decisive tests will be forthcoming, so I found this part of the book to be especially provocative.

For nearly two decades, Kane has been an enthusiastic advocate for taking sparticles seriously in experimental physics, not always a popular position. For the first ten years or so after its proposal in the early 1970’s, supersymmetry was widely regarded as a theoretical plaything. Kane recalls those days when theory research funds were granted (to others) with a strict condition that they NOT be spent on investigating supersymmetry.

Whether or not supersymmetry wins final vindication within the decade to come, Kane’s book will remain a readable and fascinating account of how physicists make educated guesses and test them. □

Photos by Reidar Hahn

HIGH-ENERGY EXERCISE

If you're a proton, it takes about 2.5×10^{-13} joules to accelerate once around the Tevatron's four-mile ring. If you're a person in jogging shoes, it takes considerably more energy—about billion billion times more. Nevertheless, every day at Fermilab's lunch hour, in winter and summer, in bitter cold or broiling heat, the Tevatron becomes one of the world's more unusual exercise tracks, as walkers, joggers, bikers and rollerbladers join the protons and antiprotons in circling the highest-energy accelerator on earth. The protons are underground, of course, and they move faster than the people. In the end, though, for people and protons alike, it all comes down to physics.

Photos by Jenny Mullins

Photo by Reidar Hahn

May 17 is National Employee Health & Fitness Day 2000

Fermilab and Wellness Works will join organizations across the country in celebrating National Employee Health & Fitness Day 2000, the largest worksite health and fitness observance in the United States.

The National Association of Governor's Councils on Physical Fitness and Sports has designated May 17, 2000, as the official national health observance. Millions of employees will observe the 12th annual event with worksite walks or special activities during the workday.

Wellness Works again will sponsor this year's event on Wednesday, May 17 from 11:30-1:00 on Ring Road. Beginning at A1, employees are invited to walk, run or rollerblade around the ring. Participants sign in at a table at A1, where they pick up their ticket and a bottle of water. Stations set up around the ring will offer games to play, prizes to win and cheers of encouragement. The Division or Section with the largest percentage of participation will win the coveted traveling trophy, defended by last year's winner, Laboratory Services. Plan to circle the Ring on May 17.

Photo by Jim Shultz

Cover : Mayling Wong, of the Particle Physics Division's Engineering and Technical Teams.

Fermilab wins Golden Family Award from Society of Women Engineers

WOMEN Engineers

Outnumbered But Undaunted

by Mike Perricone

While they say their careers largely run a smooth parallel to those of their male colleagues, women engineers also know the everyday effects of being outnumbered in a traditionally male profession.

"I've tried to hire female engineers for our group, but it's difficult to find them," says Elaine McCluskey of Fermilab's Facilities Engineering Services Section. "We're looking for a few good female engineers to join our group."

"There's no real network of women engineers yet," says Emanuela Barzi of the Technical Division's Development and Test Department. "If there were more of us, we could support each other more."

In a 1999 survey, the National Science Foundation found women were among groups "underrepresented" in science and engineering. The NSF said women made up 50 percent of the population between the ages of 18 and 30, but earned just 36 percent of the doctorates awarded in science and engineering.

McCluskey remembers her engineering classes at Washington University in St. Louis having a 20 percent female enrollment. Chris Ader, of the Beams Division's Mechanical Support Department, remembers being the only female student in most of her engineering classes at Illinois Institute of Technology. Fermilab data for 1999 show women making up 11.9 percent of engineering physicists, 9.5 percent of physicists, and 4.3 percent of electrical and mechanical engineers.

But if female engineers are outnumbered in the Fermilab environment, a sampling shows their responsibilities are far from subordinate.

Ader, for example, is assembling components of the stochastic cooling system for the Antiproton Recycler, a critical component in the lab's goal of greatly extending its experimental reach in Collider Run II of the Tevatron beginning in 2001. Barzi, who has lived in Italy and Belgium, is in charge of the superconductor research and development effort for high-field superconducting magnets.

Mayling Wong, of the Particle Physics Division's Engineering and Technical Teams, has been instrumental in the design and construction of the Cerenkov Luminosity Counter, which must fit into a cramped space as part of the CDF detector upgrade for Run II. And McCluskey is in charge of the extensive structural renovations to Wilson Hall, the lab's headquarters building as well as its renowned symbol.

McCluskey, the mother of two children, cites the "family-friendly" atmosphere at Fermilab. She describes it as a lab-wide outlook that makes families and children feel welcome, and enables parents to feel comfortable about balancing their work and family responsibilities—including that dreaded mid-day call from school that a child is ill.

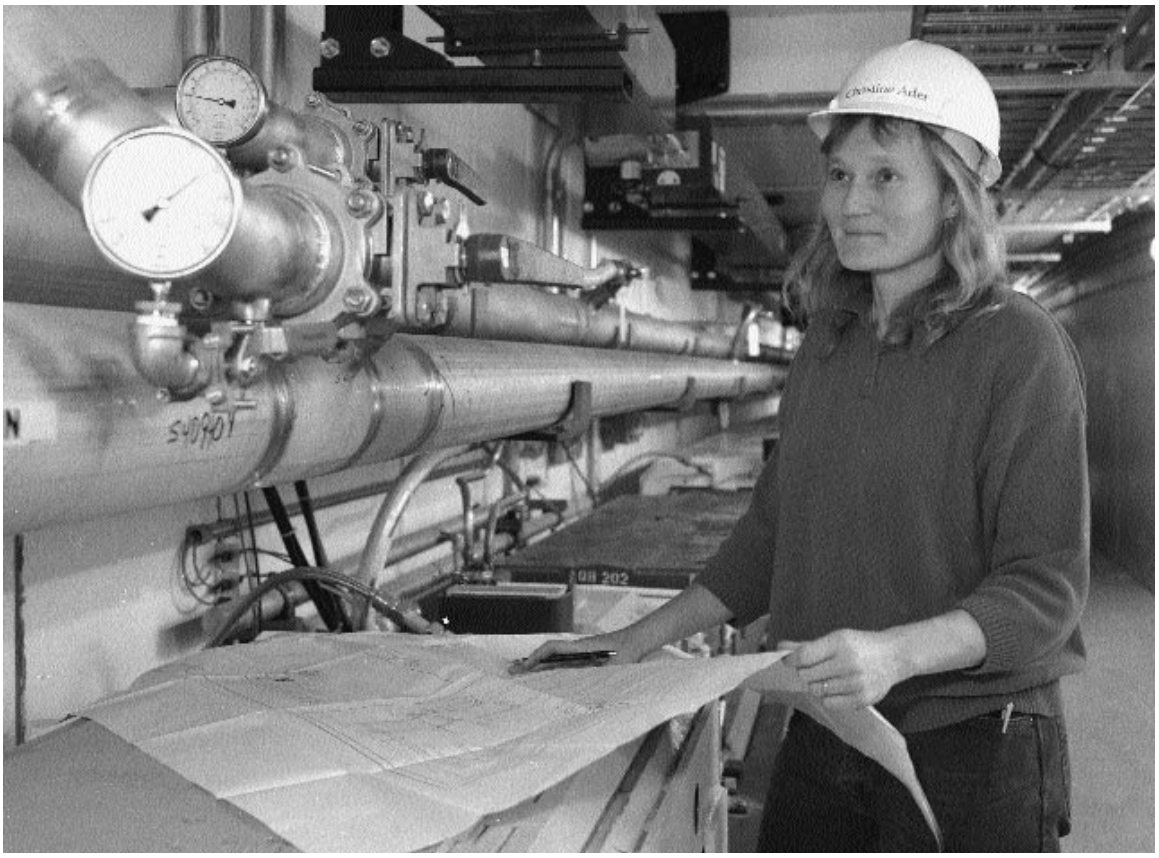


Photo by Reidar Hahn

Chris Ader is assembling components of the stochastic cooling system for the Antiproton Recycler, a critical component in the lab's goal of greatly extending its experimental reach in Collider Run II of the Tevatron beginning in 2001.

In fact, the lab has a long history of family support, establishing childcare facilities in the 1970s, during its earliest days. The attention to the quality of life for employees extends to summer camp for kids, and fitness facilities, wellness programs and referral services for employees, in addition to an overriding concern with science education. And with nature trails, ponds, restored prairie lands and good birdwatching on its 6,800 acres, the lab functions as a recreational area for surrounding communities—and for the families of its employees.

If those qualities sound distinctive, the Society of Women Engineers strongly agrees. The society's Chicago regional chapter presented its fourth annual Golden Family Award to Fermilab on April 14, recognizing the lab for "outstanding support of family issues." Wong, an active member of the professional society, nominated the lab for the award, which has previously been won by such noted companies as Motorola and Lucent Technologies.

"I was a little amazed that we won because of that level of competition," says Kay Van Vreede, head of Fermilab's Lab Services Section. "We're very happy because this is recognition from a group that we really want to bring into the lab. We need more women engineers. And we find that family support is the kind of non-traditional issue important to jobseekers today—and important to retaining people in their jobs.

"The lab has actually had these non-traditional benefits for a long time," she continued, "and they might not have seemed as valuable as they really are. As we were putting together our application, we realized that a lot of things we have here at the lab are extraordinary."

WOMEN *Engineers*

There was another significant event on April 14, in Washington, D.C.: President Clinton nominated Prof. Mildred Spiewak Dresselhaus, Institute Professor of Electrical Engineering and Physics at Massachusetts Institute of Technology, as the next director of the Department of Energy's Office of Science.

The appointment might be symbolic of changing times, because the NSF studies on under-representation have also indicated that the number of science and engineering bachelor's degrees awarded to women grew by 36 percent between 1985 and 1995. And if Wong, Barzi, Ader and McCluskey are a representative sample, the key influences in developing an interest in engineering are little different for women from those for men.

McCluskey's father was an electrical engineering professor at Washington University in St. Louis. She grew up with a knack for crafting things with her hands (though not many male engineers are likely to speak proudly as she does of sewing her own prom dress without working from a pattern). In her undergraduate days at Carleton College in Minnesota, watching the day-by-day construction of a new building for the Geology Department convinced her that civil engineering was to be her life's work.

Ader remembers gravitating toward her father working on cars in the family garage. He had become an auto-body man after finishing high school. But from the first time he saw her showing an interest and getting her hands dirty, he encouraged his daughter to follow her mechanical skills as far as she could in school and college. Which she did, with the help of a scholarship from the Society of Women Engineers. She withstood her mother's raised eyebrows in her younger years.

"My mother was worried about me being tomboyish," she recalls.

Photo by Reidar Hahn

Elaine McCluskey of FESS is in charge of the extensive structural renovations to Wilson Hall, the lab's headquarters building as well as its renowned symbol.

Now she's gotten her husband, a mechanical engineer, interested in classic cars. And together they are restoring her own classic, a 1965 Mustang. Ader is amused that many people are startled at learning that she likes to weld, but says there's nothing startling about the acceptance that she and her work have received in three years at Fermilab.

Barzi says that although her father encouraged her towards arts and literature, which she also loves, her natural inclination has always been towards physics, math and technology. She adds: "The fact that during high school I loved playing the piano did not reduce my drive for science."

Wong, a mechanical engineer, liked to take things apart when she was a child ("I wasn't so good at putting them back together," she admits), and taking apart a hairdryer introduced her to the wonders of electricity. As students, her parents had emigrated

from China to the suburbs of Chicago, where she was born and raised. Her father was a civil engineer spending a lot of time on the road, but he always encouraged her, even offering tutoring by phone for physics homework.

Then it was on to the University of Illinois, majoring in biology, but she found she was more interested in the lab equipment than in the experiments. She got her master's in mechanical engineering from Case-Western Reserve University, joining the lab three years ago.

"It's always my hope to be accepted for my work, and not to be set apart because I am a woman," she says. "I always have technical questions, but so many people here are so willing to share their experience and their point of view. Fermilab has a vast wealth of technical knowledge among engineers, machinists and technicians. I've felt very comfortable in this setting. It's been great."

The surroundings aren't so congenial everywhere. McCluskey remembers early in her career that despite ready acceptance from her professional colleagues, she sometimes experienced rude comments and behavior from construction workers. Barzi bristled at the challenge of a family member that she could never withstand the rigors of technical studies at Italy's University of Pisa. When she got there, she found that she and other female students often received what they felt were unfairly low grades.

"But I was self-confident enough to refuse those grades, which is something you can do in Italy if you want to prove that you have been under-evaluated," she says.

Refusing the grades meant retaking the exams, which she did successfully enough to earn Laurea degrees at Pisa in both engineering and physics. She came to Fermilab with a fellowship in 1994 for her physics thesis in di-boson production at CDF.

"There is much more formal respect for female professionals here," she says, after three years as an engineer in the Technical Division. "This is a very good working environment. There is more consciousness of diversity, and there is regular training in these areas, and maybe that is why."

Photo Jenny Mullins

Emanuela Barzi, who has degrees in both engineering and physics from Italy's University of Pisa, has worked in research and development for high-field superconducting magnets.

Their numbers may be growing in university studies, as the NSF studies show, but women engineers know the importance of intangibles—and help—in a non-traditional field. Barzi emphasizes the importance of confidence to women setting out in science and technology careers. Ader is proud that her father encouraged her both to work with cars and take her education as far as she could. McCluskey is grateful for the professional mentors who helped her career. Wong wishes she had pressed her teachers for more attention in school.

"Young girls start off strong in science, but for some reason they back off in junior high and high school," she says. "I know I was reluctant to ask for help. I would encourage young girls to ask questions, to ask for help, to get a teacher to sit down one-on-one and explain things. If one teacher won't, then ask another teacher."

Wong has one more piece of advice for a girl interested in science and technology.

"If that's what you want to do," she says, "then go for it. Go for it one hundred percent."

Photo by Reidar Hahn

No More TATA Non Grata

by Judy Jackson

Earlier this month, Physicist Naba Mondal, of India's Tata Institute of Fundamental Research, joined DZero colleague and Fermilab physicist Tom Diehl in commissioning activities for the detector's central muon "cosmic cap" scintillation counters. For 18 months, Tata scientists, who built the scintillation counters, were unable to install and test their half-million-dollar instrumentation system at Fermilab because of diplomatic sanctions levied against Indian scientific institutions in the wake of India's 1998 nuclear weapons tests. In December, 1999, the U.S. Department of Commerce removed Tata Institute from the list of banned scientific institutions, in a move described as "a consensus decision by the Administration to more tightly focus the sanctions on those Indian entities most directly involved" in the weapons activities. More of Mondal's Tata colleagues will return to DZero this summer. Welcome back, Tata! □

CALENDAR

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

ONGOING

NALWO is pleased to announce the free morning English classes in the Users' Center for FNAL guests, visitors, and their spouses have been expanded; The new schedule is: Monday and Thursday, 9:30am - 11am beginners (Music Room) and intermediates (Library) Monday and Thursday, 11am - 12:30pm advanced, emphasizing pronunciation and American idioms (Music Room)

NALWO coffee for newcomers & visitors every Thursday at the Users' Center, 10:30-12, children welcome. In the auditorium, International folk dancing, Thursday, 7:30-10 p.m., call Mady, (630) 584-0825; NALWO (Nat'l. Accelerator Laboratory Women's Organization) cordially invites all women associated with the lab (users, guests, employees, spouses) to the Annual Spring Tea, Friday morning May 12, 2000 from ten o'clock until noon at the lovely Warrenville home of Janine Tollestrup. If you can, please bring a favorite dessert or appetizer to share. For additional information and directions, please contact Rose Moore, 208-9309 or Sue Mendelsohn, 840-5059 or mendel@fnal.gov or Selitha Raja, 305-7769

MUSIC

E=MC^2/ E=eclectic; M=music; C=come one, come all! Come join us for a weekly gathering of Fermi folks and friends on Thursday nights at The Users Center in The Piano Room!!! We have begun an acoustic "open style" sing around. Anyone who plays an instrument, enjoys singing and/or listening to music is welcome. We are trying to keep the group as "unplugged" as possible in order to accommodate everyone.Our goal is to make everyone feel welcome. We meet at 5:30pm to maybe 9:00 pm on Thursdays. Contact DENNIS OSTROWSKI X4389 LDP 630-314-4024 or ostrowski@fnal.gov.

INTERNATIONAL FILM SOCIETY

MAY 12: *Paths of Glory* (Dir: Stanley Kubrick, USA, 1957, 86 min.)—Kubrick's fourth film, considered one of his best, is a masterful, classic anti-war film about the futility and irony of the war in the trenches in World War I. Ramsey Auditorium, 8:00 p.m. Admission $4 ($2 for Fermilab grad students, $1 for children under 12.) Call 630-840-8000 / 2156 / 5042 or go to www.fnal.gov/culture/film_society.html/.

BARN DANCES

All dances are taught and people of all ages and experience levels are welcome. Admission is $5, children under 12 are free (12-18 $2). The Fermilab Folk Club sponsors the dance. For more information, contact Lynn Garren x2061 garren@fnal.gov or Dave Harding x2971 harding@fnal.gov, or see http://www.fnal.gov/orgs/folkclub/

CORRECTION

Fermilab Director Emeritus and Nobel laureate Leon Lederman was awarded the National Medal of Science in 1965, a fact omitted from a story about James Cronin in the previous issue of *FERMINEWS* (*"Cronin Puts Medal of Science Right to Work,"* Vol. 23, No. 7, April 14, 2000). Robert R. Wilson and Norman Ramsey were correctly listed among former medal winners in the story. *FERMINEWS* regrets the error.

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

DINNER SERVED AT 7 P.M. $20/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, MAY 3

Blackened Catfish Fillets with Watercress Sauce

Red Beans and Rice

Pecan Chocolate Tart

DINNER
THURSDAY, MAY 4

Salad Niciose

Pork Tenderloin with Marsala Sauce

Egg Noodles with Dill

Vegetable of the Season

Peach Cardinale

LUNCH
WEDNESDAY, MAY 10

Grilled Beef, Vegetables and Rice Noodle Salad

Oriental Fruit Coupe

DINNER
THURSDAY, MAY 11

Grilled Squid

Veal with Capers and Lemon

Tomato Risotto

Julienne of Zucchini

Vanilla Custard with Strawberries in Grand Marnier

FERMINEWS

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The deadline for the Friday, May 12, 2000, issue is Tuesday, May 2, 2000. Please send classified advertisements and story ideas by mail to the Public Affairs Office MS 206, Fermilab, P.O. Box 500, Batavia, IL 60510, or by e-mail to ferminews@fnal.gov. Letters from readers are welcome. Please include your name and daytime phone number.

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CLASSIFIEDS

FOR SALE

■ '99 Harley Davidson Sportster Custom XL883C (Black) 3,000 miles has a windshield, forward controls, saddle bag brackets and a touring seat. Asking $7,500 contact Terry X4572 skweres@fnal.gov or Janine at none2compare@yahoo.com.

■ '99 Goldwing SE (Silver), 11K Miles, with extras. Price lowered to $1,500 less than Kelley Blue Book (3/27/00 $16,500), asking $15,000 Excellent condition, and runs great. Markland receiver hitch and (5 pin) OEM trailer wiring kit, Markland floorboards, foam grips and extra windshield. Also two headsets for the intercom, one full-face helmet model and one that can be used either on a full-face or open-face. Still has 2 yrs on original warranty (unlimited miles) as of Nov. 5. Can get another 3 yrs extended (unlimited miles). Call Terry X4572 or e-mail skweres@fnal.gov

■ '96 Dodge Neon Highline, 4 dr sedan, bright blue, cute, clean and well-maintained, auto, a/c, p/s, AM/FM cass, air bags, 104k, $4,600 or best offer. Hank x8105 or glass@fnal.gov.

■ '94 Mazda Protégée, 4dr sedan, 102k, automatic trans, AM/FM cassette, very good condition, new muffler and tubing, $3600. Call Valeri Evdokimov, x2785 or e-mail evdokimov@fnal.gov.

■ '90 Ford Taurus GL wagon (blue) - under 80K miles, original owner, auto, loaded with options: A/C, power door locks, windows, and drivers seat, aluminum wheels, 3rd seat, rear window defroster/wiper, cruise control, luggage rack, AM/FM stereo tape. Good condition. $3700 obo. Simon Kwan x2329 or e-mail swalk@fnal.gov.

■ '89 Olds Cutlass, 130K miles, 4dr, auto, air, CD, good tires and brakes. Not pretty, but reliable and runs well. $700 / obo Call Ryan, 879-1898 or casper1377@yahoo.com

■ Briggs & Stratton engine, 20" blade. Runs fine, Mulches only. $20 o.b.o. e-mail bellanto@fnal.gov.

■ 36" lawn roller $50 6" bench grinder with two wheels 1/3 HP $25 Heavy duty dog run 10' X 11' X 6'H $100 Double divided dog run with two doors 12' X 8' X 5'H $200 (630) 753-0278

■ Roper Gas Stove (white) $60.00 and Roper built-in Dishwasher $40.00. Both in very good condition. Call Gene at (630)897-0263.

■ Chicago Old Town School of Folk Music tickets: Special Consensus - 25th Anniversary concert (Bluegrass) - Saturday 5/6, 2 tickets ($17 each). Contact Roni at (630)548-4955.

■ 2-weeks time share at Acapulco/Puerto Vallarta/Mazatlan, 1-bedroom unit/sleeps 4-6 appraised @ $ 15.9 K. Call Duke @ (815)372-2368 evenings after 7:00PM &/or anytime weekends.

■ Mobile Home: Located in Calumet City. 2 bedroom, 1.5 bath, all paneled. New furnace, A/C. Moving out of state. $6,000 OBO. Call: 708-862-5711.

SPORT FISHING

■ Great Lake Michigan Sport Fishing via King Olaf Charters. We specialize in multi-boat charters. All equipment provided. Call Captain Bill Penn 630-554-3155 (day) or 630-554-3828 (evenings) for more information.

HOUSE

■ Riverside property with 2 story, 5 room house, large bathroom, 2 enclosed porches, central air conditioning, and detached 2.5 car garage. Located in the historic section of Geneva across from Wheeler Park, within walking distance from train station and downtown shopping. Year-round views of the Fox River in a beautiful garden setting with patio and goldfish pond. Asking $178,500. See photos at http://members.dsl.telocity.com /~erik/house.html/ . Contact erik@fnal.gov, or call 630-840-6416.

MOVING SALE

■ Machinist TOOLS, Cannondale Bike,GAS Barbecue Grill and many other items call (630) 897-6642

BIBLE STUDY

■ The 12 o'clock (noon) Bible Study will continues its one-year survey of the Bible on Wednesdays in the Huddle located in the cross gallery. If interested contact Jeff Ruffin x4432, or ruffin@fnal.gov.

WANTED

■ Bicycle, call 840-4794 or 8196.

■ Moderate size refrigerator and lawn mower for young couple starting in apartment. Call Larry at 4386 or e-mail allen@fnal.gov.

LAWN CARE

■ Mowing, trimming weed control and fertilizing. Self-owned, in business for 11 years. Aurora and Batavia areas only. Call 630-859-3789 or rtreend@aol.com.

MILESTONES

BORN

LeAnna Nicole Thrasher, March 24th to Billy and Donna Thrasher (Communications Center)

Bison calf, April 17, 2000

HONORED

Gerald Blazey, named Presidential Research Professor, Northern Illinois University

RETIRING

James Harder, ID 1615, March 31

Thomas Larson, ID 588, Beams Division, April 28

Fred Randazzo, ID 2005, FES-OP-Mechanical, effective May 1

Ruth Christ, ID 2109, Lab Services Section, May 12

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